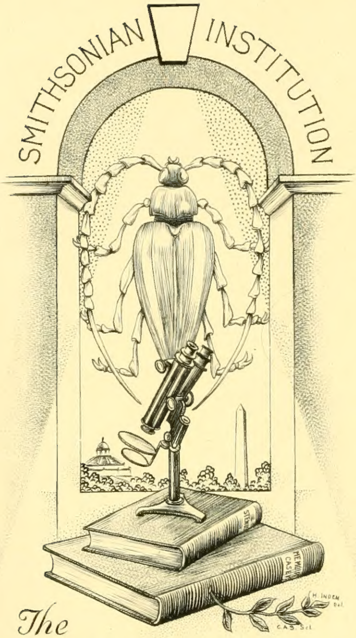
SMITHSONIAN INSTITUTION

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON.

ERRATA.

TRANSACTIONS.

Page 104, for *Notogenia* read *Notogonia.*
Page 104, for *subtesselata* read *subtessellata.*
Page 105, for *pruiosus* read *pruinosus.*
Page 107, for *crassiscornis* read *crassicornis.*
Page 109, for *Droylus* read *Dorylus.*
Page 110, for *V. armata* read *S. armata.*
Page 116, for *Œstuans* read *Æstuans.*
Page 116, for *Aphis* read *Apis.*
Page 167, for *Gynandroph halma* read *Gynandrophthalma.*
Page 180, for *Metotoplax* read *Metopoplax.*
Page 181, for *P. strichnocera* read *D. strichnocera.*
Page 181, for *Megalocerœa* read *Megalocerœa.*
Page 221, *for* sp. nov. *read* gen. nov.
Page 223, for *Evichoma* read *Evirchoma.*
Page 249, for *Hybocompa* read *Hybocampa.*
Page 273, *for* Lycœnidæ *read* Lycænidæ.
Page 310, for *T. binghami* read *I. binghami.*
Page 510, for *Ur ys* read *Uroxys.*

PROCEEDINGS.

Page xxxvii, for *fuliginose* read *fuliginosa.*
Page xxxvii, for *Poncra* read *Ponera.*
Page xlvi, *for* Mrs. Nicholls *read* Mrs. Nicholl.
Page xlvii, for (*orthocladius*) read (*Orthocladius*).
Page lvi, for 16 *ceratinia* read 16 *Ceratinia.*
Page lvi, for 4 *ceratinia* read 4 *Ceratinia.*
Page lviii, for Jansen read Janson.
Page lix, for *Anisolobis* read *Anisolabis.*
Page lix, *for* Huntingford *read* Huntingfield

THE

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR

1903.

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TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1903.

I. *A further contribution to our knowledge of African* Phytophagous Coleoptera, Part II. By MARTIN JACOBY, F.E.S.

[Read October 15th, 1902.]

THIS paper is a continuation of the one published in these Transactions in 1901. It deals with the groups Halticinæ and Galerucinæ.

HALTICINÆ.

Haltica malvernensis, sp. n.

Metallic green with brassy reflection, the basal three joints of the antennæ more or less fulvous, thorax impunctate, the basal sulcus sinuate, extending to the sides, elytra strongly and closely punctured in semiregular rows, the interstices slightly rugose, tibiæ rather broad and deeply sulcate.

Length 4 millim.

Of a brassy green colour, the head impunctate, the frontal tubercles very strongly raised, the carina very narrow, acutely raised and elongate, labrum and palpi blackish, antennæ extending rather beyond the middle of the elytra, black, the lower three joints more or less fulvous, the basal joint stained with æneous above, third joint one-half shorter than the fourth; thorax about one-half broader than long, distinctly narrowed anteriorly, the sides very feebly rounded, the anterior angles thickened, obtuse, the disc convex and shining, impunctate, the basal sulcus sinuate, not foveolate at the sides but extending to the latter and placed at a proportionately broad distance from the basal margin, scutellum blackish; elytra with very closely approached irregular rows of distinct punctures which are getting smaller towards the apex, the interstices, especially at the sides, rather uneven with some faint traces of longitudinal costæ below the shoulders, the latter prominent, the tibiæ of the male rather strongly widened anteriorly and sulcate, the male organ slender, slightly narrowed at the middle, the anterior margin nearly truncate, with a small central point, the upper surface sulcate at each side near the apex.

Hab. Malvern, NATAL (*C. Barker*); also Sedhiou, WEST AFRICA (*C. Alluand*).

The general colour of this species, of which I have eight specimens before me, is not blue as is mostly the case in this genus, but a brassy green, and the punctuation of the elytra is proportionately strong and very close, and the tibiæ (at least in the male) are more dilated and more strongly sulcate than is usually the case, they may almost be called triangularly compressed.

Haltica pyritosa, Erichs.

It is at present almost impossible to refer with certainty any of the numerous species of *Haltica* from different parts of Africa which are before me, to Erichson's species without the type for comparison; I look, however, upon specimens from Mozambique, Zambesi R., Mashonaland, and West Africa as representing Erichson's species. The author gives the colour as "æneous"; all the specimens before me are cupreous above, and the elytral punctuation is comparatively strong and arranged in nearly regular and closely-approached rows; the male organ does not differ from that of several other closely-allied or perhaps identical species, but all the specimens from the above localities are decidedly of more elongate and parallel shape than those from South Africa before me, and I am able to separate them also by the sculpturing of the elytra.

Haltica cuprea, Jac.

This species was described by me in the Trans. Ent. Soc. London, 1895, founded on specimens of entirely cupreous colour above, and in which the elytral punctuation is extremely fine and irregular as well as close; numerous specimens since received from Natal differ in having the thorax of a bright metallic brassy colour, but I am unable to find any other differences of importance, nor in that of the male organ; the latter is elongate and parallel, the apex rounded with a small projecting point at the middle, the upper surface below the anterior cavity is finely transversely wrinkled; the size of the insects differs rather considerably, some being much larger than others, but all are more oblong and convex than the species I refer to *H. pyritosa.*

Haltica cyanicollis, Jac.

The description of this species was published at the same time and in the same Journal as the preceding one, but whether the insect is really specifically distinct or only represents a local form I am unable to say. The size is larger than the largest specimens of *H. cuprea,* the thorax is metallic blue or greenish, and the basal sulcus is placed at a longer distance from the basal margin than is the case in the allied species; other differences consist in the strongly-punctured space in front of the eyes and the more distinctly-punctured elytra.

Dibolia thoracica, sp. n.

Black, the basal joints of the antennæ and the legs fulvous, head and thorax dark greenish, minutely transversely wrinkled, elytra dark bluish, microscopically punctured, posterior femora black at the apex.

Length $2\frac{1}{2}$–3 millim.

Head greenish, minutely granulate or wrinkled, eyes elongate, occupying the entire sides of the head, frontal elevations absent, clypeus broad, antennæ not extending to the middle of the elytra, the lower four joints flavous, the others black, basal joint elongate, the following three nearly equal, terminal joints short; thorax nearly three times broader than long, the sides obliquely narrowed anteriorly, the anterior angles thickened, the entire surface covered with very fine transverse wrinkles, greenish, basal margin broadly and evenly rounded, scutellum small, black; elytra strongly convex, evenly rounded and widened towards the middle, bluish, with some extremely fine punctures, only visible under a strong lens, legs flavous, the apex of the posterior femora black, posterior tibiæ widened near the apex and strongly sulcate with a broad emarginate spur.

Hab. Frere, NATAL.

The colour of the thorax which differs from that of the elytra, and the peculiar finely-wrinkled surface form the principal characteristic characters of this species, of which two exactly similar specimens are contained in my collection.

Dibolia abdominalis, sp. n.

Piceous below, the basal joints of the antennæ and the abdomen more or less testaceous, above obscure æneous, eyes closely approached, upper surface finely or scarcely perceptibly punctured, the tibiæ and tarsi obscure flavous.

Length 3 millim.

Ovate and very convex, the head impunctate, greenish-æneous, the eyes very large and closely approached at the vertex, the intermediate space smaller than their diameter, antennæ flavous, the apical joints darker, second and third joint short, equal, the fourth the longest; thorax very short, three times broader than long, the sides straight, the anterior angles thickened, the median lobe somewhat pointed, the disc minutely transversely wrinkled, without punctures, elytra very convex, widened towards the middle, minutely punctured and obsoletely longitudinally sulcate, legs flavous, the posterior femora and the breast piceous, abdomen partly flavous.

Hab. Grahamstown and Dunbrody, S. AFRICA (*Rev. O'Neil*).

The punctuation in this species seems to vary from extreme fineness to absence of punctures, but I am not able to separate the specimens on account of any other differences; in most of them, the elytral punctuation is very fine and closely placed, but in one specimen no trace of punctures can be seen and the interstices are obsoletely sulcate; in all, the eyes are approached at the vertex (in one, probably the male, much more closely so), but the space separating them gradually widens.

Dibolia bimaculata, Jac. (Proc. Zool. Soc., 1900).

Whether this species is identical with *D. maculata*, Har. (Coleopter. Hefte, xvi. p. 232), or a variety of it I am not able to say without seeing the type, but Harold describes the insect as obscure æneous with the elytra blue posteriorly only, and with the interstices of the elytral punctured striæ likewise punctured. In *D. bimaculata* the first five joints of the antennæ (not four) are flavous, the entire upper surface is metallic-blue, and the elytra are punctured in closely-approached rows of rather irregular shape without extra punctures in the interstices. In other respects Harold's description is too short and gives no other details.

Dibolia affinis, sp. n.

Blackish-blue, the antennæ and legs black, thorax closely and strongly punctured, elytra very finely punctate-striate, each with a large fulvous spot near the apex.

Length 3 millim.

Of elongate, subcylindrical shape, the head finely and sparingly punctured, dark blue, eyes widely separated, the intermediate space with a transverse groove, antennæ black, the second, third and fourth joints of nearly equal length, fifth slightly longer, four terminal joints thickened ; thorax very strongly transverse, the sides rounded, narrowly margined, the disc strongly, evenly and closely punctured, the interstices slightly aciculate ; scutellum smooth ; elytra subcylindrical, slightly narrowed posteriorly, finely punctate-striate, the striæ not very distinct, and irregular, each elytron with a bright fulvous, nearly round spot near the apex ; legs black, the tibial spur fulvous.

Hab. Bothaville, ORANGE FREE STATE (*Dr. Brauns*).

Again closely allied in coloration to the preceding species but differing in its larger size, the entirely black antennæ and legs, the strong punctuation of the thorax and the impunctate elytral interstices. I received a single specimen from Dr. Brauns in S. Africa.

Hespera maculicollis, sp. n.

Pale testaceous, finely pubescent, antennæ fuscous, thorax finely rugosely punctured, the sides with a fuscous stripe, elytra microscopically punctured, the lateral margins narrowly piceous, the breast, the apex of the posterior femora and the posterior tibiæ and tarsi piceous.

Length 2–3 millim.

Head finely rugose, obscure fulvous, frontal tubercles distinct but rather flat, antennæ extending beyond the apex of the elytra, fuscous, the base of each joint pale, second joint small, third shorter than the fourth, rather widened as well as the following three joints, terminal joints more elongate and slender ; thorax nearly twice as broad as long, the sides straight, the surface rather depressed, very obsoletely transversely sulcate at the middle, finely punctured and pubescent, rather darker than the elytra, the sides with a narrow fuscous stripe, scutellum piceous ; elytra pale testaceous, clothed with pale fulvous pubescence, the interstices minutely punctured, the lateral margins narrowly black, this colour however not quite extending to the apex ; legs rather slender, tibiæ mucronate, the metatarsus of the posterior legs as long as the following joints together, claws appendiculate, anterior cavities open.

Hab. Malvern, NATAL (*C. Barker*).

In the specimen, which I look upon as the female, the antennæ are more slender, without widened intermediate joints, and the general size of the insect is larger.

Hespera pallida, sp. n.

Pale testaceous, the antennæ fuscous, the base of each joint pale, upper surface pubescent, thorax transverse, minutely punctured and wrinkled, elytra extremely finely punctured.

Length 3 millim.

Head scarcely perceptibly punctured, frontal tubercles small and obsolete, antennæ extending beyond the apex of the elytra, fuscous, the base of each joint pale, the third joint slightly shorter than the fourth, all the rest elongate and slender ; thorax twice as broad as long, the sides straight, the anterior angles slightly tuberculate, the surface minutely punctured and wrinkled and finely pubescent ; elytra with a shallow depression below the base, sculptured like the thorax, under-side and the legs pale flavous.

Hab. Grahamstown, Pt. Alfred, S. AFRICA (*Rev. O'Neil*).

This species scarcely differs from the preceding in any other point except the coloration, in having no black markings of any kind; there are, however, four specimens before me which all agree with each other, and it is therefore unlikely that the insect is only a pale variety of *H. maculicollis*.

Eutornus picturatus, sp. n.

Black, thorax testaceous, with several small black spots, strongly and remotely punctured, elytra very closely and finely punctured, black, a round spot near the scutellum, a transverse band at the middle, another semicircular band near the apex and the lateral margins, testaceous.

Length 5–6 millim.

Head strongly punctured near the eyes, black, shining, with a deep, concave groove between the eyes, clypeus very broad, convex, antennæ short, black, the second and fourth joint small and equal, the third elongate, the others transversely widened; thorax more than twice as broad as long, the sides feebly rounded, broadly flattened, the anterior angles thickened but not produced, basal margin sinuate, preceded by a shallow transverse sulcus, the surface irregularly and rather deeply punctured, testaceous, with two small black spots at the middle near the anterior margin; another more indistinct spot is placed at the sides near the base; scutellum black; elytra very closely and distinctly punctured, the black colour interrupted by a round spot near the scutellum, a transverse regular band at the middle not quite extending to the suture and another V-shaped band near the apex of each elytron, under-side and the legs black, posterior femora strongly widened, their tibiæ with a small tooth near the apex, claw joint strongly inflated, apical segments of the abdomen and the prosternum more or less testaceous.

Hab. Salisbury, MASHONALAND (*G. Marshall*).

Longitarsus barkeri, sp. n.

Apterous, ovate, black, shining, the antennæ, the anterior and intermediate legs and the posterior tibiæ and tarsi flavous, thorax impunctate, elytra very finely punctate-striate anteriorly, the punctures obsolete near the apex.

Length 2 millim.

Head impunctate, the frontal elevations small and transverse, bounded by a straight groove behind, the carina acute, antennæ extending beyond the middle of the elytra, flavous, the terminal joints slightly fuscous at their apex, basal joint thick and sub-cylindrical, the following three of equal length, fifth joint much longer, apical ones slightly thickened; thorax subquadrate, the sides straight, the anterior angles strongly oblique, forming a slight tubercle before the middle, the disc rather convex, impunctate, black, shining, scutellum strongly transverse; elytra ovate, convex, distinctly widened at the middle, the apex of each rounded, the punctuation very fine and arranged in irregular rows anteriorly, irregular and scarcely perceptible near the apex; under-side and the posterior femora black, the rest of the legs flavous, metatarsus of the posterior legs as long as the following joints together.

Hab. Malvern, NATAL (*C. Barker*).

Smaller than *L. nigritula,* the antennæ entirely flavous, the head differently sculptured, and the elytra more distinctly punctured in rows.

Longitarsus apicipes, sp. n.

Apterous, ovate, convex, black, the basal joints of the antennæ, the apex of the tibiæ and the tarsi, fulvous, thorax impunctate, elytra strongly punctured in irregular double rows.

Length 2 millim.

Head impunctate, black, shining, obliquely grooved above the eyes, frontal elevations indistinct, carina long and distinct, antennæ rather short, the lower five or six joints flavous, the rest black, the basal joint black above, the second and the following two joints equal in length, the fifth, longer; thorax transversely subquadrate, convex, the sides straight, the anterior angles oblique, the surface impunctate; elytra gradually rounded and widened towards the apex, strongly convex, the shoulders not prominent, the punctuation comparatively strong, arranged in irregular double rows which get gradually finer towards the apex, the lateral margins accompanied by a distinct single row of punctures, under-side and the legs black, the extreme apex of the tibiæ and the tarsi fulvous, the metatarsus of the posterior legs as long as the following joints together.

Hab. Dunbrody, Cape Colony (*Rev. O'Neil*).

The shape of this species differs from many others of this genus in the posteriorly-widened elytra, which attain the greatest width at the apex instead of the middle; the sculpture of the same parts and the colour of the legs are other distinguishing features of this species.

Longitarsus dunbrodensis, sp. n.

Apterous, elongate and narrow, dark greenish-æneous, the basal joints of the antennæ, the base of the femora and the tibiæ and tarsi fulvous, head and thorax minutely granulate and punctured, elytra truncate at the apex, sculptured like the thorax.

Length 2 millim.

Head rather broad, without any frontal elevations, dark greenish, lower portion of the face obscure fulvous, antennæ extending beyond the middle of the elytra, the lower six joints fulvous, the others black, the second and third joint equal in length, the terminal joints distinctly thickened, subquadrate; thorax scarcely one-half broader than long, subquadrate, the sides straight, or nearly so, the anterior angles slightly obliquely thickened, the disc rather flat, extremely minutely and closely punctured, not very shining, scutellum broad, bluish black, impunctate, elytra slightly widened towards the middle, the apex of each almost truncate, the punctuation similar to that of the thorax ; posterior femora æneous at the apex, the base fulvous as well as the other legs and the posterior tibiæ, the first joint of the posterior tarsi as long as the following joints together.

Hab. Dunbrody, CAPE COLONY (*Rev. O'Neil*).

This species is of a more peculiar shape and depressed appearance than any of its allies from the same country; the absence of any frontal tubercles, the extremely fine punctuation of the upper surface, the truncate elytra and comparatively short metatarsus will assist further in its recognition.

Aphthona barkeri, sp. n.

Ovate, black, thorax transverse, closely punctured, elytra very closely, strongly and irregularly punctate, posterior femora short and very thick, their tibiæ with a strong spur.

Length 3 millim.

Head broad, nearly impunctate, shining, the frontal elevations broadly transverse, bounded behind by deep grooves, the carina short, antennæ extending beyond the middle of the elytra, black, the second and third joint short, more or less flavous, the fourth and fifth as long as the preceding two joints together, the following slightly shorter ; thorax transversely subquadrate, twice as broad as long, the sides feebly rounded, the anterior angles thickened and somewhat oblique, the posterior ones rather obtuse, the sides with a narrow margin, the surface rather convex, closely and strongly punctured, the punctures irregularly placed, somewhat more closely at the sides than at the middle, scutellum broad, triangular, impunctate, elytra much wider at the base than the thorax, much more strongly and more closely punctured than the latter, under-side and the legs black, the posterior femora strongly thickened, ovate, the first joint of the posterior tarsi as long as the following two joints together.

Hab. Malvern, NATAL (*C. Barker*).

This species is well distinguished by its entirely deep black and shining colour and the strong and close elytral punctuation; the structural characters all agree with *Aphthona*; the anterior tibiæ have a very small spine, the claws are appendiculate and the anterior coxal cavities are open; the prosternum is very narrow. I am not able to say anything with regard to the male organ as I seem to have only female specimens before me.

Aphthona similis, sp. n.

Black, shining, the lower four joints of the antennæ flavous, thorax transverse, finely and sub-remotely punctured, elytra more strongly punctured in closely approximate rows.

Length 3 millim.

Head impunctate, shining, black, the frontal tubercles obliquely transverse, the carina acutely raised, antennæ extending to about the middle of the elytra, black, the second to the sixth joint flavous, the second and third joints short, equal, terminal joints slightly thickened and shortened ; thorax twice as broad as long, with the sides feebly rounded, the anterior angles thickened and slightly obliquely produced, and the surface very distinctly but not very closely punctured; scutellum broad, impunctate, elytra scarcely more strongly punctured than the thorax, the punctures arranged in closely approximate rows, distinct to the apex, under-side and the legs black, the first joint of the posterior tarsi as long as the following three joints together.

Hab. Malvern, NATAL (*C. Barker*).

At first sight this species exactly resembles *A. barkeri*, but it is quite distinct, the thorax has not the narrow lateral margin of the allied species, and the sculpturing of the upper parts is different and much less strong, the antennæ have the second and the following five joints flavous, and the metatarsus of the posterior legs is elongate. I have received three specimens from Mr. Barker.

Aphthona senegalensis, sp. n.

Flavous, shining, the apical joints of the antennæ and the posterior femora piceous, head and thorax impunctate, the sides of the latter straight, elytra not perceptibly punctured.

Length 3½ millim.

Of broadly ovate shape, the head impunctate, the frontal tubercles small but broad, deeply grooved behind, the clypeus very broad, the space between the antennæ but little constricted, the labrum and palpi obscure piceous, antennæ not extending to the middle of the elytra, piceous, the lower four joints flavous, third and fourth joints equal, not much longer than the second one, the apical joints slightly thicker and scarcely shorter, thorax about one-half broader than long, the sides straight, the anterior angles oblique, the surface impunctate with an obsolete longitudinal groove near the lateral margins, elytra smooth and impunctate, flavous, under-side of the latter colour, the posterior femora piceous, their tibiæ strongly widened towards the apex, with a strong spur placed at the outer edge, the first joint of the posterior tarsi as long as the following three joints together; abdomen finely pubescent.

Hab. SENEGAL.

A comparatively robust and large species, distinguished by the straight lateral margins of the thorax and the impunctate upper surface; the prosternum is extremely n·rrow, and the legs with the exception of the posterior femora are of entirely flavous colour.

Aphthona bimaculata, sp. n.

Head and the under-side obscure piceous, the basal joints of the antennæ and the thorax pale fulvous, the latter finely punctured, elytra pale flavous, very closely and distinctly punctured, the suture, the sides and an elongate spot below the middle, piceous.

Length 3 millim.

Head impunctate, the vertex nearly black, the lower portion fulvous, frontal tubercles obsolete, clypeus thickened, very broad at the base, pale fulvous, antennæ short, not extending to the middle of the elytra, black, the lower four joints fulvous, the second joint thicker but not shorter than the third one, terminal joints slightly thickened, about one-half longer than broad; thorax transverse, twice as broad as long, the sides very feebly rounded, anterior angles slightly oblique, the disc with a very obsolete transverse groove near the base, remotely and finely punctured, the punctures rather shallow, the surface pale fulvous, stained with some very obsolete darker spots, scutellum piceous; elytra pale flavous, very closely and finely punctured with an obsolete short longitudinal costa below the shoulders, the suture and lateral margins narrowly piceous, each elytron with another short piceous longitudinal stripe below the middle, under-side and the posterior femora piceous, tibiæ and tarsi fulvous, the first named widened towards the apex, armed with a distinct spine; the spine of the posterior tibiæ is placed at the outer margin; prosternum narrow, coxal cavities open.

Hab. Malvern, NATAL (*C. Barker*).

It will not be difficult to distinguish this proportionately large and well-marked species, of which I received a single specimen from Mr. Barker.

Podagrica impressipennis, sp. n.

Ovately rounded, very convex, black, the basal joints of the antennæ, the head, thorax and legs fulvous, thorax transverse, impunctate, elytra extremely finely and irregularly punctured with a short transverse depression below the shoulders impressed with some deeper punctures.

Length $4\frac{1}{2}$ millim.

Of the shape of a species of *Sphaeroderma*; the head impunctate, with a transverse groove between the eyes, frontal elevations small, clypeus rather widened between the antennæ, palpi thickened, the apical joint conical, antennæ filiform, the lower six and part of the seventh joint pale fulvous, the rest black, second and third joint short, equal, the following elongate; thorax twice as broad as long, the sides straight at the base, rounded from the middle to the apex, the anterior angles blunt, the median lobe of the posterior margin nearly straight at the middle, each side of the same margin provided with a small notch, the surface entirely impunctate, reddish-fulvous, scutellum black, elytra wider at the base than the thorax, strongly convex, finely punctured in irregular rows, with a short but deep transverse depression below the shoulders within which the commencement of deeper rows of punctures are placed, apex of the elytra nearly impunctate, legs rather robust, fulvous, the first joint of the posterior tarsi as long as the following two joints together, anterior coxal cavities closed, prosternum elongate and narrow.

Hab. Malvern, NATAL (*C. Barker*).

This species has entirely the shape and coloration of *P. indica*, Fab., but differs in the short second and third joints of the antennæ and the deeply punctured elytral depression. I received a single specimen from Mr. Barker; another one in my collection has only the first four joints of the antennæ fulvous but agrees in all other respects.

Crepidodera carinipennis, sp. n.

Fulvous, the outer joints of the antennæ black, thorax with very deep and broad sulcus, finely punctured, elytra very closely and rather strongly punctate-striate, metallic dark green, with an acute ridge from the shoulders downwards.

Mas. Antennæ long and robust, the basal joint strongly thickened.

Fem. Antennæ shorter and thinner.

Var. Thorax and elytra dark blue.

Length 4 millim.

Elongate and parallel, the head finely wrinkled at the vertex, the frontal elevations very strongly raised, subquadrate, clypeus triangularly raised, antennæ black, the lower four joints fulvous, the basal joint strongly thickened and subquadrate in the male insect, fourth joint very slightly longer than the third; thorax one-half broader than long, the sides straight, the anterior angles obliquely thickened and produced outwards, the surface convex, finely and sparingly punctured, the basal sulcus very broad, bounded at the sides by an acute, slightly-curved ridge, the sulcus with some deeper punctures anteriorly, scutellum black; elytra wider at the base than the thorax, the base slightly raised, the disc very closely punctured in rows, bluish green, the shoulders prominent and joined by an acute ridge which extends nearly to the apex; this ridge is preceded by a more feebly raised one near the apex, and the space between the outer ridge and the lateral margin is concave; legs robust, fulvous, all the femora thickened, the intermediate tibiæ dilated at the apex.

Hab. Drakensberg, NATAL (*G. Marshall*); Malvern, NATAL (*C. Barker*).

This is rather an aberrant species, the male of which resembles much in shape and colour the Central American genus *Plectotetra* especially in the structure of the antennæ. The sculpturing of the elytra will at once distinguish the species. The single specimen sent by Mr. Barker only differs in the entirely blue upper surface and the less strongly developed elytral costæ.

Crepidodera marshalli, sp. n.

Obscure piceous below, the basal joints of the antennæ, the head (the vertex excepted) thorax and the legs fulvous, elytra very strongly and closely punctate-striate, metallic green.

Length 3 millim.

Head rather elongate, impunctate, the vertex metallic green, frontal elevations broad and strongly raised, carina acute, antennæ extending beyond the middle of the elytra, black, the lower four joints fulvous, the third joint one-half longer than the second one; thorax scarcely twice as broad as long, rather convex, the sides rounded, narrowly margined, anterior angles thickened, the base with a deep transverse groove which does not extend to the lateral margins, the entire surface impunctate, scutellum black; elytra slightly wider at the base than the thorax, the shoulders rather prominent, the base slightly raised, the punctuation very strong and closely arranged in not very regular double rows here and there, finer at the apex, legs and the extreme apex of the abdomen more or less fulvous; posterior tibiæ with a small spine; prosternum rather narrow

Hab. Drakensberg, NATAL (*G. Marshall*).

The general coloration of this little species agrees with that of many of its allies, but the metallic-green vertex of the head and the strong and close elytral punctuation distinguish the species from any of its African congeners.

Crepidodera uniformis, sp. n.

Flavous, the apical joint of the antennæ infuscate, thorax transverse, impunctate, the basal sulcus deep, elytra strongly punctate-striate, the interstices finely punctured, flavous, the sutural margin narrowly obscure piceous.

Length $3\frac{1}{2}$ millim.

Head impunctate, of darker colour than the rest of the upper surface, obliquely grooved between the eyes, without any frontal tubercles, the clypeus broad and flat, impunctate, antennæ about half the length of the body, flavous, the apical joint fuscous, the second one about one-half shorter than the third, terminal joints slightly thickened ; thorax twice as broad as long, narrower in front than at the base, the sides rounded, the angles distinct but not produced, the surface impunctate, with a deep transverse sulcus at the base, bounded at the sides by a perpendicular groove which extends upwards a little way beyond the sulcus, scutellum triangular, flavous ; elytra not wider at the base than the thorax, rather strongly punctate-striate, the punctures much finer at the apex, the interstices extremely finely punctate, only visible under a strong lens, the sutural margins narrowly piceous, under-side and the legs flavous, the metatarsus of the posterior legs as long as the following three joints together.

Hab. Malvern, NATAL (*C. Barker*).

I have received two specimens of this species which will be easily recognized by the general flavous coloration, the dark elytral suture, and the absence of any frontal elevations.

Lypnea africana, sp. n.

Elongate, flavous, the outer joints of the antennæ and the tibiæ and tarsi black, thorax transverse, nearly impunctate, the base with a transverse sulcus, elytra finely punctate-striate.

Length 5 millim.

Head impunctate, the frontal elevations nearly contiguous, transverse, antennæ filiform, black, the lower two joints flavous, third joint one-half longer than the second one, terminal joint more slender and elongate ; thorax about one-half broader than long, the sides very feebly rounded, the anterior angles oblique, the base with a shallow transverse sulcus, bounded at the sides by a short perpendicular groove, the surface with a few minute punctures, shining, flavous; elytra slightly wider at the shoulders than the thorax, elongate, subcylindrical and parallel, finely punctate-striate, the interstices flat and impunctate; under-side and the femora flavous, anterior and intermediate tibiæ unarmed, posterior ones with a minute tooth, the first joint of the posterior tarsi as long as the following joints together, claws appendiculate, anterior coxal cavities open.

Hab. Umtali, MASHONALAND (*G. Marshall*).

I can find no characters of any importance to separate this species generically from Baly's Eastern genus *Lypnea*, with which it has not only the structural characters in common but also the coloration, except that of the tibiæ and tarsi; the elytral punctuation also is very fine, not strong. *Poëphila*, Weise, differs in the finely pubescent eyes, the quadrate thorax, and the shape of its sulcus and in the longer metatarsus; the present is the first African representative of this genus.

Livolia, gen. n.

Body narrowly elongate, glabrous, head broad, the frontal tubercles obsolete, eyes small, antennæ filiform, the terminal joints slightly thickened, thorax subquadrate, constricted at the base, the surface with a transverse groove near the base, extending to the lateral margins, elytra wider at the base than the thorax, punctate-striate, posterior femora very moderately thickened, their tibiæ with a small spine, the metatarsus scarcely as long as the following two joints together, claws appendiculate, prosternum narrow between the coxæ, the anterior cotyloid cavities closed.

This genus is proposed for a very small species of *Halticidæ*, having the appearance of a species of *Corticaria* and affinities with *Crepidodera*; the very obsolete frontal tubercles of the head, the thoracic sulcus which is placed close to the basal margin and extends to the sides, as well as the but slightly thickened posterior femora and unarmed anterior tibiæ separate the genus from the last-named one and those allied to it; it seems a transitional form between the *Halticinæ* and *Galerucinæ*.

Livolia sulcicollis, sp. n.

Fulvous, the breast and abdomen black, thorax strongly and remotely punctured, elytra finely punctate-striate, the interstices impunctate.

Length 2 millim.

Head broad, impunctate, fulvous, shining, the eyes small, widely separated, clypeus wide at the base, palpi thin and slender, antennæ half the length of the insect, fulvous, the basal joint strongly and suddenly thickened at the apex, the second joint longer than the third, the latter and the fourth equal, the terminal joints thickened, thorax about one-third broader than long, the sides rounded and widened at the middle, the base distinctly narrower than the anterior portion, the angles acute, the basal sulcus narrow but deep, the disc rather convex, strongly but remotely punctured, scutellum broad, impunctate; elytra wider at the base than the thorax, rather depressed, finely punctate-striate, the punctures closely placed, elytral epipleuræ broad; under-side black, legs fulvous, tibiæ slightly widened towards the apex, non-sulcate, the four anterior femora scarcely less widened than the posterior ones, the first joint of the anterior tarsi of the male, dilated.

Hab. Salisbury, MASHONALAND (*G. Marshall*).

I have received three specimens of this curious little species from Mr. Marshall.

Weiscana barkeri, sp. n.

Under-side nearly black, upper-side obscure testaceous, finely pubescent, terminal joints of the antennæ and the head fuscous or piceous, thorax with three piceous spots (more or less connected), elytra opaque, narrowly margined with black, legs testaceous, tarsi piceous.

Length $3\frac{1}{2}$–4 millim.

Head rugose, the vertex blackish, the clypeus strongly triangularly convex, flavous, labrum piceous, margined with testaceous, antennæ robust, blackish, the lower three or four joints testaceous at the base, third joint slightly longer than the fourth, the following joints thickened; thorax rather more than twice as broad as long, the sides nearly straight, the angles obtuse, the disc with three obsolete depressions, rugosely punctured, the interstices minutely granulate, the surface with a central marking and two lateral black markings, sometimes connected in shape of ∧; scutellum fuscous; elytra clothed with very fine silky pubescence, opaque, very finely transversely wrinkled, without distinct punctuation, obscure testaceous, the sutural and lateral margins narrowly black; legs testaceous, the femora stained with fuscous as well as the apex of the tibiæ and the tarsi, claws with a basal tooth.

Hab. Malvern, NATAL (*C. Barker*).
I received four specimens from Mr. Barker.

GALERUCINÆ.

Genus *Diacantha*, Chev.

I cannot agree with Weise in his definition of this and the allied genera (Deutsche Ent. Zeitsch. 1901, p. 274). He has evidently overlooked the type *D. bispinosa*, Oliv. Chevrolat in his diagnosis of the genus in D'Orbigny, Dict. Univ. d'Hist. Naturelle, p. 718, iv, quotes 12 species mentioned by Dejean in his catalogue. These are—*D. picea*, Fab.; *spinosa*, Oliv.; (*bispinosa*) *festiva*, Dalm.; *unifasciata*, Oliv.; 11 *punctata*, Dej.; *Dregei* (6 pustulata = tricincta, Chev.); *fuscitarsis, gloriosa, testudinaria*, Dej.; *unipunctata*, Chev., et *generosa*, Dej.

Of all these only *D. bispinosa* and *D. dregei* belong to *Diacantha* as defined by Chapuis, and the first named must undoubtedly be taken for the type. In this species the claws are *bifid* and the male has two elytral tubercles at the base; most of the other species named above belong to entirely different genera, thus *picea* is the genus *Stenoplatys*, Baly, 11 *punctata*, Dej., is an *Aulacophora*, etc. Harold gives *D. bidentata*, Fab., as the type of the genus *Diacantha*, but as this is not one of the species mentioned either by Chevrolat or Dejean, it cannot be looked upon as the type. Chapuis was therefore perfectly right when he established the genus *Hyperacantha*, in which the claws are appendiculate, and his genus must be accepted. Weise has not said which species he looks upon as the type, and has not mentioned the only true *Diacantha* of Chevrolat's list *D. bispinosa*. A typical specimen of this species is contained in the British Museum, and I am indebted to Mr. Gahan for his examination of the specimen and the other details given above concerning the genus.

Hyperacantha bituberculata, Fab.

According to Mr. Gahan the specimen contained in the British Museum is certainly the typical *bituberculata*, Fab., and named so by Dejean himself and also by Chevrolat. Weise expresses a doubt that I had this species before me when I remarked on it in Novitates, 1894, and gives the last abdominal segment of the ♀ with three deep incisions; this is a mistake, as in *H. bituberculata* this part is only very slightly concave, and Weise's insect must represent another species. In the British Museum specimen the elytral fulvous margin is only just visible.

Hyperacantha abdominalis, Duv., C. Rend. Belg. Entom. Soc. (1891, July).
Hyperacantha abdominalis, Jac., the Entomologist (1891, May).

On account of my name having the priority of two months, I alter that of Duvivier's to *H. duvivieri*.

Hyperacantha abdominalis, Jac.

In the Entomologist for 1891, I have described this species from specimens obtained at the Transvaal and other localities in Africa. The typical form has a reddish fulvous upper surface, the elytra are narrowly margined with black, and have a transverse black band at the middle, the under-side is black with the exception of the flavous last segment. I have lately received other specimens from the Umkomaas Mountains in Natal, obtained by Mr. Guy Marshall, which I am quite unable to separate from the type structurally, although one specimen only resembles it in the coloration of the upper surface; in this specimen, however, the under-side is entirely flavous; the others represent the following varieties.

Var. (*a*) Elytra margined with black at the anterior half only, the transverse band narrower, not extending to the suture, underside flavous, general size much smaller.

Var. (*b*) Elytra with a small black stripe at the lateral margins from the base to the shoulders and a small spot at the middle of each elytron, under-side and the femora black.

Var. (*c*) Upper- and under-sides entirely flavous.

In all these varieties the tibiæ have the apex black and the tarsi are entirely of that colour as is the case in the type. The insect seems to be subject to a very great amount of variation in regard to colour and also to size; the general shape is broadly ovate and convex. I cannot find any differences in the antennæ or the sculpture.

Hyperacantha apicipes, sp. n.

Broadly oblong, testaceous, the antennæ (the basal joints excepted) the breast, the apex of the tibiæ and the tarsi black, thorax strongly transverse and sulcate, impunctate, elytra finely and closely punctured, black.

Length 6 millim.

Of broadly ovate and convex shape, the head impunctate, testaceous, strongly transversely grooved between the eyes, the carina narrowly acute, palpi piceous, antennæ slender, the third and following joints elongate and nearly equal, terminal joints more slender, the basal two testaceous, the rest, black ; thorax twice as broad as long, the sides nearly straight, the anterior angles slightly produced outwards but blunt, the disc impunctate, with a deep and straight transverse sulcus near the middle, pale testaceous, scutellum black ; elytra very convex, widened towards the middle, extremely finely and rather closely punctured, black and shining ; under-side and the legs testaceous, the breast, the apex of the tibiæ and the tarsi black, the tibiæ all mucronate, the claws appendiculate ; the last abdominal segment of the male trilobate, the median lobe with a deep fovea.

Hab. Ulundi, NATAL (*G. Marshall*).

A species of broadly ovate shape of which I received two specimens, one of which showing traces of paler spots on the elytra, probably due to immaturity.

Hyperacantha militaris, sp. n.

Testaceous or fulvous, the terminal joints of the antennæ, the apex of the tibiæ and the tarsi black, thorax transverse, impunctate, deeply sulcate at the sides, elytra impunctate, with basal depression, black, the basal third portion fulvous.

Length 6 millim.

Head impunctate, the vertex fulvous, the lower portion generally paler in colour, frontal elevations transverse, carina acute, antennæ black, the lower three joints more or less testaceous, the third joint slightly longer than the fourth ; thorax twice as broad as long, the sides feebly rounded anteriorly, slightly constricted at the base, the disc impunctate, with a rather deep transverse sulcus at each side, scutellum fulvous or testaceous, elytra widened posteriorly, the lateral margins flattened and widened below the shoulders, the base with a distinct transverse depression, fulvous or testaceous, this colour occupying the basal third portion, the rest of the surface black ; under-side, the femora and the base of the tibiæ testaceous, their lower portion and the tarsi black, the latter appendiculate, all the tibiæ mucronate.

Hab. Dar es Salaam, EAST AFRICA ; also ZANZIBAR and DELAGOA BAY.

This is one of the smaller species which is well distinguished by its coloration; in some specimens, however, the black elytral portion includes a larger or smaller spot or space of the fulvous ground-colour; in the male, the last abdominal segment has the median lobe of transversely subquadrate and flattened shape.

Luperodes nigrotibialis, sp. n.

Oblong, very convex, the antennæ, tibiæ and tarsi and the underside black, upperside testaceous, thorax subquadrate, impunctate like the elytra.

Length 5 millim.

Head impunctate, pale fulvous, shining, frontal tubercles strongly raised, trigonate, carina broad, convex, labrum black, antennæ extending below the middle of the elytra, black, the base of each joint more or less fulvous, second one one-third lower than the third, the latter about half the length of the fourth joint; thorax scarcely broader than long, convex, the sides slightly rounded before the middle, the anterior angles thickened, the surface entirely impunctate, testaceous; elytra scarcely wider at the base than the thorax, very slightly widened below the middle, impunctate, their epipleuræ continued below the middle; under-side black, the femora flavous, tibiæ with a long spine, black like the tarsi, the metatarsus of the posterior legs rather longer than the following joints together, anterior coxal cavities open.

Hab. Grahamstown, S. Africa (*Rev. O'Neil*).

Of less than half the size of *L. sulphuripennis*, Jac., and with black antennæ tibiæ and tarsi, but otherwise similar to the last-named species.

Luperus dunbrodyensis, sp. n.

Narrowly elongate, subdepressed, flavous, thorax subquadrate, nearly impunctate, elytra extremely minutely punctured, rather flattened.

Length 2½–3 millim.

Head impunctate, the vertex more or less obscure piceous, shining, frontal tubercles strongly raised, transverse, carina small but distinct, antennæ entirely flavous, extending below the middle of the elytra, the third joint one-half longer than the second one; thorax one-half broader than long, the sides slightly rounded at the middle, with a very narrow margin, anterior angles slightly thickened, not produced, the disc only perceptibly punctured when seen under a strong lens, the sides with an obsolete fovea, scutellum flavous; elytra somewhat flattened, very finely but distinctly punctured, the suture slightly infuscate, legs flavous, all the tibiæ mucronate, the metatarsus of the posterior legs as long as the following joints together.

Hab. Dunbrody, CAPE COLONY (*Rev. O'Neil*).

Of this species I received a male and female specimen from the Rev. O'Neil, taken "in cop."; the first-named sex is smaller than the female, the under-side is stained with piceous, and the last segment of the abdomen is rather deeply sulcate. The species is very closely allied to *L. weisei*, Jac., and *L. verticalis*, Jac., but differs from both in being of narrower, smaller, and more depressed shape, and in the entirely flavous antennæ; the sides of the thorax in *L. weisei* are also more strongly constricted at the base, and the disc is more convex and without any depressions.

Luperus tugelaensis, sp. n.

Black, the antennæ very long, their basal three joints, the thorax and the anterior legs, flavous, thorax impunctate, elytra minutely punctured, flavous, narrowly margined with black.

Length 4 millim.

Narrow and elongate, the head black, impunctate, the clypeus, labrum and the palpi flavous, frontal elevations strongly raised, broad, antennæ extending to the apex of the elytra, black, the lower three joints and the apex of the fourth and fifth joint flavous, the third longer than the second but much shorter than the fourth joint; thorax scarcely broader than long, the sides straight at the base, slightly rounded before the middle, the angles distinct, the surface impunctate, flavous, scutellum black; elytra slightly wider at the base than the thorax, very finely and closely punctured, margined with black, the suture more broadly so; under-side and the legs black, the anterior ones flavous, all the tibiæ mucronate, the metatarsus of the posterior legs as long as the following joints together.

Hab. Upper Tugela, NATAL (*C. Barker*).

Of this distinctly-marked species I received a single specimen (♂) of Mr. C. Barker; the protruding apex of the penis is straight and acutely pointed.

Luperus malvernensis, sp. n.

Below black, above testaceous, clypeus, thorax and the femora flavous, antennæ piceous, thorax subquadrate, with a shallow lateral fovea, minutely punctured, elytra very closely and finely punctured, the suture narrowly fuscous.

Length 3–4 millim.

Head black at the vertex, impunctate and shining, the frontal tubercles transverse, strongly raised, carina acute, flavous like the clypeus, labrum and palpi black, antennæ rather long and slender, piceous, the third but slightly longer than the second but much shorter than the fourth; thorax but little broader than long, flavous, very minutely granulate and punctured, with an obsolete depression at each side, lateral margins feebly rounded at the middle, anterior angles thickened, scutellum black; elytra wider at the base than the thorax, very feebly transversely depressed below the base, extremely closely and finely punctured, obscure testaceous (sometimes fuscous) with the suture narrowly piceous or fuscous; under-side black, the femora flavous, metatarsus of the posterior legs as long as the following joints together.

Hab. Malvern, NATAL (*C. Barker*); Dunbrody, CAPE COLONY (*Rev. O'Neil*).

This *Luperus* may easily be mistaken for *L. inconspicuus*, Jac., from Mashonaland, with which it has the same coloration in common, but in that species the vertex of the head is finely granulate and not shining, the clypeus is black and very broad as well as the frontal elevations, the thorax is more transversely shaped, and the legs are generally entirely dark coloured.

Apophylia, Chev. (nec Chapuis).

This genus has been entirely mistaken by Chapuis, Allard, and myself. The description given by Chapuis of *Apophylia* does not apply to the type at all; the latter is the *A. chloroptera*, Thoms., who is the first who characterized the genus, and that insect belongs to the genus known at present as *Malaxia*, Fairm. = *Glyptolus*, Jac. This latter name, therefore, cannot stand, and all the species placed in it must be placed in *Apophylia*. *A. tricolor*, Fab., and others must receive another generic name as they do not belong to *Apophylia*. It is difficult to know what insect Chapuis had before him when he drew up his description of the genus; he gives as the type *A. smaragdina*, Dej. (a catalogue name), and says that the anterior and intermediate tibiæ are mucronate; but this is an error, as *A. smaragdina*, Dej., undoubtedly is also a *Malaxia* in which the tibiæ are all unarmed. I have seen specimens, named by Chevrolat *A. smaragdina*, which certainly represent the last-named genus. This is also the case with *A. murina*, Gerst., and *A. nobilitata*, Gerst., of which a figure is given and which belong to *Malaxia*. I am indebted to Mr. Gahan for his assistance in clearing up the above synonyms.

Pseudapophylia, gen. n.

Elongate, antennæ filiform, thorax transverse and short, with an obsolete transverse depression, scutellum broad ; elytra elongate and parallel, finely rugose, their epipleuræ broad anteriorly, indistinct below the middle; legs robust, the anterior and intermediate tibiæ with a small spine, the posterior ones unarmed, their metatarsus as long as the following joints together, claws appendiculate, prosternum invisible between the coxæ, the anterior cavities open.

Type. *P. smaragdipennis*, Jac. (sub Apophylia).

I am obliged to place this species in a special genus, as it has nothing to do with *Apophylia* (now *Palæophylia*), under which name I described it (Trans. Ent. Soc. 1888); the thorax differs quite in shape, being transverse and short as well as obsoletely sulcate. It was perhaps this species which Chapuis referred to *Apophylia*.

Palæophylia, gen. n.

Antennæ filiform, the second to the fourth joint gradually lengthened, eyes entire, thorax transverse, the sides, the posterior angles and margin rounded, the surface rather convex, without depression, elytra generally metallic, finely rugosely punctured, their epipleuræ very broad, gradually narrowed towards the apex, the anterior and the intermediate tibiæ mucronate, the posterior ones unarmed, the metatarsus of the posterior legs as long as the following two joints together, claws appendiculate; prosternum invisible, anterior coxal cavities open.

Type. *P. tricolor*, Fab.

In this genus will have to be placed, besides the type (the oldest described species) the *Apophylia tricolor* of Gemminger's Catal., the following species, all described under *Apophylia*—*P. borrei*, Alld.; *P. maculicollis*, Alld.; *P. bipunctata*, Alld.; *P. viridiniteus*, Alld.; *P. nigritarsis*, Jac.

Whether the other species described by Allard belong to the same genus, is doubtful. Of those mentioned above, however, I was able to compare the types, so that there is no doubt about it. *A. marginata*, Jac., has, as I now find, entirely unarmed tibiæ and elytral epipleuræ which are absent below the middle; this insect must therefore find another place, although the general appearance and structure is that of the genus here proposed.

Palæophylia granulosa, sp. n.

Metallic green below, the antennæ and legs fulvous, above less shining, minutely granulate, thorax subquadrate, the extreme lateral margins fulvous, elytra minutely punctured and granulate.

Length 5 millim.

Head entirely impunctate, the frontal tubercles trigonate, strongly raised and shining, carina short but distinct, labrum flavous, antennæ extending beyond the middle of the elytra, fulvous, the second joint half the length of the third, fourth and following joints slightly longer than the third; thorax scarcely one-half broader than long, the sides rounded, the angles obtuse, the surface rather convex, without impressions, bright green, minutely granulate, scutellum impunctate; elytra parallel, sculptured like the thorax but with some minute punctures; underside more shining, green, the legs fulvous, the anterior and intermediate tibiæ with a small spine, posterior ones unarmed, the first joint of their tarsi as long as the following two joints together, anterior coxal cavities open.

Hab. Upper Tongaat, Upper Tugela, NATAL (*C. Barker*).

Of this species I received several specimens which may be known by the silky green and finely granulate upper surface, and by the narrow flavous margin of the thorax; the last segment of the abdomen in the male has a longitudinal sulcus of fulvous colour; the antennæ in the female are shorter, and the abdominal sulcus is absent. I cannot identify this species with *A. Duvivieri*, Alld. (Comptes-rendus Ent. Soc. Belg. 1889), although it is evidently closely allied, but Allard makes no mention of the flavous labrum nor similarly-coloured thoracic margins, nor does he mention the fine elytral punctuation.

Palæophylia semirugosa, sp. n.

Metallic green, the labrum, antennæ and the legs flavous, thorax finely granulate, the sides broadly flavous, elytra finely punctured and transversely wrinkled.

Length 6 millim.

Of exactly similar coloration to *A. granulosa* but larger, the frontal elevations transverse, the antennæ extending to the apex of the elytra, the second and following joints gradually elongate; thorax one-half broader than long, the sides strongly rounded, the disc minutely granulate, with some extremely fine punctures, bright green, the sides broadly flavous, this colour narrowed posteriorly; near the middle of the anterior margin a slight depression is visible; elytra closely and finely punctured, the interstices finely transversely rugose, legs flavous, the first joint of the anterior tarsi of the male dilated, the last segment of the abdomen deeply triangularly emarginate.

Hab. Upper Tongaat, NATAL (*C. Barker*).

Of this species I received a single specimen from Mr. Barker; the broad flavous margin of the thorax and the sculpture of the elytra will at once distinguish it from *A. granulosa,* which is also of general smaller size.

Malacosoma, Chev.

Although this name has been in use for a genus of *Galerucinæ* ever since 1846, it is high time to change it, since it has long before that time been employed by Hübner for a genus of Lepidoptera. I am therefore reluctantly obliged to change it to *Exosoma.*

Exosoma barkeri, sp. n.

Under-side black or piceous, upper-side flavous, thorax transversely subquadrate, impunctate, elytra microscopically punctured.

Length 4–5 millim.

Head impunctate, frontal elevations transverse, nearly contiguous, carina acutely raised, labrum and palpi flavous, antennæ in the male long and slender, extending beyond the middle of the elytra, flavous, the terminal joints slightly darkened, third joint twice as long as the second one, fourth joint distinctly longer than the third; thorax about one-half broader than long, of equal width, the sides rounded at the middle, the anterior angles thickened but not produced, the disc rather convex, not perceptibly punctured, scutellum triangular, flavous, elytra slightly wider at the base than the thorax, closely and extremely finely punctured when seen under a very strong lens; breast and abdomen nearly black, legs flavous, the first joint of the anterior tarsi in the male dilated, that of the posterior legs nearly as long as the following joints together, all the tibiæ with a small spine.

Hab. Malvern, NATAL (*C. Barker*).

At once to be distinguished from other nearly similarly-coloured species by the black under-side in connection with the flavous head; the female insect is larger, the antennæ have the basal joints flavous only, and the tarsi are more or less infuscate; the male organ has a very elongate and pointed apex with the lateral margins acute and subangulate, and a slender filiform process is placed at the anterior cavity.

Monocida thoracica, sp. n.

Upper-side black, the clypeus, antennæ, femora and apex of the tibiæ testaceous; thorax minutely punctured, with a small fovea at each side; elytra extremely closely and finely punctured, the extreme suture piceous.

Var. Head, antennæ, the elytra and the tibiæ and tarsi, black.

Length 4 millim.

Head impunctate, the vertex black, frontal tubercles transverse, strongly raised, bounded behind by a deep, transverse groove, clypeus flavous, labrum piceous, antennæ slender and filiform, testaceous, the third joint one-half longer than the second one, the following joints more elongate; thorax subquadrate, one-half broader than long, the sides feebly rounded, the angles thickened, the surface with a shallow fovea at each side, very minutely granulate and punctured, scutellum black; elytra with a very shallow depression below the base, very finely but more distinctly punctured than the thorax, their epipleuræ broad, continued below the middle, under-side black, legs pale fulvous, the base of the tibiæ black.

Hab. Lower Tugela, NATAL (*C. Barker*).

Closely allied to *M. inornata*, Jac., but differing in the following points:—the head is black at the vertex, not fulvous, the frontal tubercles are not subquadrate but strongly transverse, the thorax has a lateral fovea and the elytra a shallow basal depression of which there is no trace in *M. inornata*.

Sardoides transvalensis, sp. n.

Metallic green, the lower part of the face, the antennæ and legs fulvous, thorax subquadrate, rugosely punctured, elytra elongate, of similar sculpture, abdomen piceous.

Length 6 millim.

Head coarsely punctured and slightly wrinkled, frontal elevations strongly raised, subquadrate, divided by a deep central groove, clypeus and labrum flavous, antennæ fulvous, the terminal three joints black, fourth joint longer than the third and the longest; thorax about one-half broader than long, slightly narrowed anteriorly and posteriorly, the angles tuberculate, the surface rugose and strongly punctured, with three obsolete small foveæ, scutellum black; elytra much wider at the base than the thorax, very closely punctured and finely transversely rugose throughout, their epipleuræ broad and concave anteriorly, disappearing below the middle, breast metallic green, abdomen piceous, legs fulvous, the tibiæ unarmed, the first joint of the posterior tarsi as long as the following joints together, claws appendiculate, anterior coxal cavities open.

Hab. TRANSVAAL.

There are some slight structural differences to be noticed in this species in comparing it with the type, *S. viridicollis*, Jac.; in the latter the thorax is deeply bifoveolate and narrower at the base, and the elytral epipleuræ, although very narrow below the base, are visible; in the present species they are absent, but as all these differences are but one of degree, and the unarmed tibiæ and open cavities agree with the generical characters, it would not be wise to separate the insect, of which I possess three specimens. In the male, which may be known by the dilated first joint of the anterior tarsi, the last abdominal segment is rather deeply foveolate and slightly emarginate at the apex with thickened sides.

Megalognatha, Baly.

The type of this genus is *M. elegans*, Baly, which has been described from apparently female specimens, now in the British Museum. In the male insect the terminal joints are considerably thickened, much more so than in the other sex. *Apophylia elegantula*, Jac. (the Entomologist, 1891), is identical with this species, and must be omitted altogether. Baly's description of his *M. elegans* differs somewhat from my specimens, as the lower part of the face is not "nigro-piceous" but fulvous, nor does Baly mention the narrow fulvous lateral elytral margins.

Megalognatha bohemani, Baly (*Cneorane foveicollis*, Jac.).

This is another species which scarcely fits into the genus, as the thorax is transverse and not subquadrate, although there is a fovea as in most species of the genus. I have described this in the Entomologist, 1891, under the above name, as Baly described his species from female specimens, in which the antennæ are but little dilated; in the male they are considerably so, and the terminal joints are fulvous. As Baly's name is the oldest, mine cannot stand, although *Cneorane* is as good a genus for the species as that of Baly's.

Megalognatha hirticollis, sp. n.

Black, the abdomen flavous; thorax finely rugose and pubescent, foveolate anteriorly, elytra closely punctured and finely wrinkled.

Mas. Antennæ very long, the seventh joint dilated anteriorly, hatchet shaped, thorax with a small triangular fovea.

Fem. Antennæ shorter and simple, thorax of nearly similar structure.

Length 8 millim.

Head impunctate, the frontal elevations very strongly raised, narrowly oblong, antennæ nearly extending to the apex of the elytra, black, the third joint rather longer and more slender than the following three joints, the seventh more strongly dilated at the apex than the rest in the male; thorax as long as broad, all the margins nearly straight, the anterior margin thickened at the middle and followed by a small triangular fovea, rest of the surface finely rugose and pubescent; elytra sculptured like the thorax but without the pubescence, the sutural margin accompanied by another ridge near the apex, under-side and the legs black, abdomen flavous, the last segment more or less black.

Hab. Salisbury, MASHONALAND, on Zizyphus (*G. Marshall*).

From *M. rufiventris*, Baly, *M. abyssinica*, Jac., and *M. imbecilla*, Weise, this species may at once be distinguished by the pubescent thorax and its sculpture.

Megalognatha granulicollis, sp. n.

Head, antennæ, the breast and legs black, thorax rufous, minutely punctured and granulate, elytra flavous, convex posteriorly, very finely punctured with a small piceous spot below the middle, abdomen flavous.

Mas. Thorax with a shallow triangular depression, minutely punctured and granulate.

Fem. Thorax coarsely rugose with a very deep triangular excavation.

Length 6 millim.

Mas. Head black, impunctate, labrum flavous, antennæ black, the sixth to the ninth joint dilated, the eighth with a flattened appendage below, the preceding two joints hollowed at the sides; thorax not broader than long, of usual shape with an acute but shallow triangular depression before the middle and a shallow transverse sulcus in front of the depression, the surface very minutely punctured and granulate, scutellum piceous, elytra strongly convex at the posterior portion, constricted at the sides, extremely finely and closely punctured; legs and the breast black.

V. Reenen's Pass, Malvern, NATAL (*C. Barker*).

In spite of the great resemblance of this species to *M. suturalis*, Baly, and *M. bipunctata*, Jac., I cannot identify it with either of them, as the thorax is quite differently sculptured and punctured in both sexes, and the head is black. In the first-named species the thorax is strongly punctured and shining and without the triangular groove. *M. bipunctata* has a fulvous head and differently-punctured thorax. The thorax in the female has the depression very deep, bounded at the sides by strongly-raised ridges of perfectly triangular shape, and there are also some raised feeble smooth lines visible at each side; the elytral spot in the specimen before me is just indicated and the suture in both sexes has the usual ridge at the posterior portion.

Megalognatha natalensis, sp. n.

Head, antennæ and the breast black, thorax pale fulvous, strongly punctured, deeply transversely sulcate anteriorly; elytra flavous, finely and closely punctured, strongly depressed below the base.

Length 6 millim.

Fem. Head black, impunctate, antennæ with the apical joints widened, the third and fourth joints more slender, equal; thorax subquadrate, narrowed at the base, the surface strongly and deeply punctured, deeply transversely sulcate anteriorly and to a less extent near the base, the anterior edge of the anterior sulcus strongly raised, scutellum piceous and pubescent at the base; elytra rather deeply depressed below the base, very finely and closely punctured, legs obscure testaceous, stained with fuscous and pubescent, abdomen flavous.

Hab. Frere, NATAL.

Of this species I only know a single female specimen, like *M. melanocephala* the head is black, but the thorax has no tubercles, is less strongly punctured, and altogether of different sculpture; as in the allied species, the elytral suture has a narrow ridge at the posterior portion.

Megalognatha nigrofasciata, sp. n.

Head and thorax rufous, antennæ, the breast and the legs black, thorax closely punctured, triangularly depressed anteriorly, elytra testaceous, finely and closely punctured, the suture narrowly and a broader lateral band black, abdomen flavous.

Length 5 millim.

Mas. Head impunctate, rufous, the frontal elevations highly raised, trigonate, antennæ black, the seventh joint widened at the apex, the eighth shorter, triangularly produced into a sharp point at the middle, thorax as long as broad, the sides straight at the base, the disc rather closely and distinctly punctured, with a triangular rather deep depression below the anterior margin, the latter thickened, but not acutely margined, scutellum piceous; elytra scarcely depressed below the base, finely and very closely punctured, testaceous, the suture narrowly piceous, the sides with a broad black band which does not quite extend to the apex; legs and breast black.

Hab. Cape (my collection).

M. bicostata, Alld., is evidently a closely-allied species, but is described with fulvous legs and antennæ and with lateral elytral costæ, not with a broad black lateral band. The female is unknown to me.

Megalognatha melanocephala, sp. n.

Testaceous, the head, antennæ, the breast and the legs black; thorax subquadrate, elytra finely and closely punctured.

Mas. Thorax impunctate, the anterior margin thickened, the disc obsoletely depressed at the sides and the middle.

Fem. Thorax rufous, strongly punctured, deeply transversely sulcate anteriorly, the sulcus bounded in front by a strongly-raised ridge, the disc with three round tubercles.

Length 7 millim.

♂. Head longer than broad, impunctate, black, shining, frontal tubercles strongly raised, carina acute, antennæ black, the third and fourth joints equal, the following three joints shorter and wider, the rest more slender and elongate; thorax scarcely broader than long, the sides slightly narrowed at the base, the surface impunctate, testaceous, the anterior portion slightly transversely thickened and followed by a lateral and median very feeble depression, scutellum pubescent, piceous; elytra distinctly transversely depressed below the base, very closely and somewhat rugosely punctured; the breast and legs black, closely pubescent, the abdomen testaceous, the anterior margin of the last segment rather deeply concave.

♀. Antennæ simple, the terminal joints slightly widened; thorax rufous, strongly punctured, the disc with three blunt tubercles and preceded by a deep transverse sulcus which is anteriorly limited by a strongly-raised ridge.

Hab. Transvaal.

The black head, testaceous colour, the transverse depression of the elytra and their fine punctuation will distinguish this species from *M. ruficollis*, Alld., and the other species.

Pseudolognatha, gen. n.

Body elongate and parallel, head not longer than broad, frontal elevations transverse, antennæ filiform, the second joint small, the others nearly equal, of normal structure, thorax transverse, subquadrate, the surface more or less foveolate, elytra irregularly punctured and granulate, tibiæ unarmed, metatarsus of the posterior legs as long as the following joints together; claws appendiculate, the anterior coxal cavities open.

Type. *P. immaculata*, Jac. (sub Megalognatha).

In comparing this insect with a species of *Megalognatha* and the type *M. elegans*, Baly, to which it is generically closely allied, there will be found differences sufficient to justify the separation of the two genera. In the present genus, the head is broad, not produced or longer than broad as in *Megalognatha*, the antennæ in the male have no abnormal joints, and the thorax is distinctly transverse; there is also no thickening of the suture near the apex of the elytra as is nearly always the case in the allied genus, nor are the elytra widened and convex at the posterior portion, but the short and deflexed head will form the principal character of separation between the two genera.

Pseudolognatha salisburiensis, sp. n.

Fulvous, the apical three joints of the antennæ fuscous, thorax transversely subquadrate, impunctate, elytra metallic blue, extremely minutely granulate and microscopically punctured.

Length 4 millim.

Head impunctate, fulvous, frontal elevations transverse, narrow, labrum black, antennæ about half the length of the body, fulvous, the terminal three joints blackish, the intermediate joints slightly triangularly widened, of equal length, the second one short, thorax one-half broader than long or rather broader, the sides feebly rounded, the anterior angles more distinct than the posterior ones, the surface with a very short and obsolete depression anteriorly and a slightly more distinct one at each side, entirely impunctate, fulvous; scutellum of the latter colour; elytra with a distinct depression below the base, metallic blue, minutely punctured and extremely finely granulate, under-side and the legs fulvous.

Hab. Salisbury, MASHONALAND (*G. Marshall*).

The above description applies to what seems to be the male insect; in the female, the thorax has a deep, transverse fovea near the anterior margin and the antennæ are somewhat thinner, otherwise there is no difference.

Eurycycla, gen. n.

Body elongate, glabrous, antennæ filiform; thorax transverse, broader than the head and as broad as the elytra, narrowed anteriorly, elytra metallic, irregularly punctured, epipleuræ prolonged posteriorly, tibiæ unarmed, the metatarsus of the posterior legs as long as the following joints together, claws appendiculate, anterior coxal cavities open.

Type. *E. balyi*, Jac. (sub Megalognatha).

It is impossible to leave this species in *Megalognatha*, as the thorax is of totally different shape without any depressions, strongly transverse and narrowed anteriorly; in other respects the generic characters agree; I know of no other African genus having a similar-shaped thorax.

Hemixantha flavicornis, sp. n.

Black below, upper-side testaceous, the antennæ very long, flavous, thorax subquadrately transverse, impunctate, elytra subcylindrical, extremely minutely punctured, tibiæ unarmed.

Length $4\frac{1}{2}$ millim.

Elongate and parallel, the head impunctate, the frontal elevations strongly raised, transverse, clypeus triangularly convex, antennæ nearly as long as the body, flavous, the apical joint stained with fuscous, the third twice as long as the second, but shorter than the fourth joint; thorax one-half broader than long, the sides rather strongly rounded at the middle, the anterior angles obliquely thickened and slightly produced, posterior margin sinuate, oblique at the angles, the disc with some minute punctures, only visible under a strong lens, scutellum smooth; elytra subcylindrical and parallel, extremely closely and finely punctured, under-side black, legs testaceous, the metatarsus longer than the following joints together; anterior cavities closed.

Hab. Malvern, NATAL (*C. Barker*).

A comparatively small species, allied to *H. piceipes*, Jac., likewise from Natal, but smaller, with entirely flavous and much more slender and longer antennæ, the legs differently coloured and the metatarsus longer. I received two specimens from Mr. Barker.

Platyxantha varicornis, sp. n.

Pale testaceous, the head, thorax and the femora darker, the basal and the apical two or three joints of the antennæ black, thorax bifoveolate, impunctate; elytra extremely finely punctured, tibiæ and tarsi black.

Length 5 millim.

Head as broad as long, the vertex piceous or pale fulvous, impunctate, frontal elevations broadly transverse, divided by a short groove which extends a little way upwards, clypeus acutely carinate, palpi thickened, antennæ nearly extending to the apex of the elytra, the basal joint or two joints black, the following six fulvous, the apical joints black, second joint very small, the rest nearly equal in length; thorax subquadrate, scarcely one-half broader than long, slightly constricted at the base, the angles slightly oblique; the disc bifoveolate, impunctate, pale fulvous; elytra pale testaceous, extremely finely but not very closely punctured, femora, the base of the tibiæ and the abdomen pale fulvous, the breast, the lower part of the tibiæ and the tarsi black.

Hab. Malvern, NATAL (*C. Barker*).

In one specimen (♂) of this species the extreme vertex of the head and the greater part of the breast is blackish, in the other these parts are fulvous; the coloration of the antennæ and that of the legs are the principal characters of distinction in this species; the tibiæ are, as usual, unarmed and the metatarsus of the posterior legs is as long as the following joints together.

Monolepta punctipennis, sp. n.

Under-side black, the basal joints of the antennæ, the head, thorax and legs flavous, head and thorax distinctly punctured, elytra dark blue, strongly and closely punctured.

Var. Elytra testaceous.

Length 3 millim.

Head obscure fulvous, distinctly but not closely punctured, minutely granulose, frontal elevations broad and flattened, carina not very acute, labrum flavous, palpi piceous, antennæ long and slender, extending to the middle of the elytra, black, the lower four joints flavous, basal joint long and slender, the second, third and fourth, gradually lengthened ; thorax twice as broad as long, the sides straight, narrowed anteriorly, anterior angles slightly oblique, the surface very closely and comparatively strongly punctured, scutellum small, black ; elytra not wider at the base than the thorax, much more strongly punctured than the latter, the punctures arranged in very close irregular rows, epipleuræ indistinct below the middle, breast and abdomen black, legs flavous, the metatarsus very elongate.

Hab. Malvern, NATAL (*C. Barker*).

This *Monolepta* may be known by the strong and close punctuation of the elytra, which differs in that respect from any other species of the genus or those placed in *Candezea* which I am acquainted with. I received two blue and two flavous specimens in regard to the elytra, but these agree in all other respects except colour.

Monolepta cærulea, sp. n.

Under-side black, upper-side metallic dark blue, the basal joints of the antennæ and the legs fulvous ; thorax subquadrate, impunctate, elytra very closely punctured, the interstices likewise very finely punctate and wrinkled.

Length 4 millim.

Oblong-ovate, the head impunctate, frontal tubercles transverse, narrow, clypeus broad and thickened, blackish, the space below the eyes at the sides fulvous, antennæ extending to about the middle of the elytra, the lower three or four joints fulvous, the rest black, third joint one-half longer than the second but shorter than the fourth joint ; thorax about one-half broader than long, the sides feebly rounded, posterior margin nearly straight, the anterior angles thickened, the disc convex, impunctate, metallic dark blue, scutellum black ; elytra strongly convex, their epipleuræ absent below the middle, the punctuation very fine and close, slightly arranged in rows, the interstices everywhere very minutely punctured and wrinkled ; below black, legs fulvous, the first joint of the posterior tarsi as long as the following joints together.

Hab. Dunbrody, CAPE COLONY (*Rev. O'Neil*).

The metatarsus of the posterior legs in this species is shorter than is generally the case in this genus, with which it agrees in all other characters; the uniformly blue upper surface and the sculpture of the elytra will comparatively easily distinguish this species, of which two specimens were forwarded by the Rev. O'Neil.

Candezea (Iphidea) *capensis*, Baly.

In a publication by the late Miss Ormerod (Observat. on African injur. Insects, 1889, p. 34), Baly has described the above insect and placed it in *Iphidea*, a genus he himself had already withdrawn and considered identical with *Lupcrodes* in 1873 (Trans. Ent. Soc., i, p. 187). Miss Ormerod some time ago kindly presented me with the type, and on examination I find the anterior coxal cavities closed and all the other characters identical with *Candezea*. The species agrees in coloration with several others from Africa; it is testaceous above, black below, the thorax is narrowed in front, transverse and impunctate, the scutellum is black, and the elytra are finely and closely punctured with the extreme sutural and lateral margins piceous. I have also received this insect from Grahamstown where the type was obtained, as well as from Malvern, Natal. *C. nigrosuturalis*, Jac., is another closely-allied species, but is a much more narrowly-shaped insect, the antennæ are longer, and the elytra are distinctly margined with black.

Candezea braunsi, sp. n.

Under-side black, upper-side testaceous, antennæ fuscous, legs fulvous, thorax transverse with three small foveæ, elytra extremely closely and finely punctured, their epipleuræ continued to the apex.

Length 7 millim.

Very convex and elongate, the vertex fulvous, impunctate, frontal elevations trigonate, small, carina acute, lower portion of face testaceous, antennæ long and slender, the lower three joints and the base of the fourth and fifth, flavous, the rest fuscous, third joint twice as long as the second, fourth joint longer than the preceding one; thorax twice as broad as long, the sides and the posterior margin rounded, the angles distinct, the disc convex, finely granulate, with three very small foveæ, placed triangularly, scutellum rather small, testaceous; elytra wider at the base than the thorax, extremely closely impressed with small piceous punctures, under-side black, closely covered with grey pubescence, legs robust, fulvous, the coxæ and the extreme base of each joint black, the metatarsus of the posterior legs much longer than the following joints together.

Hab. ALGOA BAY (*Dr. Brauns*).

Of nearly similar shape and coloration to *C. hæmatura*, Fairm., but the sculpture of the head quite different, the labrum testaceous, not black, the antennæ differently coloured as well as the scutellum, and the elytra more distinctly punctured; from *C. flavicola*, Gerst., the species may be at once distinguished by the black under-side.

Candezea scutellata, sp. n.

Under-side black, the basal joints of the antennæ and the head and thorax pale fulvous, impunctate, scutellum black, elytra testaceous, extremely minutely punctured, tarsi and the posterior femora more or less black.

Length 7 millim.

Again closely allied to *C. Braunsi* and *C. hæmatura*, but with the frontal elevations scarcely raised and the clypeus very broad and flat, without carina, the antennæ rather shorter, black, the lower three or four joints flavous; the thorax twice as broad as long, slightly narrowed anteriorly, the sides nearly straight, the surface entirely impunctate, without depressions, scutellum black; elytra somewhat narrowed posteriorly, their punctuation scarcely perceptible, of paler coloration than the thorax, legs fulvous, the posterior femora and the tarsi black, as well as the under-side; metatarsus very elongate.

Hab. ALGOA BAY, CAPE (*Dr. Brauns*).

Of the two specimens, kindly sent by Dr. Brauns, one has the tarsi almost concolorous with the legs; the sculpture of the head and the black scutellum will distinguish this species from its allies.

Candezea infuscata, sp. n.

Bluish-black, the basal joints of the antennæ and the thorax flavous, the latter very finely and obsoletely punctured, elytra bluish-black, very closely and distinctly punctured in irregular rows, legs flavous, the femora and the tarsi more or less fuscous.

Length 3 millim.

Head blackish, impunctate, the frontal elevations strongly raised, transverse, clypeus highly convex between the antennæ, the latter of about half the length of the body, black, the lower three or four joints flavous, the third joint about one-half longer than the second; thorax about twice as broad as long, the sides very feebly rounded, the anterior angles slightly obliquely thickened, the surface very minutely, closely and obsoletely punctured, flavous; elytra very closely and much more strongly punctured than the thorax, the interstices very slightly wrinkled, bluish-black; under-side of the latter colour, the legs flavous, the femora and the tarsi obscure fuscous to a greater or smaller degree; the metatarsus of the posterior legs as long as the following three joints together.

Hab. Malvern, NATAL.

Closely allied to *C. nigrocærulea*, Jac., and nearly similarly coloured, but the thorax more obliquely narrowed and the sides quite straight in the last-named species, the elytral punctures finer, and the legs entirely flavous.

Buphonella, gen. n.

Body narrowly elongate, pubescent above, antennæ subfiliform, eyes entire; thorax transversely subquadrate, finely rugose like the elytra, the latter with the lateral margins deflexed, their epipleuræ extremely narrow; anterior coxæ raised, closely approximate, legs slender, the tibiæ unarmed, the metatarsus of the posterior legs as long as the three following joints together, claws bifid at the extreme tip only, prosternum invisible between the coxæ, the anterior cavities closed.

At first sight, this genus here proposed bears a greater resemblance to the *Eumolpidæ*, and more especially to the group *Leprotinæ* than to that of the *Galerucidæ*, as the antennæ are more widely apart than is the rule in this last-named tribe; these organs are, however, inserted in front and a little below the eyes; there are the usual frontal elevations, and most important of all, the anterior coxæ are almost united, and hide the prosternum; they resemble in that respect the genus *Buphonida*, Baly, which has likewise closed coxal cavities and bifid claws, but the thorax in that genus is transversely sulcate and of different shape; the claws in the present genus are also rather peculiar, as each claw has the division united and bifid to a small extent at the tip only. *Mombasica*, Fairm., seems also more nearly allied to *Buphonella* than to any other genus of *Galerucidæ*.

Buphonella elongata, sp. n.

Narrowly elongate and parallel, black, finely pubescent above, the basal joint of the antennæ and the femora fulvous, thorax subquadrate, very finely rugose, elytra still more finely sculptured, clothed with short grey pubescence; tibiæ unarmed.

Length 5 millim.

Head broad, closely rugose, the middle with a narrow, elongate, smooth raised space, eyes rounded, entire, frontal tubercles trigonate, smooth and tuberculate, clypeus transverse, antennæ about two-thirds the length of the body, black, the basal joint fulvous, the third joint more than twice as long as the second, slightly shorter than the fourth, the following joints slightly thickened, terminal ones thinner; thorax transversely subquadrate, one-half broader than long, the base slightly constricted, the anterior angles obtuse, thickened, the surface sculptured like the head, the rugosities partly confluent, scutellum broader than long, finely rugose; elytra opaque like the rest of the upper surface, extremely finely rugose and pubescent, body below and the tibiæ and tarsi black, the femora fulvous, the last abdominal segment triangularly emarginate (♀ ?).

Hab. Salisbury, MASHONALAND (*G. Marshall*).

Two exactly similar specimens were obtained by Mr. Marshall.

Ergana fulvipes, sp. n.

Under-side black, upper-side dark metallic blue, basal joints of the antennæ and the legs fulvous, thorax transverse, very minutely punctured, elytra closely and strongly punctured.

Length 4½ millim.

Head broad and short, impunctate, deeply transversely grooved, frontal elevations strongly convex, trigonate, clypeus very broad and swollen, labrum and palpi blackish, the penultimate joint of the latter dilated, antennæ extending to half the length of the body, black, the lower four joints flavous, third joint longer than the second, the intermediate ones slightly widened; thorax more than one-half broader than long, the sides strongly rounded, the posterior margin to a less extent, the surface convex, very finely and closely punctured; scutellum black, impunctate, elytra slightly wider at the base than the thorax, posteriorly widened, extremely closely and more strongly punctured than the thorax, the interstices finely wrinkled and furnished with still smaller punctures; legs fulvous, all the tibiæ mucronate, the first joint of the posterior tarsi as long as the following joints together, claws appendiculate, anterior coxal cavities closed.

Hab. Dunbrody, CAPE COLONY (*Rev. O'Neil*).

A typical species, and distinguished by its system of coloration.

II. *On the Life History of* Drilus flavescens, Rossi. By Lionel R. Crawshay, M.A. Oxon. Communicated by Charles Owen Waterhouse, F.E.S.

[Read November 5th, 1902.]

Plates I and II.

The following notes on *Drilus flavescens* are collected from observations made during the past three years. In July 1900 I first found the larva on the Downs, near Seaford, Sussex, and in this year reared five larvæ (all females), four of them emerging in the following spring, and the fifth continuing its growth for another summer. In 1901 I collected several more larvæ from the same locality, and from these I obtained in the spring of the present year (1902) a single male, and a few females, the remainder reappearing as larvæ.

In spots where snails—*Helicella itala* and *Helicella virgata* especially—cover the ground in immense numbers, it is not surprising that the larva thrives on its food-supply, and it may often be seen during the summer months, running hastily over the ground in search of food. Before passing to its life history, the form of the larva deserves some notice.

The larva, which is narrowed in front and much widened behind, has the upper surface of the abdomen rather thickly covered with coarse hairs of a bright burnt-sienna colour, springing chiefly from four longitudinal rows of fleshy processes, the processes increasing in length towards the posterior. The head is reddish-brown, flat above, with strong sharp mandibles, curving upwards and crossing one another above the labrum; the eyes consist of a single ocellus on either side. The antennæ (Plate I, fig. 1; Plate II, fig. 1) are two-jointed with a supplement to the second joint, and can be partially extended or withdrawn by the larva by means of a collapsible membranous tube which carries the first joint, the latter being thrust forward or partially withdrawn within the tube by a muscle which passes up the centre of it to the apex of the first joint. The second joint is somewhat flattened and bears at its apex—on the inner margin a two-jointed supplementary process terminated by a long seta, and on the outer margin a smaller colourless process. The thoracic segments have a reddish-brown corneous covering above—marked with dark patches—with a few hairs. On each of the abdominal segments to the penultimate one the soft white body of the larva is protected above by a dark brown dorsal shield, sparsely hairy, bearing a bristly process on each margin, and by a pair of similar processes outside these, arising from the sides. The last segment has a single pair of larger bristly processes extending behind, with a spine at the apex of each, completing a covering which doubtless goes far to protect the larva from attack during its occupation of the snail-shell. The spiracles (Plate I, fig. 2) lie in an uncovered space between the dorsal shields and lateral processes, and project from small horny encasements which lie along the surface of the segments. A fleshy nipple on the under-side of the last segment aids the progression of the larva, and enables it to cling firmly to the surface of the snail-shell. It moves rapidly about the outside of the shell, aided also by a pair of small colourless pulvilli, attached by slender stalks to the base of the tarsal claw (Plate I, fig. 3).

The young larva, which is hatched about the middle of July, feeds till September, and then hibernates in the shell it has last occupied, attaining only a small size in the first year. This shell is evacuated in the following spring, and after this the larva may continue feeding at regular intervals till September. But owing to the existence of a distinct, inactive form for hibernation, and the fact that this may be assumed at any time of the summer, it is equally liable to pass nearly the whole of the year in a dormant state in the shell. Doubtless the larva often becomes full-fed in the year after hatching, but it probably more often feeds for a third summer. The full-fed larva then changes into a second hibernating form, pupating in the following spring, shortly before the appearance of the imago in May or June of the third or fourth year, as the case may be.

The snails which chiefly constitute its food in the locality referred to are *Helicella itala*, Linné; *Helicella virgata*, Da Costa; and *Helicella caperata*, Montagu; but the larva has shown the same readiness to attack any other species that I have hitherto tried, including:—

Helicella cantiana, Montagu; *Hygromia rufescens*, Pennant; *Vitrea cellaria*, Müller; *Helix nemoralis*, Linné; and even the largest examples of *Helix aspersa*, Müller; passing indifferently from one to another in the course of its growth.

When a snail is found, the larva raises itself at once on to the shell and examines it carefully, assuring itself of the presence of its occupant. If unsuited to the size of the larva, the snail is left and the search resumed. If it is satisfactory, the larva (more especially in its earlier stages at least) then proceeds to sound the surroundings, reaching out to its full length and ranging about on all sides above and below, but retaining all the while its hold on the shell by means of the anal clasping-organ. This is done with a view to secreting the snail before attacking it. If the position is found to afford sufficient cover, the snail is soon pushed or dragged into it, till out of sight; otherwise, if it is too much exposed (as on a roadway, for example), the larva endeavours to remove it to a better one. This removal of the snail to a place of hiding may prove a difficult matter, and remarkable perseverance is often shown in the endeavour to accomplish it. The larva takes a firm anal grip on the outer surface of the shell, and bending over the side, plants its head on the ground beneath; then, taking hold of the ground with its mandibles, it proceeds to "punt" the snail backwards over the ground, so far as possible in a straight line. Where an obstruction occurs, in the endeavour to pass it, the larva will often raise the snail entirely into the air and throw it forward bodily, but never losing its hold upon the shell. If in the meantime the snail appears and attempts to crawl away it is attacked with the mandibles and driven back. From time to time the larva returns to the summit of the shell to try the surroundings as before, afterwards going back to its task, which, if no cover should be found, may often be continued for an hour, or, as I have once noticed, for as much as three hours before the snail is attacked. It is advisable, when feeding the larva, to provide some loosely placed moss, into which it will soon carry the snail out of sight. In the case of larger larvæ (about 14 mm. and over) the snail is generally attacked very soon, without any attempt to remove it, however exposed the position may be. Larger snails (and I refer especially to *H. cantiana*) seem instinctively to know their danger when this horrible parasite has attached itself to their shells, and will do their utmost to dislodge it by making rapid contortions of their shells around them as they crawl, even to the extent of overbalancing themselves, and while the larva perhaps lies motionless on the shell. It is surprising that at such times the larva retains its hold or escapes injury, but it quickly takes up a position near the orifice and makes a ferocious onslaught with its mandibles, which probably soon overpowers its wretched victim; I have, however, more than once seen a large *H. cantiana* throw off its assailant and escape.

When the larva enters the shell it lies inside, against the outer wall, and gradually absorbs the moisture, finally consuming the whole or the greater part of the body of the mollusc. After a period varying from eight to sixteen days the shell is thoroughly cleaned out, preparatory to a succeeding period of inactivity and moulting. The larva may then be heard scraping with its mandibles within the shell, and may be seen making a number of journeys backwards, from the centre of the spire to the orifice, to eject from the shell the accumulated and unconsumed matter. The hairy processes seem to aid the work, as a brush, while the larva shuffles backwards down the shell. As the terminal segment reaches the orifice, the anal clasper grips hold of the edge, and, by an undulating movement of the body, the slimy matter is ejected from the shell. I once found a very large larva thus engaged at 10.30 p.m. (having already been working for perhaps half-an-hour). I then watched it for an hour and a half, while it made nine journeys down to the orifice, mostly at intervals of three to five minutes, and with generally about twenty to twenty-five of these undulating movements at the end of a journey. After this I ceased observing it, but I have found that with varying intervals the work may extend over the greater part of a day. In this way the interior of the shell is at length thoroughly cleaned out and made fit for habitation. The larva, which has become gorged with food almost beyond recognition (the dark scuta appearing as isolated patches on the distended white body), then thrusts itself up, with its head towards the centre of the spire, and prepares for moulting, which takes place about four or five weeks from the time of entering the shell, the skin being then cast towards the orifice, where it sometimes closely stops up the entrance. While the summer lasts, the undeveloped larva, as a rule, evacuates the shell about forty days after entering it, and goes off in search of another. Excluding the shorter feeding interval (July to September) in the year of hatching, it may thus devour as many as three, or perhaps four snails in the course of the summer, moulting once in each case before leaving the shell. But it often ceases feeding as early as July, and in one example, at least, under notice this year, the first shell entered by the larva on June 2nd, after hibernation, was not left afterwards. In such cases the larva, on moulting, reassumes the winter form (which is referred to below), and the growth is again suspended until the following year. From examples under observation, this early return to the winter form seems to be caused by a period of low temperature preceding the time of moulting. An instance of it occurs in the following incomplete record of a remarkable larva:

1900, July 8th:	Larva (length about 8 mm.) entered *H. virgata* (greatest diameter 8 mm.);
1901, May 30th:	evacuated this shell (length about 10 mm.), and entered *H. aspersa* (greatest diameter 8 mm.);
„ July 10th:	left this shell (length about 13 mm.), and entered *H. aspersa* (greatest diameter 28 mm.);
„ August 18th:	left this shell (length 21 mm.), and entered *H. aspersa* (greatest diameter 25 mm.);
„ „ 31st:	seen to be cleaning out this shell (length, at the time, fully 30 mm.).

Unfortunately, in the spring of 1902, it died while still in the winter stage. The larva was doubtless hatched in July 1899, and must therefore have become full-fed in the third year, as seems to be more often the case.

The winter form, into which the undeveloped larva changes about the middle of September, or often earlier, as stated, is incapable of feeding or of more than a heavy grub-like motion, when disturbed. In general outline it much resembles the ordinary form of the larva, but it rather perhaps deserves the term "false pupa." The scuta are absent, the body being almost entirely soft, of a dingy whitish colour, and, except on the last three or four segments, almost hairless. The head is small, rather soft, and pale, with the mouth parts rudimentary, and the antennæ very short and much modified. The legs are soft and short, with the claws absent and replaced by a small prominence. The processes on the body are much smaller and less distinct, with only a few fine hairs, until the last three or four segments, where they become longer and rather thickly hairy, but with the hairs shorter than in the larva. The terminal processes are likewise shorter, but with the spines long (Plate II, fig. 2a). This skin is cast about the middle of May, and the larva then reappears from the shell in its ordinary form, continuing its life as before, until it is full-fed, in the second, or, probably in most cases, the third summer.

When full-fed, it changes into a second inactive winter form, which more nearly approaches the pupa, and which, like the other, may be assumed early or late in the year, often as early, at least, as July. Though this is very similar to the previous one, it differs from it especially in the much more stumpy form of the antennæ and of the processes on the last three or four segments; the hairs also on the latter are finer and shorter, and the spines on the terminal pair are very short (Plate II, fig. 3a).

Points of difference in the head and last segment of the two forms are figured in the accompanying drawings beside the corresponding parts in the ordinary form of the larva (Plate II).

The two small apical processes in the antennæ of the larva are retained in both winter forms; but what is the "outer" process in the larva becomes inferior and invisible from above in the first form, and partly inferior while visible on the *inner* side in the second form.

These sluggish winter forms (or "false-pupæ," if they may be so termed) appear to possess a strange tenacity of life. A specimen of the second form, lately kept out for examination, passed a day and a half in a solution one-third alcohol and two-thirds glycerine; then, two days afterwards, an hour in turpentine, followed by a day in alcohol and glycerine. Three days after removal from the latter, it seemed so little the worse that, after washing it in alcohol and in water, I put it into an empty shell, which it entered without difficulty, and it appeared to have its usual amount of vitality when examined a week afterwards. Though in a much lesser degree, the same point is noticeable in the ♀ imago, which will live for two or three hours in the same preservative solution, or return to its dull existence apparently unaffected by an immersion of an hour and a half in whisky half diluted.

An offensive acrid fluid is emitted from both extremities of the body by the two winter forms of the larva, when disturbed; the active form does not seem to possess this resource, but rolls itself into a ring.

In Mulsant's account of the insect ("Histoire Naturelle des Coléoptères de France; Mollipennes:" pp. 422 ff.), pupation is said to take place fifteen to eighteen days before the imago appears. Prior to this, the position within the shell is reversed, so that the head lies in the direction of the orifice (in which respect this second winter form differs from the earlier one). In a single instance this change of position had already occurred when I examined the shell on October 8th, but ordinarily it appears to be made in the spring. At the time of pupation, the skin is cast far back, near the centre of the spire. The skin of the pupa is soft and unprotected, and merely displays rather distinctly the enclosed form of the imago.

When the final change takes place, about the middle of May, the imago moves forward and occupies the intervening space between the pupa and the larva-skin of the previous year, lying with its head thrust against the anterior part of the latter. There are thus, at this point, four stages of the insect represented in the shell. Here the imago remains for some days before it is able to leave the shell. In three female examples observed in the present year, at least eight days were passed in this way, and the case of a male, referred to below, was similar. The imago appears at the end of May or beginning of June, about the same time as the hibernated larva.

The apterous female (Plate I, fig. 4) is elongate and broader behind, with the abdominal segments sharply explanate under the spiracles, so that the sides have a scalloped appearance. It is of a tawny testaceous colour, marked on each segment, except the last, with a pair of large dark-brown digitate patches more or less regular in shape, and thinly covered, especially above, with fine short rufous hairs. The last segment is terminated by two processes with a small palpiform appendage at the apex of each. The supplement to the antennæ found in the larva and retained in both winter forms, reappears very similarly in the female imago. At the apex of the tenth joint there is a small inner supplementary joint, terminated by a short seta (which is sometimes scarcely apparent), and a smaller process at the outer margin. The antennæ of the female are normally composed of ten joints (omitting the supplement), but the ninth joint is often imperfectly formed, being sometimes confounded with the preceding one, so as to be scarcely visible, and sometimes entirely absent. This deformity may even appear in different degrees in the two antennæ of the same insect.

Among the imagines that emerged this year I obtained only a single male, and this one happened to occupy one of two shells which I examined on May 18th. It seemed inclined to leave the shell, so I removed it, but it proved to be quite helpless and could only lie on its side, in a curved position, twisting the distended abdomen about like a pupa. I put it on some moss in a shady place, and its condition gradually advanced till, seven days afterwards, it was quite strong. For breeding purposes I had therefore to rely on this male alone, and it paired successively with four females (twice over with one of them) on May 25th, 31st, June 2nd, 4th, and 9th, respectively.

In the spring of the previous year a few eggs had been laid by some infertile females, a week after emerging, on the moss in which they were kept; but this year, under similar conditions, the first female that paired passed six days without laying: there was also reason for believing that the eggs are naturally secreted. I therefore cut a piece of fine turf from the Downs, ten inches by six inches and two inches deep, which I fitted closely into a shallow deal box, and on this the females were afterwards kept near an open window. The following is an account of the movements of these four females which I reserved, and the attempt to breed from them.

The first ♀, as stated, was not put on the turf till six days after pairing, namely on May 31st. From May 31st till June 4th she was up about the surface, generally resting in an exposed position on the short herbage, during each day, but going down every evening under the grass. On June 5th she came up in the morning and rested in the usual attitude on a short blade of grass, with the heavy body curving under her, and thus remained, never leaving the position, so far as I know, day or night, until June 9th, when she fell off and died without having laid.

A second ♀ emerged on May 26th and paired on the turf on June 2nd, at 11.30 a.m. She continued to move restlessly about the surface till 3.30 p.m., when she dived down a hole between the turf and the side of the box, and did not appear again.

A third emerged on June 2nd and paired on the turf on June 4th, disappearing on the same day.

A fourth emerged and paired on May 31st, but was not put on the turf till five hours afterwards. From this date, this ♀, like the first, was about the surface (generally resting on the herbage) regularly during the daytime, but always going down under the grass in the evening, until June 9th. I then tried the ♂ again, and she paired a second time, disappearing soon afterwards on the same day.

After June 9th none of them appeared again.

Though it is to a great extent the instinct of the ♀ to hide herself, she seems, in fact, after emerging, to choose more often some exposed position on the short herbage, and to remain clinging to this for hours at a time without moving. From the moment of pairing she proceeds at once to make her way down under the grass (the ♂ probably sharing the same instinct), and after separation—*i.e.* after about forty minutes—disappears very shortly, as it seems, into the turf, where she lays her eggs and dies. The failure of the first of these four was perhaps due to the absence of natural conditions in the first week.

On June 20th I examined the turf in search of ova. The body of one ♀ was found resting in a perpendicular position between the turf and the side of the box. The body seemed half empty, but I could find no eggs that had been laid. Probably this was the second ♀ mentioned above.

The bodies of the other two I found in the bottom of the turf (*i.e.* two inches deep), each lying with its contents emptied in a compact heap within a distance of half-an-inch from it. Doubtless both had died very soon after laying.

The egg is nearly spherical, about 1 mm. in diameter, and of a pale yellow colour. Roughly speaking, there were about thirty to thirty-five eggs in each heap.

It was a mistake to disturb them so soon, but the period of development proved to be much longer than I expected, and to leave them as they were, and unobserved, was unsatisfactory. In an endeavour to preserve natural conditions, the evils of excessive moisture and excessive dryness crept in, and worked serious injury in the first week or ten days. On July 2nd the embryo began to show signs of development, and on July 8th the form of the young larva was discernible. After this they advanced rapidly till the first hatched on July 20th, or about six weeks from the approximate date of laying. But meantime the greater number had fallen off in various stages of development, and only five, out of perhaps sixty-five, survived, hatching respectively on July 20th, 22nd, 24th, 25th, and 26th. One of these was a cripple and another was lost by an accident.

At the time of hatching, with the exception of the conspicuous black ocelli and a few reddish hairs, they were nearly white, the head and the shields about the segments attaining their darker colour several hours afterwards. The length is about $2\frac{1}{2}$ mm.

Of the three that remained, two began to feed about thirty-six hours after hatching; the third clung to its egg-shell for twenty-four hours, and refused food for three and a half days. The snails at length given them were *Helicella caperata*, and *Hygromia rufescens*, 3 to 4 mm. in diameter.

In these three examples (as also the one that was lost) I noticed most of the instincts of the older larva, including the feigning of death for as long as fifteen or twenty minutes at a time. There was no attempt to push the snail away, but a decided tendency to work underneath it, perhaps with the same purpose. More than once a snail that began to appear from the shell was sharply struck with the mandibles and driven back; in another case the hardened film quickly thrown by the snail as a barrier across the orifice was cut away by the larva after an hour and a half's work, and the shell was then entered. The ultimate loss of these larvæ was perhaps largely due to the period of exceptionally cold weather that followed the time of hatching, and particularly so in the Cotswolds, where I happened to be staying. The fragmentary account of them, so far as it goes, may, however, be worth recording.

Larva (*a*) hatched on July 20th, and entered the first shell on July 21st; partly devoured this snail; left it and entered another on August 2nd, but afterwards became entangled inside the shell, and died without having moulted.

Larva (*b*) hatched on July 22nd, and on July 25th entered the first shell, in which it became entangled, and died without moulting.

Larva (*c*) hatched on July 25th, entered the first shell on July 26th, and, after partly devouring the occupant, left it and attacked a second on July 28th; was ejected some hours afterwards by the latter, and left entangled; I released it and put it back on the first shell, which it at once re-entered, but it afterwards died without having moulted.

I have nevertheless found the exuviæ of the young larva at about 3 mm. in very small snail-shells (3–4 mm. in diameter), and it seems more probable that the economy of the larva in its infancy is the same as in its later growth, and that under ordinary circumstances the first shell is not left till after moulting, in the usual manner. It would thus be able to attain a length of about 4 mm. at the time of entering the second shell, at which point it is to be found feeding, about the middle of September, prior to hibernation. After this, the growth of the larva is regulated by the size of the snails it happens to meet with, its length being increased, as I have found in most cases observed, roughly by about half the greatest diameter of the snail attacked. The female imago may thus be no more than 8 mm. in length, or, on the other hand, probably not far short of 30 mm. On the Downs, larger snails such as *H. cantiana* are seldom met with by the larva, and the average length of nine naturally-reared females which emerged this year was 10·7 mm. only.

In regard to the life history of the male, Mulsant mentions the fact that out of one hundred and fifty shells containing larvæ, Desmarest obtained only two males, while M. Rouget obtained only one male among about two hundred females. Appended are a few details bearing on this point.

As already mentioned, all of five larvæ which I reared in 1900 were females.

The shells collected in the autumn of 1901 and early in 1902 varied from 4 to 12 mm. in their greatest diameter (*i.e.* the measurement across the shell to the outermost point of the orifice). Of those larvæ that were full-fed, nine were females and five were males. All of the females emerged, but four of the males died as pupæ (the fifth was taken in February; the others in September).

Another shell contained the remains of a male pupa which had probably failed to emerge in the previous spring.

The shells containing these six males were :—

Two of them *Helicella virgata*, Da Costa; 8 and 9 mm. in diameter respectively.

Four of them *Helicella caperata*, Montagu, 7, 7, 7, and 8 mm. in diameter respectively.

Another shell found at the same time, containing a male pupa skin, was that of *Helicella caperata*, 6 mm. in diameter.

The following table shows the greatest diameter of thirty-seven winter shells (all naturally occupied by larvæ), and the state of the insect after hibernation :—

2 shells	of 4 mm.	in diam.	produced	2	undeveloped	larvæ.		
2	,, 5	,,	,,	2	,,	,,		
5	,, 6	,,	,,	4	,,	,,	and 1	♂.
6	,, 7	,,	,,	3	,,	,,	,, 3	♂.
6	,, 8	,,	,,	4	,,	,,	,, 2	♂.
5	,, 9	,,	,,	4	,,	,,	,, 1	♂.
11	,, 10–12	,,	,,	2	,,	,,	,, 9	♀.

In other words, all full-fed larvæ occupying shells of 6–9 mm., and averaging 7½ mm., were males, and all those occupying shells over 9 mm. were females; which result might, in fact, be expected approximately, considering that the male imago never perhaps attains the minimum length of the female.

The females probably outnumber the males very considerably, while the male larva must be sought for in shells of a small size only. But, apart from these considerations, the male seems, for some reason, to be more difficult to rear than the female—possibly owing to the fact that it is more likely to complete its limited growth early in the year, and so to be subject to a longer period of exposure to the exigencies of weather.

The number of eggs laid by the female may be as many as three hundred, or even more; but the female, which is little more than an egg-magazine, varies in size to an extraordinary degree, and the number of eggs must vary greatly in proportion. In a female of 19 mm. I found two hundred and sixty-seven, but in smaller examples the numbers were far short of this. The two that laid (presumably 10 mm. and 13 mm. respectively) cannot either of them have laid more than about forty; the abdomen of another (11 mm.), nine days after leaving the shell, contained thirty-three; while in another (8 mm.), seven days after leaving the shell, there were only four or five developed ova, and the abdomen *could* hardly have contained more than fifteen or twenty.

The following case of cannibalism occurred in the present year:—

Two larvæ, "A" and "B," were due to leave their shells about the same date, early in July, and both had already moulted. "A" left its shell first, and escaping unobserved into the division of "B," entered the shell and attacked and devoured the unfortunate occupant. The unconsumed remains of "B" were afterwards cast back and left near the orifice of the shell, and the larva "A" in due time moulted, evacuating the shell thirty-five days after the probable date of entering it.

Among a number of shells examined, which have contained larvæ, I have not noticed any clear case of parasitic attack on the species. I am indebted to Mr. C. O. Waterhouse for his kind assistance in connection with the subject of this paper.

Explanation of Plate I.

Figure 1. Left antenna of larva, partially withdrawn.
,, 2. Spiracle of larva, projecting from horny encasement.
,, 3. Part of intermediate leg of larva.
,, 4. Female imago.

Explanation of Plate II.

Figure 1. Active form of larva; part of head, showing antennæ and mandibles (antennæ extended).
,, 2. Winter form of undeveloped larva; part of head, showing antennæ and mandibles.
,, 3. Winter form of full-fed larva; part of head, showing antennæ and mandibles.
,, 1a. Active form of larva; last segment.
,, 2a. Winter form of undeveloped larva; last segment.
,, 3a. ,, ,, ,, full-fed larva; last segment.

III. *On the Genus* Deilemera, Hübner. By Colonel Charles Swinhoe, M.A., F.L.S., F.Z.S.

[Read Feb. 4th, 1903.]

Plates III and IV.

The genus *Nyctemera* was erected by Hübner in the Verzeichniss, p. 178, and diagnosed as "Die Flügel weiss und weissfleckig schwarz gesäumt." Under this genus Hübner put seven species in the following order:—

hesperia, Cram., Pap. Exot., iii, pl. 251, f. A. B. (1780).
caffra, Drury, Ill. Ex. Ent., iii, pl. 5, f. 1 (1780).
nerina, Drury, l. c., f. 2.
coleta, Cram., l. c., iv, pl. 368, f. D. H. (1782).
famula, Drury, l. c., ii, pl. 11, f. 3 (1773).
atralba, Hübner = *tripunctaria*, Linn., Syst. Nat., i, p. 523 (1758).
lacticinia, Cram., l. c., ii, pl. 128, f. E. (1779).

Walker in the 2nd vol. of his Catalogue, p. 402, erected the genus *Otroeda*, placing therein in the following order:—

hesperia, Cram., l. c.,
occidentis, Walker, ii, 403,
vesperina, Walker, ii, 403,
caffra, Drury, l. c.,
nerina, Drury, l. c.,

leaving *coleta*, Cram., as the type of Hübner's genus *Nyctemera*; and this seems to have been followed ever since, except that Hampson makes *lacticinia*, the seventh in the list of Hübner's named species, the type of the genus.

No author in erecting a new genus can be justified in removing the first three species, including of course the type, of a genus already in existence, yet this is what Walker did.

It is not only that *hesperia*, being the first species in the seven under the genus Nyctemera, is thus made the type of the genus, but Hübner's diagnosis, "wings white with white-spotted black borders," is a good description of *hesperia*, and not of any one of Walker's so-called *Nyctemeras*; consequently as *hesperia* is the type of the genus *Nyctemera*

Walker's genus *Otroeda* becomes a synonym, and as *hesperia* is a *Lymantrid*, another name must be found for the species hitherto erroneously referred to *Nyctemera*.

This is not far to seek; Hübner's next genus *Deilemera* contains a single species only, *evergista*, Cram., and about this type there can be no mistake.

For some of the other species in this genus five genera have been erected by different authors. I have had one or two examples of species in each genus denuded of their wing scales, and after carefully working through the species have come to the conclusion that structurally there is no essential difference* between them, and that the genus *Deilemera*, Hübner, must include them all.

The scheme of neuration of the fore-wings is practically the same throughout; the length of the areole, by which Hampson separates *Deilemera* from the rest of the species, appears to be as variable as its breadth, in fact both its size and shape vary not only in individuals of the same species, but in the right and left wing of the same individual.

In the hind-wings veins 6 and 7 are generally stalked; in the few instances where 6 and 7 arise from the cell, this difference is found to be correlated with a difference in the structure of the antennæ and palpi, and may be legitimately employed for the purposes of sub-division; thus the species included under *Pitasila*, Moore, and *Atasca*, Swinhoe, which have veins 6 and 7 arising from the cell, agree in also having the palpi much shorter than the others, *Atasca* being separated from *Pitasila* by the antennæ in both sexes being simply pubescent, with a short bristle from each joint, whereas in *Pitasila* they are bipectinate in both sexes, the pectinations being short.

In the large majority of cases, those with veins 6 and 7 of the hind-wings stalked, with longer palpi and more fully pectinated antennæ, secondary sexual characters are available for sub-division; thus a few species with *evergista*, Cram., the type of the genus, have in the male the inner margin of the fore-wings strongly convex, and the inner margin of hind-wings amplified and containing a fold and furrow, the outer margin produced and straight from the anal angle, not rounded, so that the hind-wing becomes oblong in shape.

Again in *coleta*, Cram., the fore tibia in the male bears a long pencil of hairs, and the species is further separated by

* Except in *coleta*, where vein 11 is short stalked with 9 and 10.

a slight difference in neuration, vein 11 of fore-wings being stalked with 9 and 10.

A third sub-division of Section II is necessary for the African species, including *leuconoë*, Hopffer; in this the hind-legs of the male suffer great modification, the coxæ are greatly elongated, the femora still more so, the tibiæ are all but obsolete and without spurs, while the tarsi are much attenuated and almost equal to the femora in length, and are accompanied by a tuft of hairs as long as themselves, from the femoro-tibial joint.

The fourth sub-division contains species without secondary sexual characteristics, and will include all the species heretofore placed under *Tripheromera*, *Zonosoma*, and *Leptosoma*, amongst which there is no difference whatever, except in the pattern and sometimes as in *cenis* in the length of the wings.

As might be expected with moths of weak flight, nearly every island contains its own peculiar form; this of course does not of a necessity make each a good species, as in *baulus*, Boisd. = *mundipicta*, Walker, forms of which are found in nearly all the islands (probably in all), from the Philippines to the Solomon Group, and although one can generally trace some small difference in each, the differences are too slight for any attempt to make any distinctions.

The Family NYCTEMERIDÆ stood for many years by itself, next to the CALLIDULIDÆ, where Kirby puts it in his catalogue of Heterocera. Meyrick, in Proc. Linn. Soc. N.S.W. 1886, p. 687, put the members of this group into the Family HYPSIDÆ = AGANAIDÆ, and though Hampson, in his Moths of India, vol. ii, put them into the ARCTIIDÆ, they have now been put in the National Collection with the Aganaidæ, which is evidently their proper place, and they form a sub-division of that Family.

KEY TO THE SUB-DIVISIONS OF *Deilemera*.

Section I. Veins 6 and 7 of hind-wings not stalked, palpi short.

- A. Antennæ not pectinated. . . . . . . (*Atasca*)
- B. Antennæ shortly pectinated. . . . . . (*Pitasila*)

Section II. Veins 6 and 7 of hind-wings stalked, palpi longer, antennæ with long pectinations.

- A. Both wings of male abnormally developed. (*Deilemera*)
- B. Male with long tuft of hair to fore tibiæ. (*coleta group*)
- C. Male with abnormal hind-legs. . . . . (*leuconoë group*)
- D. Without secondary sexual characters. (*Tripheromera**)

* *Leptosoma* and *Zonosoma* being praeoccupied.

Genus Deilemera, Hübner, Verz. Schmett, p. 178 (1818).

Leptosoma, Boisd., Voy de l'Astrolabe Lep., p. 197 (1832) (praeocc.).
Pitasila, Moore, P. Z. S., 1877, p. 599.
Zonosoma, Butler, Ill. Het. B. M., v, p. 44 (1881) (praeocc.).
Triphcromcra, Butler, l. c., p. 45.
Tristania, Kirby, Cat. Het., i, p. 423 (1892).
Atasca, Swinhoe, Cat. Het. Mus. Oxon., i, p. 139 (1892).

SECTION I.

Veins 6 and 7 of hind-wings not stalked, palpi short.

A. ANTENNÆ NOT PECTINATED. . . . . (*Atasca*)

Deilemera pellex.

Phalæna (*Noctua*) *pellex*, Linn., Syst. Nat., x, p. 530 (1758).
Leptosoma pellex, Aurivillius, Rec. Crit. in Sv. Ak. Handl., xix (5), p. 161, pl. 1, f. 5 (1882).
Atasca pellex, Swinhoe, l. c.
Nyctemera artemis, Walker, ii, 394 (1854).
Nyctemera separata, Walker, xxxi, 204 (1864).

Sixteen examples from Batjan, Ceram, Aru, N. Guinea, Fergusson Isl., and N. Ireland. Type *separata* from Gilolo is in Mus. Oxon.

Deilemera albipuncta. (Pl. III, f. 8.)

Deilemera albipuncta, Druce, P. Z. S., 1888, p. 573.
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 164.

Two examples from Guadalcanar Island (*Meek*). A very distinct species.

Deilemera signata.

Deilemera signata, Butler, P. Z. S., 1878, p. 386.
Nyctemera signata, Pag., Jahrb. Nass. Ver. Naturk., 1891, p. 152.

The type female from Darnley Island; it may be an extreme form of *pellex*, but it is impossible to say, without seeing more examples.

Deilemera ægrota.

Leptosoma ægrotum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 145, pl. v, f. 15 (1892).

Nyctemera ægrotum, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 135.

Two females from Queensland and one male from S.E. Australia. Type from N. S. Wales in Mus. Oxon.

Deilemera simplex.

Nyctemera simplex, Walker, xxxi, 207 (1864).
Atasca simplex, Swinhoe, Cat. Het. Mus. Oxon., i, p. 140, pl. 5, f. 13 (1892).
Nyctemera doriæ, Oberth., Ann. Mus. Genov., xv, pl. 4, f. 2 (1883).

The type from N. Guinea is in Mus. Oxon. Oberthür's type came from the same locality.
It is not in the B. M.

Deilemera quadriplaga.

Nyctemera quadriplaga, Walker, xxxi, 207 (1864).
Atasca quadriplaga, Swinhoe, Cat. Het. Mus. Oxon., i, p. 140, pl. 5, f. 9 (1892).

The type from New Guinea is in Mus. Oxon.
It is not in the B. M.

B. Antennæ shortly pectinated . . . (*Pitasila*)

Deilemera varians.

Nyctemera varians, Walker, ii, 400 (1854).
Pitasila varians, Butler, Ill. Het. B. M., v, p. 46, pl. 88, f. 4 (1881).
Pitasila moolaica, Moore, P. Z. S., 1878, p. 847, pl. 53, f. 10.

Fourteen examples from Kashmir, Sikkim, Cachar, Karen Hills, Toungyen and Tenasserim, including both types.

Deilemera inconstans.

Pitasila inconstans, Butler, P. Z. S., 1880, p. 672.
,, ,, Swinhoe, Cat. Het. Mus. Oxon., i, p. 139. (1892).

Six examples from Formosa, including the type, one from Carniguen, and one from Tizard Bank, China.

Deilemera semperi, nov.

♂. Palpi black, face, frons, head and fore part of thorax ochreous, a black spot on the frons, one on top of head, two on the collar, two on each patagia, two transverse black bands on the thorax in front, and a black spot behind, lower half of thorax and abdomen white, the latter with a dorsal row of black spots, one on each segment, and lateral double rows of black dots, anal tuft ochreous; fore-wings black, with white markings, much as in *P. disrupta*, Butler, from the Solomon Islands, but there is an additional band of three white spots between the basal streak and the discal band, the latter is entire and is composed of five large spots: the hind-wings are white with a black marginal band containing two apical spots, and another a little below the middle, as in *disrupta*.

Expanse of wings $2\frac{1}{10}$ inches.

Hab. PALAWAN (*Doherty*).

One example; there are several from the Philippines in Mr. Herbert Druce's coll. It is the insect figured by Herr Semper as *Pitasila leucospilota*, Moore, in his great work on the Phil. Schmett, Heterocera, pl. 59, f. 6; though of course allied to that species it is absolutely distinct from it.

DEILEMERA BIJUNCTELLA.

Nyctemera bijunctella, Walker, xxxv, 1880 (1866).
Pitasila bijunctella, Swinhoe, Cat. Het. Mus. Oxon., i, p. 139 (1892).
Leptosoma maculosum, Felder (nec Walker), Reise Nov. Lep., pl. 103, f. 2 (1869).

The type example from the Philippines.

DEILEMERA BURICA.

Nyctemera burica, Holland, Nov. Zool., vii, p. 560 (1900).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 136.

One example from Sula Mangoli.
The type came from Buru.

DEILEMERA DISTINCTA, nov. (Pl. IV, f. 4.)

♂ ♀. White, head, thorax and tip of abdomen tinged with ochreous, last joint of palpi brown, one black spot on frons, two on collar and five on thorax, and a duplex row of black dots on the sides of the pure white abdomen; wings with pale black bands, very much thinner in the female than in the male; on the fore-wings the basal two-thirds of the subcostal vein is broadly black and is joined to a spot on the costa before its end, and connected with the hinder margin by two bands, forming a circle ; there is a spot on the costa near the base, another on the hinder margin beyond the middle, submarginal and marginal irregular bands, the former almost connected by a streak with a spot on the costa above the end of the cell ; hind-wings with an outer marginal band, which is disconnected in its middle and has an apical white spot in the male, and is disconnected both at the middle and near the apex in the female.

Expanse of wings 2 inches.

Hab. SANGIR (*Doherty*).
Two males and one female.

DEILEMERA OROYA, nov. (Pl. IV, f. 8.)

♀. Palpi with the second and third joints black, first joint white, antennæ black ; head, body, legs and wings white, a tinge of ochreous on face, head, shoulders, and tip of abdomen ; a black spot on the frons, one on the head, two on the collar, five on the thorax, a black dot on each segment of the abdomen on the sides, and a black line below them divided by the segments : wings with the bands and spots pale black ; fore-wings with a spot on costa before the middle, one at upper end of cell, a submarginal irregular band, ending at the hinder angle and joined to the outer margin below the apex, forming a large subapical white spot or space, a thickening on the basal half of subcostal vein, a slight thickening at the origin of vein 2 and another on the discoidal vein ; hind-wings with an outer marginal band, containing two submarginal spots, subapical and medial.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. SULA BESI (*Doherty*).
Two examples.

DEILEMERA ABRAXOIDES.

Nyctemera abraxoides, Walker, Journ. Linn. Soc. Lond., vi, p. 93 (1862).
Pitasila abraxoides, Swinhoe, Cat. Het. Mus. Oxon., i, p. 139 (1892).

Two examples from Borneo, including the type.

DEILEMERA AMOSA, nov. (Pl. IV, f. 6.)

♂ ♀. Palpi, head and thorax yellow, a black spot between the antennæ, another behind it, four on the collar and four on the thorax, abdomen white, anal tuft yellow ; fore-wings pale chocolate-grey, a white spot before the middle divided by the median vein, a longer white spot beneath it in the hinder margin, a broad discal white band, from the costa a little beyond the middle, widening in its centre and attenuated towards the hinder margin, three white submarginal spots as in *Atasca pellex*, Linn. ; hind-wings white with a broad chocolate-grey even band, containing two submarginal white spots, one subapical, the other beyond the middle.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. Damma Island.

Deilemera disrupta.

Pitasila disrupta, Butler, Ann. Mag. N. H. (5), xix, p. 223 (1887).

Six examples from the Duke of York Island, Kiriwini and Alu, including the type.

Deilemera selecta.

Nyctemera selecta, Walker, ii, 399 (1854).
„ „ Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 156.

Six examples from Alu, and the type without locality.

Deilemera variolosa.

Nyctemera variolosa, Felder, Reise Nov. Lep., pl. 129, f. 15 (1875).
Pitasila variolosa, Cotes and Swinhoe, Cat. Het., p. 80 (1887).

Two examples from the Andaman Islands and one from the Nicobars.

Deilemera leucospilota.

Nyctemera leucospilota, Moore, P. Z. S., 1887, p. 509, pl. 58, f. 7.
Pitasila leucospilota, Kirby, Cat., p. 422 (1892).

Eight examples from the Andaman Islands, including the type.

This form and *disrupta*, Pagenstecher sinks as synonyms to *selecta* (p. 156): Sir George Hampson sinks *abraxoides*, *bijunctella*, and *disrupta*, omitting *inconstans*. I cannot agree with either. Semper reared some from larvæ, but there is nothing to show that the eggs of one female produced two forms: *bijunctella* and *inconstans* are nearest to each other in pattern, and may be local forms of the same thing, *abraxoides* seems to be very distinct: the members of each species shown above do not vary, there is not one intermediate form amongst them, and therefore unless proved otherwise by breeding they must be kept distinct.

DEILEMERA GUTTULOSA.

Nyctemera guttulosa, Walker, xxxi, 201 (1864).
Pitasila guttulosa, Swinhoe, Cat. Het. Mus. Oxon., i, p. 138 (1892),
Nyctemera abraxata, Snellen, Tijd. v. Ent., xxii, p. 73, pl. 6, f. 6 (1879).

One example (the type) from Celebes; there are two from the same locality in Mus. Oxon.

DEILEMERA SPECULARIS.

Nyctemera specularis, Walker, vii, 1665 (1856).
Pitasila specularis, Swinhoe, Cat. Het. Mus. Oxon., i, p. 139 (1892).

Two examples including the type from Ceram; there are two also from the same locality in Mus. Oxon.

SECTION II.

Veins 6 and 7 of hind-wings stalked, palpi longer, antennæ with long pectinations.

A. BOTH WINGS OF MALE ABNORMALLY DEVELOPED. (*Deilemera*)

DEILEMERA EVERGISTA.

Phalæna (*Geometra*) *evergista*, Cram., Pap. Exot., iv. p. 155, pl. 369, f. E (1781).
Deilemera evergista, Swinhoe, Cat. Het. Mus. Oxon., i. p. 147 (1892).

Two examples from Amboina.

DEILEMERA UNIPLAGA, nov. (Pl. III, f. 2.)

♂. Palpi with first joint ochreous, second and third joints black, ochreous inside and with ochreous tips; antennæ black; head, thorax and abdomen dark ochreous with black bands and spots, a spot on the frons, one behind base of antennæ, four on the collar, three on the thorax, and a band on each segment of the abdomen; fore-wings blackish-brown with a large white patch in the disc, extending from below vein 3 across the end of the cell to the costa where it is narrowest; hind-wings white with a broad blackish-brown marginal border, which suddenly becomes diffuse and ends after rounding the angle: on the under-side the wings are as on the upper-side, quite as dark, the veins in the fore-wings pale and a subapical white dot.

Expanse of wings $2\frac{1}{10}$ inches.

Hab. FERGUSSON ISL. (*A. S. Meek*).

Two examples; wings shaped as in *D. evergista*, Cram.

Pagenstecher in Jahrb. Nass. Ver. Naturk., 1901, p. 165, sinks *mutabilis*, Walker, from Ternate (noted in Cat. Het. Mus. Oxon., i, p. 147), to *evergista*, Cram., but this cannot hold, the white patch in the disc of fore-wing inclines inwards, whereas in *evergista* it inclines outwards and is altogether of a different nature.

DEILEMERA INTERCISA.

Nyctemera intercisa, Walker, xxxi, 205 (1864).
Deilemera intercisa, Swinhoe, Cat. Het. Mus. Oxon., i, p. 147 (1892).

The type from Amboina is in Mus. Oxon. It is not in the B. M.

DEILEMERA MACULATA.

Nyctemera maculata, Walker, ii, 396 (1854).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 168, pl. 2, f. 10.
Nyctemera noviespunctatum, Voll., Tijd. v. Dierk., i, p. 42 (1863).

One example (the type) without locality, from Children's coll., probably Java.

DEILEMERA ÆRES.

Leptosoma æres, Boisd., Voy. de l'Astrolabe Lep., p. 198 (1832).
Nyctemera mutabilis, var., Walker, xxxi, 206 (1864).
Deilemera mutabilis, Swinhoe (note), Cat. Het. Mus. Oxon., i, p. 147 (1892).

Walker's type from Ternate and one example from Buru.

DEILEMERA LEUCTRA, nov. (Pl. IV, f. 5.)

♂ ♀. Palpi with the first joint yellow, second and third black, head, thorax and abdomen ochreous yellow, with black spots and bands, a spot on the frons, one behind the base of the antennæ, four on the collar, five on the thorax and broad segmental bands on the abdomen ; fore-wings black, with a large white patch (as in *D. mülleri*, Voll.) at the base, a larger white patch covering the whole of the disc, extending from near the costa to near the hinder margin, its inner margin recurved, its outer margin outwardly dentated, its lower side having a small square projection, two submarginal white spots, one a little above the middle, the other larger and subapical ; hind-wings white with a broad black band, with two white spots as in the fore-wings, the band complete in the female, but in the male it terminates abruptly at vein 2, and is followed by two black spots.

Expanse of wings $2\frac{1}{10}$ inches.

Hab. Sangir (*Doherty*); Talaut (*Doherty*).

Allied to *D. mülleri*, Voll., from Borneo, which is very distinct from *D. carissima*, Swinhoe, from Assam. Pagenstecher on p. 164 puts them together ; though the pattern of the wings is somewhat similar the shape of the two insects is very different, *carissima* having long narrow wings and in the male an excavation in the hind-wings a little before the anal angle, making the angle produced hindwards.

Deilemera gerra, nov. (Pl. IV, f. 1.)

♂ ♀. Palpi, head and body as in *D. leuctra* ; fore-wings blackish-brown, a white basal patch narrower than in *leuctra*, a narrow discal white patch with a round excavation on its inner side, toothed on its outer side, but with no square projection hind-wards ; hind-wings white with a broad blackish-brown band with the white spots as in *leuctra*, but without the two black spots in the male in continuation of the marginal band.

Expanse of wings 2 inches.

Hab. Talaut (*Doherty*).

The white bands on the fore-wings of the female are rather broader than those in the male.

Deilemera mülleri.

Leptosoma mülleri, Voll., Tijd. v. Dierk, i, p. 41 (1863).
Deilemera mülleri, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 164.

Two males and three females from Borneo.

Deilemera carissima.

Deilemera carissima, Swinhoe, Trans. Ent. Soc., Lond., 1891, p. 447, pl. 19, f. 1.
Deilemera carissima, Hampson, Moths, India, ii, p. 46 (1894).

One male and one female (types) from the Khasia Hills; I have also a pair from the same locality in my museum.

Deilemera zerenoides.

Tripheromera zerenoides, Butler, Ann. Mag. N. H. (5), viii, p. 380 (1881).

One female (the type) from Sumatra.

It more nearly resembles *carissima*, Swinhoe, than anything else.

Deilemera arctata.

Nyctemera arctata, Walker, vii, 1664 (1856).
Deilemera arctata, Hampson, Moths, India, ii, p. 45, f. 21 ♂ (1894).
Nyctemera maculosa, Walker, xxxi, 198 (1864).

Five examples from Sikkim, Assam, and Burma; the type from Cherra Punji in the Khasia Hills, Assam, is in Mus. Oxon.

B. Male with long tuft of hair to fore tibiæ.

(*coleta group*)

Deilemera coleta.

Phalæna coleta, Cram., Pap. Exot., iv, pl. 368, f. H (1781).
Nyctemera coleta, Hübner, Verz. Schmett., p. 178 (1818).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 142.

Sixteen examples from Tenasserim, Singapore, Sumatra, Borneo, Java, Amboina and Ceram.

Deilemera nigrovenosa.

Nyctemera nigrovenosa, Moore, P. Z. S., 1879, p. 394.
" " Swinhoe, Cat. Het. Mus. Oxon., i, p. 141 (1892).

Seven examples from Ceylon, including the type; Pagenstecher following Hampson has put it as a synonym to *coleta*.

DEILEMERA MELANEURA.

Leptosoma melaneura, Butler, Ann. Mag. N. H. (5), xii, p. 160 (1883).

" " Weymer, Stett. Ent. Zeit., xlvi, p. 274 (1885).

The type example from Nias.

In my collection are two from Nias and some in Mr. Herbert Druce's collection; it seems to be confined to the Island and is quite distinct from either *coleta* or *nigrovenosa*.

C. MALE WITH ABNORMAL HIND LEGS. . (*leuconoë group*)

DEILEMERA LEUCONOË.

Nyctemera leuconoë, Hopffer, Berl. Mon. Acad., p. 422 (1857).

Leptosoma leuconoë, Butler, P. Z. S., 1898, p. 419.

Three examples from Abyssinia, one from Foda, four labelled E. Africa, two from Nyassa Land, two from Zomba, one from Delagoa Bay, and six from Natal.

DEILEMERA INSULARIS.

Leptosoma insulare, Boisd., Faun. Madag., p. 84, pl. 12, f. 1 (1833).

Three examples from Madagascar.

DEILEMERA CONSORS.

Leptosoma consors, Butler, Ann. Mag. N. H. (5), xv, p. 192 (1879).

The type from the Island of Johanna.

DEILEMERA FALLAX.

Nyctemera fallax, Holland, Ent. News. and Proc. Ent. Soc. Ac. Nat. Sci. Phil., iv, p. 59 (1893).

" Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 147.

One example from Ogove River; the type came from the same locality and is in coll. Holland.

Deilemera perspicua.

Nyctemera perspicua, Walker, ii, 398 (1854).

Ten examples from Sierra Leone, Old Calabar, and the Congo, including the type.

Deilemera biformis.

Nychthemera biformis, Mab., Bull. Soc. Zool. Fr., iii, p. 87 (1878).
Nyctemera biformis, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 149.
Nyctemera mabillei, Butler, Ent. Mo. Mag., xix, p. 57 (1882).

Two males and one female (Butler's type) from Madagascar.

In Ent. Mo. Mag., xix, p. 57, Butler says, that as they have received in the B. M. a black female from Madagascar almost exactly like the male, the white insect described by Mabille cannot be the female of *biformis*. I have carefully examined this so-called black female; it is not a female, but a male with frenulum and retinaculum complete, and I cannot therefore see why this white female should not be the female of *biformis*, and it must stand as such until proved otherwise.

Deilemera apicalis.

Nyctemera apicalis, Walker, ii, 395 (1854).
" " Waterhouse, Aid, pl. 178, f. 4 (1880).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 145.

One example (type) from W. Africa, and one from Ashanti.

Kirby put *tricolor*, Felder, as a var. of this species, and Pagenstecher does the same; but judging from Felder's figure I do not believe this to be correct, *apicalis* having a very broad discal pure white band.

Deilemera restricta.

Leptosoma restrictum, Butler, P. Z. S., 1894, p. 585.
Nyctemera restrictum, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 146.

Four examples from E. Africa, including the type.

Deilemera antinorii.

Nyctemera antinorii, Oberthür, Ann. Mus. Genova, xv, p. 174, pl. 1, f. 1 (1880).

Two from Sierra Leone, two from Mongo-ma-Lobak, nine from Old Calabar, three from the River Nigra, and one from the Cameroons.

Deilemera acræina.

Nyctemera acræina, Druce, P. Z. S., 1882, p. 780.

Type, Calabar in coll. Druce.
It is not in the B. M.

Deilemera chromis.

Nyctemera chromis, Druce, P. Z. S., 1882, p. 780, pl. 65, f. 2.

The type from W. Africa is in coll. Druce.
It is not in the B. M.

Deilemera fulleri.

Nyctemera fulleri, Druce, Ent. Mo. Mag., xx, p. 157 (1883).

The type from the Cameroons is in coll. Druce.
It is not in the B. M.

D. without secondary sexual characters. (*Tripheromera*)

Deilemera plagifera.

Nyctemera plagifera, Walker, ii, 400 (1854).
Tripheromera plagifera, Butler, Ill. Het. B. M., v, p. 45, pl. 88, f. 3 (1881).

Twenty-five examples from W. China, Loochoo, Hong Kong, Nepaul, Darjiling, Assam, Silhet (type), and the Nilgiri Hills.

Deilemera ludekingii.

Leptosoma ludekingii, Voll., Tijd. v. Dierk., i, p. 49 (1863).
" " Snellen, Tijd. v. Ent., xlii, p. 108, pl. 5, B., f. 1 (1899).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 141, pl. 2, f. 11.

One example from Sumatra. Pagenstecher's figure is better than Snellen's. Pagenstecher puts *zerenoides*, Butler, as a synonym, but that species belongs to a different section of the Family.

Deilemera cenis.

Phalæna cenis, Cram., Pap. Exot., ii, pl. 147, f. E (1777).
Nyctemera interlectum, Walker, ii, 400 (1854).

Fifteen examples from Loo Choo, Shan States, Kashmir, Dera Dhun, Chin Hills, Jawai Hills, Darjiling, Sikkim, Assam, and Walker's type from Silhet.

Deilemera annulata.

Leptosoma annulatum, Boisd., Voy. de l'Astrolabe Lep., p. 197, pl. 5, f. 9 (1832).
Nyctemera annulata, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 111.
Nyctemera doubledayi, Walker, ii, 392 (1854).

Fourteen examples from New Zealand including Walker's type.

Deilemera amica.

Aglages amicus, White in Grey's Journ. Exped. Austral., ii, p. 482 (1841).
Nyctemera amica, Meyrick, Proc. Linn. Soc. N.S.W. (2), i, p. 760 (1886).
Nyctemera annulata, Walker (nec Boisd.), ii, 391 (1854).
Leptosoma plagiatum, Guen., Ent. Mo. Mag., v, p. 2 (1868).
Nyctemera conica, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 112.

Eleven examples from S.E. Australia; Pagenstecher's *conica* is evidently a misprint for *amica*.

Deilemera secundaria.

Leptosoma secundarium, Lucas, Proc. Linn. Soc. N.S.W., vi, p. 280 (1891).

Four examples from Queensland, differing nearly as much from *amica* as *amica* does from *annulata*.

Deilemera latemarginata. (Pl. III, f. 4.)

Nyctemera latemarginata, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 114.

One example from N. Guinea.

It has only two spots on the fore-wings, and is therefore not absolutely identical with Pagenstecher's type, but I am convinced it must belong to the same species.

DEILEMERA DISTINCTA.

Nyctemera distincta, Walker, ii, 392 (1854).
„ „ Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 108, pl. 2, f. 1.

Five examples from Java including the type. Pagenstecher's figure does not well represent the typical form; the type has hardly an indication of the white discal band of fore-wings, and in none of the examples in this Museum is the band plainly shown, and the yellow streaks are very faintly indicated.

DEILEMERA POPIYA, nov. (Pl. III, figs. 3 and 7.)

♂ ♀. First joint of palpi bright ochreous, second and third black, a large black spot on frons, one behind the base of antennæ, two on collar, one on each shoulder, three black longitudinal stripes on the thorax, all the spots and stripes edged with bright ochreous; fore-wings dark blackish-brown above and below, a broad white discal band on the under-side, from vein 2 to the costa; vein 1, the median and sub-costal veins white; on the upper-side the broad white band can be very distinctly seen, and all the veins on the basal third are yellow; the hind-wings are white with a broad blackish-brown border and with some brown suffusion at the base; cilia whitish; abdomen grey with white segmental bands and gold tip.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. JAVA, six examples.

On the upper-side it is something like *distincta,* but the band on the hind-wings is much narrower, and the abdomen is whiter, pure white beneath, with a double row of black spots on each side; underneath the markings of fore-wings are very distinctive.

DEILEMERA TRITA.

Nyctemera trita, Walker, ii, 394 (1854).
„ „ Moore, Cat. Lep. E.I.C., ii, p. 331, pl. 8a, f. 9 (1858).
Leptosoma tritum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 143 (1892).

Nine examples from Java, including the type.

DEILEMERA SUBVELATA.

Nyctemera subvelata, Walker, xxxi, 200 (1864).
Leptosoma subvelatum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144 (1892).
Leptosoma infuscata, Hopffer, Stett. Ent. Zeit., xxxv, p. 44 (1874).
Nyctemera infuscata, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 129.

Three examples from Celebes, including Walker's type. I have examples in my own Museum from Celebes that have been identified as *infuscata* by Pagenstecher.

DEILEMERA CLATHRATA.

Leptosoma clathratum, Voll., Tijd. v. Dierk., i, p. 48 (1863).
Nyctemera clathratum, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 137, pl. 2, f. 2.

One male from Ceram which seems identical with Pagenstecher's figure is in my coll.

It is not in the B. M.

DEILEMERA ASSIMILE.

Leptosoma assimile, Voll.. Tijd. v. Dierk., i, p. 39 (1863).
Nyctemera assimile, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 108, pl. 2, f. 3.
Leptosoma confusum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144 (1892)

One example from Java. The types of *confusum* from Java are in Mus. Oxon.

DEILEMERA ALTERNATA.

Nyctemera alternata, Walker, xxxv, 1879 (1866).
" " Semper, Phil. Schmett., p. 495, pl. 58, f. 9, 10 (1899).

The type example from the Philippines.

DEILEMERA RADIATA.

Nyctemera radiata, Walker, vii, 1664 (1856).
" " Semper, Phil. Schmett., p. 494, pl. 58, f. 8, ♀ (1899).
Leptosoma radiata, Swinhoe, Cat. Het. Mus. Oxon., i, p. 142, pl. 5, f. 10 (1892).

Two females from the Philippines.
The type from Manilla is in Mus. Oxon.

DEILEMERA VELANS.

Nyctemera velans, Walker, xxxi, 200 (1864).
Leptosoma velans, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144, pl. 5, f. 7 (1892).
Nyctemera velans, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 131.

The type from Celebes is in Mus. Oxon.
It is not in the B. M.

DEILEMERA LOMBOKIANA, nov.

♂ ♀. Palpi with first joint ochreous, second and third black, frons and head pale ochreous, nearly white, a black spot on frons, one on head and two on collar, all large ; thorax and abdomen dark brown, the former with longitudinal pale yellow lines, the latter with white hairs and indistinct whitish segmental bands and ochreous tip ; wings of a uniform dark brown ; fore-wings with veins yellowish on basal third, an indistinct discal band of six inconspicuous small spots, the last two the largest, the others uniform in size and very small, all of them suffused more or less with brown ; hind-wings with a small central space whitish.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. LOMBOCK, one pair.

Received from a Continental dealer as *N. lombokiana*, Fruhstorfer ; but I can find no reference : it is allied to *assimile*, Voll., and *propria*, Swinhoe.

DEILEMERA PROPRIA.

Leptosoma proprium, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144, pl. 5, f. 12 (1892).
Nyctemera proprium, Semper, Phil. Schmett., p. 495, pl. 58, f. 11 ♂, 12, 13, 14 ♀ (1899).

The types ♂ ♀ from the Philippines are in Mus. Oxon. Semper records it from the Babuyan Islands, Bohol, Camotes, and East Mindanao. It is not in the B. M.

DEILEMERA QUADRIGUTTATA.

Leptosoma quadriguttatum, Voll., Tijd. v. Dierk., i, p. 40 (1863).
Nyctemera quadriguttatum, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 114, pl. 2, f. 9.

One example from Java.

Not the same as *kondekum*, Swinhoe, as Pagenstecher says: that species being more nearly allied to *distincta*, Walker.

Deilemera sexmaculata.

Leptosoma sexmaculatum, Butler, Ann. Mag. N. H. (5), xix, p. 222 (1887).
Nyctemera aolænsis, Druce, P. Z. S., 1888, p. 573.

Two males and four females, Alu, Solomon Islands, including Butler's type; Druce's type came from Guadalcanar, Solomon Islands; there is much less white in the females than in the males, especially on the hind-wings.

Deilemera extendens.

Nyctemera extendens, Walker, vii, 1666 (1856).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 127, pl. 2, f. 7.
Nyctemera horites, Druce, P. Z. S., 1888, p. 573.

Walker's type from New Hebrides and nine examples from Alu, Solomon Islands; Druce's type, a female, also came from the Solomon Islands. I have it in my coll. from Treasury Isl. and New Georgia.

Deilemera syrnia, nov. (Pl. III, f. 6.)

♀. Palpi with the first joint dull orange, second and third joints black, large deep black spots edged with pale orange, filling up all the spaces, one on the frons, one behind the base of antennæ, two on the collar, one on each shoulder, and three longitudinal stripes similarly edged filling up the entire surface of the thorax; abdomen black, tip ochreous, segmental bands thin and white above, broad and ochreous beneath; fore-wings deep black, vein 1 and the median vein slightly ochreous towards the base, a discal white band, divided by the veins into seven spots, much indented, almost dislocated at the lower end of the cell, the upper spot near the costa very small, the fourth and seventh much smaller than the rest, the seventh just below vein 2; hind-wings with a broad deep black marginal band, scooped inwards from veins 2 to 5, extending along the costa and partly up the abdominal margin.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. Fergusson Island (*Meek*).

Two examples.

Deilemera kapaurensis, nov. (Pl. III, f. 1.)

♀. Allied to *syrnia*, fore-wings not quite so deep black, all the veins in the basal half whitish, the discal band similarly shaped, but broader, the subcostal spot as large as the lowest spot, the band extending below vein 1 forming eight spots, a white stripe in the basal two-thirds of the hinder margin; hind-wings as in *syrnia*, but the costal band with a short production hindwards in its centre; the abdomen also differs in being ochreous below, with black segmental macular bands.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. Kapaur, N. Guinea (*Doherty*).
One example.

Deilemera drucei, nov.

♂ ♀. Palpi black, ochreous beneath and at the base, face and head ochreous, but with the spots so large as to make them look black, thorax black with ochreous longitudinal stripes, abdomen black; with ochreous segmental bands and ochreous tip; fore-wings deep black, in the male there is a white mark below end of cell which looks like the termination of a stripe from the base, this is wanting in the female; a white discal band, not macular, fairly uniform in width, curved inwards, with two indentations on its inner side; on the basal third the veins are slightly ochreous, and there is a white streak on the hinder margin, from the base to two-thirds its length; hind-wings white with the usual black marginal band, without any spots.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. N. Australia, types in Mus. Druce; not in B. M.
The only species in the Family I have yet seen with the discal band of fore-wings curving inwards.

Deilemera dispar, nov.

♂. Palpi with first and second joints ochreous, last joint black, frons, head and collar ochreous, frons with one black spot, head with a large black spot, and the collar with two, occupying nearly the whole space, thorax and abdomen black, the former with ochreous longitudinal stripes, the latter with segmental white bands, which go completely round the abdomen, are ochreous in the last two segments, and there is an ochreous stripe along each side containing black spots; tip orange; fore-wings black, veins without markings, the discal white band broad, extending almost to the hinder margin near the angle, divided by the veins into seven spots, much as in *D. aluensis*, Butler, but closer together and more compact; hind-wings white, with the usual black band on the margins.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. Rossel Island, Louisiade Group.

Its black colour, without any vein markings, separates it from the *mundipicta* group, which it otherwise somewhat resembles.

Deilemera lacticinia.

Phalæna (Geometra) lacticinia, Cram., Pap. Exot., ii, pl. 128, f. E (1777).
Leptosoma lacticinia, Swinhoe, Cat. Het. Mus. Oxon., i, p. 141 (1892).

Fifteen examples from Hong Kong, Canara, Cachar, Malabar, Nilgiri Hills, Ceylon, and Penang; the Penang examples have the discal band of the fore-wings rather wide, but seem otherwise identically the same as those from India.

Deilemera simulatrix.

Nyctemera simulatrix, Walker, xxxi, 198 (1864).
Leptosoma simulatrix, Swinhoe, Cat. Het. Mus. Oxon., i, p. 143 (1892).

One example from Celebes. The type from Celebes is in Mus. Oxon.

Deilemera nigrovena, nov. (Pl. IV, fig. 2.)

♀. First two joints of palpi dull orange-yellow, last joint black, head and thorax orange-yellow, one black spot on the frons, one behind the base of antennæ, two black bands on the collar, a spot on each shoulder, and three longitudinal bands on the thorax; abdomen white above with black segmental bands, below slightly yellow tinged, with the bands macular; fore-wings black, the veins on the basal half white, discal band composed of eight spots as in *mundipicta*, but well separated from each other by the veins, except the spot at the end of the cell, which is joined to the spot outside the end; hind-wings white, with the usual broad marginal band, with all the veins black; veins 1, 1a, the median, and subcostal veins with a thin band of black suffusion on each side.

Expanse of wings $2\frac{3}{10}$ inches.

Hab. South Celebes (*Fruhstorfer*).

One example.

DEILEMERA KALA.

Leptosoma kala, Swinhoe, Cat. Het. Mus. Oxon., i, p. 143, pl. 5, f. 8 (1892).

The type from Ké Island is in Mus. Oxon.
It is not in the B. M.

DEILEMERA BAULUS.

Leptosoma baulus, Boisd., Voy. de l'Astrolabe Lep., p. 200 (1832).
Nyctemera mundipicta, Walker, Journ. Linn. Soc. Lond., iii, p. 184 (1859).
Leptosoma mundipicta, Swinhoe, Cat. Het. Mus. Oxon., i, p. 141, pl. 5, f. 14 (1892).
Nyctemera herklotsii, Voll., Tijd. v. Dierk., i, p. 39 (1863).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 113, pl. 2, f. 5.

Thirty-five examples from New Britain, New Ireland, Borneo, Singapore, Ternate, Amboina, Trobriand Island, Fergusson Island, Sumatra, Java and Ceram; in the Oxford Museum it is also from Flores, Gilolo, New Guinea, Mysol, and New Caledonia. It seems to have a very wide range, and is variable as to the width of the discal white macular band of the fore-wings and the marginal band of hind-wings. There are in the B. M. ten examples from Java, some identical with Pagenstecher's figure of *herklotsii*, and none of them separable from *baulus*, and also many examples from Buru (where Boisduval's type came from) are in the Tring Museum, some of which I have examined.

DEILEMERA FASCIATA.

Nyctemera fasciata, Walker, vii, 1665 (1856).
Nyctemera latistriga, Snellen (nec Walker), Tijd. v. Ent., xxii, p. 72, pl. 6, f. 5 (1879).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 120.
Nyctemera latistriga, var. *fasciata*, Rober, Tijd. v. Ent., xxxiv, p. 325 (1891).
Nyctemera tertiana, Meyrick, Ent. Mo. Mag., xxiii, p. 15 (1886).
" " Pag., l. c., p. 121.

The type from Aneitum, and six examples from Fiji and Adelaide: it has been recorded from Celebes, Ceram, Aru, N. Guinea, Flores, Timorlaut, Uliasser, Shortland Island, and Solomon Islands; it is very doubtfully distinct from *baulus*.

DEILEMERA INTEGRA. (Pl. III, f. 5.)

Nyctemera integra, Walker, xxxv, 1879 (1866).
Leptosoma integra, Kirby, Ann. Mag. N. H. (6), iii, p. 187 (1889).
Leptosoma mundipicta, Swinhoe (part), Cat. Het. Mus. Oxon., i, p. 141, pl. 5, f. 14 (1892).
,, ,, Semper, Phil. Schmett., p. 493, pl. 50, f. 4 ♀ (1899).

One female example (the type) from the Philippines, one from Alu, Solomon Islands, and two from the Caroline Islands.

This species is very similar in some respects to *mundipicta*, Walker, but it is blacker, and the spots forming the discal band of the fore-wings are closer together and more compact, the veins dividing them being white, not black; the latter have the abdomen yellower, but are otherwise identical. The figure represents one of the Caroline Island examples.

DEILEMERA ALUENSIS.

Nyctemera aluensis, Butler, Ann. Mag. N. H. (5), xix, p. 222 (1887).
,, ,, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 121.

Two male and three female examples from Alu, Solomon Islands, including the types.

DEILEMERA KINAGANANGA, nov.

♂ ♀. Palpi with first joint ochreous, last two black; frons, head and thorax ochreous, the first with one spot, one on the head, two on the collar; thorax with longitudinal black stripes, and a black spot at the base; abdomen white with black segmental bands above, three rows of black spots on each side; wings very much as in *D. baulus*, Boisd. = *mundipicta*, Walker, except that the hinder margin of fore-wings has a white stripe from base to below the discal band, and a prominent white streak in the interno-median interspace, also from the base to near the discal band; the black band on the hind-wings is as narrow as it is in *lacticinia*, Cram.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. KINAGANANG, New Britain.

DEILEMERA KONDEKA.

Leptosoma kondekum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144 (1892).

One example from Java. Types from Java in Mus. Oxon.

DEILEMERA ILLUSTRIS, nov.

♂ ♀. Last joint of palpi black, first and second joints, the head and collar bright ochreous, a black spot on the frons, one on top of head and four on the collar; thorax and abdomen white, tinged with yellow in parts, the last two joints of abdomen bright ochreous; thorax with three longitudinal black bands, abdomen with a black band on each segment; fore-wings brown, blackish on the outer half, pale and tinged with green on the basal half; a white streak on hinder margin for two-thirds its length, the veins on the basal half white, a white streak through the middle of the cell, another white streak much broader in the interno-median interspace from the base to the discal band, where it runs into and forms the lowest spot of the six that form the band; the second spot is large and kidney-shaped, the first and third are the smallest, the fourth longer, the fifth longest; hind-wings with a black outer border, as in *mundipicta*.

Expanse of wings 2 inches.

Hab. ALU, Solomon Islands.

Two pairs, described by Dr. Butler as *aluensis*, var., but they are certainly quite distinct from that species.

DEILEMERA NISA, nov. (Pl. IV, f. 7.)

♂ ♀. Palpi with the first joint ochreous, second and third black, head and collar ochreous, a black spot on the frons, one on top of head, two on the collar, one on each shoulder; thorax and abdomen white, the hind part of the former and the last two segments of the latter ochreous; three longitudinal black bands on thorax, and a black spot on the yellow part; abdomen with black segmental bands above, and a double row of black spots on each side; fore-wings black, veins on the basal half pure white, a white streak throughout the middle of the cell to the discal band, a much broader and prominent white streak in the interno-median interspace, also from base to discal band, the latter composed of white spots much as in *baulus*, but broader than usual, the large spot second from the costa nearly round, hinder marginal border with a white streak for two-thirds its length; hind-wings white with marginal black band as in *baulus*.

Expanse of wings $1\frac{9}{10}$ inches.

Hab. SANGIR (*Doherty*).

Male and female, the types, and one male marked Celebes.

It somewhat resembles *aluensis*, Butler.

DEILEMERA OBTUSA.

Nyctemera obtusa, Walker, vii, 1666 (1856).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 115.

Three examples from Celebes, including the type.

In Kükenthal's Reise (Abhandl. Senckenbergschen Gesellschaft), p. 440, pl. 18, f. 4, Pagenstecher described and figured *N. consobrina*, Hopffer. In Jahrb. Nass. Ver. 1901, p. 115, he says that this was a mistake, and that the description and figure represent *N. obtusa*, Walker; but this also is an error, the figure being very unlike Walker's species, and representing a species with which I am not acquainted.

DEILEMERA LATISTRIGA.

Nyctemera latistriga, Walker, ii, 397 (1854).
Leptosoma latistriga, Butler, Ill. Het. B. M., v., p. 44, pl. 88, f. 1 (1881).
Nyctemera inconstans, Voll., Tijd. v. Dierk., i, p. 47 (1863).
Nyctemera consobrina, Hopffer, Stett. Ent. Zeit., 1874, p. 45.
Nyctemera arcuatum, Swinhoe (nec Voll.), Cat. Het. Mus. Oxon., i, p. 142 (1892).

Twenty-two examples from Borneo, Silhet, Ceylon, Burma, Sumatra, Java, Pulo Laut, and the type from Maulmein.

Arcuatum, Voll., was wrongly identified in the B. M., and this led me to sink it as a synonym to *latistriga* in Cat. Het. Mus. Oxon. Snellen in Tijd. v. Ent., xli, p. 26, pl. 1, f. 3, 4, 5 (1898), says it belongs to the Chalcosiidæ; Pagenstecher (p. 114) makes *consobrina*, Hopffer, a distinct species; he does not say he has seen Hopffer's type, but the description exactly fits *latistriga*: "Der Raum zwischen mediana und submediana ist auf der innern Flügelhälfte durch eine spindelförmige oder ein langgezogenes Dreieck bildende Längsbinde ausgefüllt die aber die weisse Querbinde nicht erreicht." If this does not describe *latistriga* it describes something very near it; the elongated white triangle in the interno-median interspace together with the description of the discal band of fore-wings is peculiarly distinctive to *latistriga*.

DEILEMERA ACCEPTA.

Leptosoma acceptum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 143, pl. 5, f. 5 (1892).
" " Pag., Kükenthal's Reise in Abh. Senckenb. Naturf. Ges., 1897, p. 440.

The type from Celebes, a female, is in Mus. Oxon.

I have in my collection a male from Flores (Everett), which seems to me to be identical.

It is not in the B. M.

DEILEMERA SONTICA.

Leptosoma sonticum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 142 (1892).
Nyctemera sonticum, Semper, Phil. Schmett., p. 494, pl. 58, f. 5 ♀ (1898).

The types ♂ ♀ from the Philippines are in Mus. Oxon.; it is recorded by Semper from Luzon, Mindoro and Bohol; I have in my collection a male from Mindoro and a female from Palawan.

It is not in the B. M.

DEILEMERA ABSURDA.

Leptosoma absurdum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 143 (1892).
Nyctemera absurdum, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 135.

The male type, from Salawatti Island, is in Mus. Oxon.; it is not in the B. M.

Deilemera luctuosa.

Leptosoma luctuosum, Voll., Tijd. v. Dierk., i, p. 42 (1863).
" " Swinhoe, Cat. Het. Mus. Oxon., i, p. 146 (1892).
Nyctemera crescens, Walker, xxxi, 204 (1864).

One example from Morova, one from Batjan, and one from Sula; the type of *crescens* from Morty is in Mus. Oxon.

Deilemera galbana.

Leptosoma galbanum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 146 (1892).
Nyctemera galbanum, Semper, Phil. Schmett., p. 429, pl. 58, f. 2 ♀ (1899).

The types ♂ ♀ from the Philippines are in Mus. Oxon. Semper records it from Luzon.

It is not in the B. M.

Deilemera onetha.

Leptosoma onetha, Swinhoe, Ann. Mag. N. H. (7), vii, p. 466 (1901).

The type example from New Britain.

Deilemera tripunctaria.

Phalæna tripunctaria, Linn., Syst. Nat., x, p. 523 (1758).
Phalæna petalea, Sparrm. Amœn. Acad., xii, p. 500 (1769).
Nyctemera atralia, Hübn., Verz. Schmett., p. 178 (1818).
Nyctemera sumatrensis, Heylarts, Compt. Rend. Soc. Ent. Belg., xxxiv, p. xvii (1890).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 139, pl. 2, f. 6.

Eleven examples from Penang, Malacca, Lankawi, Singapore, Sumatra, Borneo, and Siam.

The example from Sumatra in the National Collection is identical with Pagenstecher's figure of *sumatrensis* and is not separable from the other examples of *tripunctaria*.

Deilemera celsa.

Nyctemera celsa, Walker, xxxi, 199 (1864).
Leptosoma celsum, Swinhoe, Cat. Het. Mus. Oxon., i, p. 144 (1892).

Four examples from Hong Kong and Foo-Chow; the type from Siam is in Mus. Oxon.; it is the extreme Eastern form of *tripunctaria*.

Deilemera picata.

Secusio picatus, Butler, Ann. Mag. N. H. (5), viii, p. 380 (1881).

The type example from Sumatra.

This is much like *regularis*, but it is I think distinct; the type example is that of a female with a white streak in the interno-median interspace on fore-wings, and the discal band is much broader; *regularis*, of which there are both sexes in the National Collection, has no sign whatever of a discal streak and is well figured by Pagenstecher.

Deilemera regularis.

Leptosoma regularis, Snellen, Mid. Sum. Lep., p. 34 (1880).
Nyctemera regularis, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 139, pl. 2, f. 8.

Three examples from Sumatra.

Deilemera kinabalina.

Nyctemera kinabalina, Snellen, Tijd. v. Ent., xlii, p. 110, pl. 5 B, f. 2 (1899).

One female example marked Borneo; it is considerably larger then Snellen's figure of the male, but is undoubtedly the same species.

Deilemera harca.

Leptosoma harca, Swinhoe, Ann. Mag. N. H. (6), xii, p. 215 (1893).
Nyctemera herce (sic), Holland (sic), Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 138.

Nine examples from Malacca, including the type.

There are some curious printer's errors in Pagenstecher's paper.

DEILEMERA OVADA, nov.

♀. Palpi white, third joint and top of second black; frons, thorax and abdomen white, slightly tinged in parts with yellow, a black spot on frons, one on head, two on collar and one on each shoulder; thorax with brown longitudinal stripes, abdomen with no markings above, a double row of brown stripes on each side, tip ochreous; fore-wings pale bronzy-brown, a white spot on the costa with an indistinct small streak below it, indicating the commencement of the usual discal band, no other markings above; below, the discal band is more apparent, consisting of two large wedge-shaped spots disconnected from each other; hind-wings white, with the usual marginal band, of the same colour as the fore-wings.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. WAINGAPO, Sumba Isls.

I have also a female from the same locality in my coll.; it is allied to nothing I know of.

DEILEMERA OPTATA. (Pl. IV, f. 3.)

♂. First joint of palpi ochreous, second and third brown, frons pure white with a black spot, top of head and collar ochreous, the former with one black spot, the latter with two; thorax white with three longitudinal black stripes, abdomen white with grey dorsal spots and some blackish spots on the sides towards the tip, which is ochreous; fore-wings pale greyish-fawn colour, a white stripe in the interno-median interspace from base to near hinder angle, the discal band white, divided by the fawn-coloured veins and all running on to the margin, with the exception of the costal spot above end of cell which is small; hind-wings white with short fawn-coloured indistinct streaks in the interspaces near the outer margin; under-side same as above but with the fawn-coloured parts darker.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. SUMATRA, one example.

DEILEMERA AMPLIFICATA.

Tanada (?) *amplificata*, Walker, xxxii, 377 (1865).
Tripheromera amplificata, Kirby, Cat. Moths, i, p. 423 (1892).
Nyctemera cydippe, Weymer, Stett. Ent. Zeit., xlvi, p. 274, pl. 2, f. 8 (1885).
" " Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 134.

Three examples from Nias and the type without locality;

seems to be confined to the Island of Nias; there are a number in Mr. Herbert Druce's collection and in mine.

DEILEMERA ALBA.

Nyctemera alba, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 135.

Three examples from Viti and Samoa.

The following species, described as such, do not belong to this Genus or Family:—

Nyctemera (?) *vagata*, Walker, xxxi, 208 (1864), N. Australia.

Is a Noctuid near the genus Ipana, Jordan, Nov. Zool., iii, p. 54 (1896).

Nyctemera arcuatum, Voll., Tijd. v. Dierkunde, i, p. 45 (1863), Lombok.

This is said to be a Chalcosia, vide Snellen, Tijd. v. Ent., xli, p. 26, pl. i, f. 3 (1898); it was wrongly identified in the B. M. collection.

Nyctemera (?) *contracta*, Walker, xxxi, 208 (1864), Mysol.

This is a Boarmid belonging to the genus Bursada.

The following species are not in the National Collection, and are unknown to me:—

Nyctemera confluens, Felder, Sitz. Ac. Wien., xliii, p. 38 (1861), Amboina.

Nyctemera aurivillii, Pag., Jahrb. Nass. Ver. Naturk., 1901, p. 154 (note) = *N. fasciata*, Aurivillius, Ent. Tidskrift, 1897, p. 220, text f. 5 (praeocc.), Nyasaland.

Nyctemera melaneura, var. *melas*, Rober, Tijd. v. Ent., 1891, p. 326, Ceram.

Nyctemera mesolychna, Meyrick, Trans. Ent. Soc. Lond., 1889, p. 466, N. Guinea.

Nyctemera pagenstecheri, Pag., Jahrb. Nass. Ver. Naturk., 1898, p. 199, Lombok.

Nyctemera quaternarium, Pag., Lep. Fauna, Bismark-Arch., ii, p. 54, pl. 2, f. 29 (1900), N. Ireland.

Leptosoma pallens, Voll., Tijd. v. Dierk., i, p. 45 (1863), Java.

Nyctemera apensis, Semper. Phil. Schmett., p. 496, pl. 55, f. 9, Mindanao.

Leptosoma fascipenne, Wallgn., Wien. Ent. Mon., iv., p. 161 (1860), Caffraria.

Leptosoma tricolor, Felder, Reise Nov. Lep., pl. 103, f. 3 (1874), Africa.

Nyctemera rasana, Mab., Ann. Soc. Ent. Fr., 1879, p. 304, Madagascar.

Nyctemera vollenhovii, Snellen, Tijd. v. Ent., xxxiii, p. 276, pl. ii, f. 4 (1890), Tanah Djampea.

Nyctemera tenuifascia, Snellen, Tijd. v. Ent., xli, p. 26, pl. 1, f. 2 (1898), Lombok.

Nyctemera dentifascia, Snellen, l. c., p. 24, f. 1, Sumatra.

Leptosoma anthracinum, Voll., Tijd. v. Dierk, i, p. 38 (1863), Java.

Nyctemera tritoides, Heylaerts, Compt. Rend. Soc. Ent. Belg., xxxiv, p. xvii (1890), Sumatra.

Leptosoma macklotti, Voll., Tijd. v. Dierk., i, p. 18 (1863), = *N. latifascia*, Hopffer (teste Pag.), Stett. Ent. Zeit., 1874, p. 45, recorded from Ceram, Flores, Amboina, and Celebes and is probably some well-known species, but I am unable to identify it.

Nyctemera menes, Felder, Sitz. Ac. Wiss. Wien., xliii, p. 38 (1861), Amboina.

Leptosoma aglaope, Boisd., Voy. de l'Astrolabe Lep., p. 198 (1832), Amboina.

Deilemera uniformis, Plötz, Stett. Ent. Zeit., xli, p. 38 (1880), W. Africa.

Leptosoma flavescens, Voll., Tijd. v. Dierk., i, p. 64 (1863), Sumatra.

Leptosoma leucostigma, Voll., l. c., p. 44, Java.

= *Leptosoma nubecula*, Voll. (teste Pag.), l. c., p. 49.

Nyctemera McKiana, Lucas, Proc. Roy. Soc., Queensland, xiii, p. 60 (1898).

Explanation of Plate III.

FIG. 1. *Deilemera kapaurensis*, Swinhoe.
2. ,, *uniplaga*, Swinhoe.
3. ,, *popiya*, Swinhoe.
4. ,, *latemarginata*, Pag.
5. ,, *integra*, Walker.
6. ,, *syrnia*, Swinhoe.
7. ,, *popiya*, Swinhoe (under-side).
8. ,, *albipuncta*, Druce.

Explanation of Plate IV.

FIG. 1. *Deilemera gerra*, Swinhoe.
2. ,, *nigrorena*, Swinhoe.
3. ,, *optata*, Swinhoe.
4. ,, *distincta*, Swinhoe.
5. ,, *leuctra*, Swinhoe.
6. ,, *amosa*, Swinhoe.
7. ,, *nisa*, Swinhoe.
8. ,, *oroya*, Swinhoe.

IV. *Some notes on the habits of* Nanophyes durieui, Lucas, *as observed in Central Spain.* By George Charles Champion, F.Z.S., and Dr. Thomas A. Chapman, M.D., F.Z.S., with a description of the larva and pupa by Dr. T. A. Chapman, M.D.

[Read Nov. 19th, 1902.]

Plate V.

During a recent visit to Bejar, Central Spain, June 26th–July 17th, 1902, we noticed numerous large fleshy excrescences or galls on the stems of a *Cotyledon*, a plant growing abundantly between the crevices of the stone walls in the outskirts of the town. Many of these galls, on examination, were found to contain specimens of a *Nanophyes*, subsequently identified as *N. durieui*, Lucas, in the larval, pupal, and imaginal condition. The beetles, at the beginning of July, were mostly immature, and we therefore contented ourselves by bringing home a supply of the galls, from which, during August and September, quite two hundred examples have emerged, accompanied, in September, by a few *Apion sedi*, Germ. In the accompanying plate an illustration is given of the perfect insect, the larva, pupa, and gall, the beetle only having been previously figured by Lucas, who, in his description of the species, from a few specimens found at Oran, Algeria, merely states that the insect passes its metamorphosis in swellings on the stems of *Cotyledon* (*Umbilicus*) *horizontalis.* Our observation, therefore, is not new, still it is interesting as confirming the statements of MM. Lucas and Durieu, and will no doubt induce entomologists to search for the insect in other European localities. *N. durieui* is recorded from Southern Spain in Heyden, Reitter and Weise's "Catalogus Coleopterorum Europae" (1891), but on what authority we know not, as MM. Brisout and Xambeu, both of whom have described or noticed the species, simply refer to Lucas' work. M. Xambeu (Le Naturaliste, 1901, pp. 224, 225) has recently described the larva and pupa of three species of the genus: *N. lythri*, Fabr., on *Lythrum salicaria*; *N. telephii*, Bedel, on *Sedum telephium*, an insect that is not unlikely to occur in England, if its food-plant was searched in various places; and *N. hemisphæricum*, Oliv., on *Lythrum hyssopifolium*. He also notes (*loc. cit.*) the larva of *N. tamarisci*, Gyll., as attacking *Tamarix*, that of *N. siculus*, Boh., on *Erica scoparia*, and that of *N. durieui*, Luc., on *Cotyledon* (*Umbilicus*) *pendulinus*. The habits of *N. telephii* appear to be very similar to those of *N. durieui*, both species making galls on the stems of the plants a little above the roots. *Apion sedi* has not, we believe, been previously recorded as attacking *Cotyledon*, though it is known to pass its metamorphoses in the stems of *Sedum*. The galls formed by *N. durieui* are very conspicuous, owing to their large size. They are somewhat kidney-shaped, several of them being often clustered together, green in colour, more or less streaked with reddish or purple, and marked here and there with a minute scar, showing the original punctures made by the parent insect in the stem of the plant. The beetle is attacked by a small Chalcid, of which a number of specimens emerged from the galls.

The larva of Nanophyes durieui is a footless maggot very like many other weevil larvæ. Its length is, or rather would be if straightened out, about 3·0 mm., but as it lies curled up into an arc of about 100 degrees, its actual measure when full-grown is a little over 2·0 mm. The thoracic segments are decidedly thicker than the others, and here the diameter of the larva approaches 1·00. In the preserved specimens examined to find them, no spiracles can be detected, if they exist they are very small and have no coloured chitinous surroundings. The larva is white or colourless, except the jaws and some other chitinous portions in connection with the mouth parts. There is a very definite ventral prominence of each of the thoracic segments representing the true legs, but no actual fore-legs exist; at what may be supposed to be the site of each, is a rather stronger hair than exists anywhere else on the larva, but there is nothing to show whether this surviving hair corresponds to one that naturally (*i. e.* where the fore-legs are present) exists at the base of the fore-legs, or is one of those arming some joint of the fore-leg itself. The marginal flange is well developed in three definite prominences on each segment, a lower one that is almost ventral, rather flat and well delimited, a median one, full and rounded and almost continuous with the next above, which forms the lower part of the dorsal area, but is marked off by a longitudinal depression from the portion next above it. This carries at least on the hinder abdominal segment a minute colourless bristle. The sulci above this are rather complicated; they mark off an anterior and posterior subsegment, of which the anterior is dorsally the higher, each carries a minute bristle, the anterior the larger—one or two more are present on the prothorax. The intersegmental sulcus branches downwards and there is also a small eminence, at the anterior margin of the segment immediately above the flange. The 10th abdominal segment cannot be seen, but is probably present, retracted. The hairs or bristles made out are very small and very colourless, and cannot be detected without considerable search, so that it is possible that others exist; of these others the only ones supposed to have been observed are abdominal ones continuing the thoracic pedal series.

The head is comparatively large and well developed, rounded. Looked at from the front there is a median suture, losing itself below, without definitely ending in sutures marking off a clypeus. The head is faintly if at all tinted, but the clypeal region has some faint fuscous clouds. The front ends below in a brown chitinous margin, arched upward centrally over the labrum, and again laterally into rather more than semicircles round the antennal origins. In the area projecting between the labrum and antenna, a short bristle arises, and another, still in the clypeal region, higher up and nearer the middle line. Marginally (as seen from in front) are three bristles on each side at about equal intervals, the lower and smaller behind the antenna, and the highest one about half-way to the vertex.

The antennæ have a very large colourless circular basal region, bounded by the chitinous semicircle already alluded to above, a less marked chitinous margin behind, and the bases of the jaw in front. The antenna itself, arising in the centre of this area, is very minute and slender, and deflexed, and appears to consist of a large basal and a minute terminal joint. The jaws are large and strong, broad at base, about half that width at their cutting margin, which consists of two sharp teeth below (as seen from front), separated from another above by a smooth hollowed margin.

The maxilla is full and fleshy, has two fine bristles externally and in front a palpus rising from the middle of a clear area surrounded by a brown chitinous circle, and apparently of two joints, below this and more central is the labrum formed of two round processes each having in front a minute palpus, looking (in front view) like two small concentric circles. Below this the gular region is swollen and carries two bristles on either side.

The pupa of Nanophyes durieui has much the appearance and outline of the larva, is rather shorter and wider, and is absolutely without any hard, coloured, or chitinous parts. Whilst the dorsum has much the same curve as in the larva, the ventral aspect is nearly straight, the (larval) concavity being filled by the various projections of the appendages. The head is deflexed, and the rostrum extends downwards ventrally, to about the middle (antero-posteriorly) of the pupa, the anterior end of the pupa being the front margin of the prothorax. From each side of the rostrum extend outwards, first at its base the antenna, then the first femur, and against it the tibia completely flexed, then similarly the second femur and tibia, the tarsi (1st and 2nd) lie close against the rostrum, the end of the second being slightly beyond it. The femoro-tibial articulation of these legs lies outside the elytra cases, which however, with the wing cases directed backwards, ventrally, and finally inwards cover the third legs, except the femoro-tibial articulation which just projects dorsally from beneath them. The wings nearly meet in the middle just beyond the end of the rostrum.

On the prothorax are a series of bristles, remarkable in being perched each on the summit of a conical projection, giving an armed appearance to the front of the pupa. These appear to be arranged as a row towards the anterior border and another towards the po terior border of the segment, two on either side in the front and four in the back row, but the marginal two of the latter are not so directly placed in the row as to prevent their position being otherwise described.

The antennæ have a thick basal piece lying against the head or rostrum, from the anterior (position if the head were extended) end of this the flagellar joints extend outwards as above noted, to the number of 10 (or 11) ?, each being larger than the preceding. The joints are somewhat angular, and at about the fourth or fifth the angles appear as definite projections; on the fifth from the extremity these appear as one or two very definite mammillary projections, and on the three next they form on each a ring of seven or eight sharp projecting angular points, with picturesque effect, reminding one strongly of the similarly studded clubs and chained balls anciently used as weapons. Very similar conical projections occur on the tibiæ, to the number of three or four on each, and a hair at the exposed extremity of the first and second femora. Two pairs of conical points are present on the front of the head (or base of rostrum) basal to the antennal origin. Some very minute hairs are with difficulty seen on the abdominal segments. There is a rather larger conical eminence or two between the projecting elytral bases on the dorsal centre of the mesothorax.

Explanation of Plate V.

Fig. 1. *Nanophyes durieui*, larva, × 15.
1a. „ „ „ head, from in front.
2. „ „ pupa, × 15.
3. „ „ imago, × 12.
3a. „ „ hind tarsus.
3b. „ „ antenna.
4, 5. The galls made by the beetle on the stems of *Cotyledon*, natural size. N.B.—These figures do not show the minute scars that suggest that each egg is separately laid.

V. *The* Aculeate Hymenoptera *of Barrackpore, Bengal.* By GEORGE ALEXANDER JAMES ROTHNEY, F.E.S.

[Read March 4th, 1903.]

AS it is a somewhat uncommon feature for a definite limited area within the tropics to be worked continuously for a number of years, I have ventured to hope that a thoroughly representative list of the *Aculeate Hymenoptera* collected by me in the cantonment of Barrackpore may prove of some interest to the Society, as this order has of late become so much more popular, and the Indian and Far Eastern fauna in particular has attracted an unusual amount of attention.

My list represents the result of steady collecting from 1872 to 1886, and a flying visit in 1893.

Barrackpore, Bengal, is situated on the east bank of the Hooghly; lat. 22° 40′ 30″, long. 88° 22′ 45″ and 88° 30′. Area, forty-two square miles, and about sixteen miles north of Calcutta. It is practically contained within a bend of the river, and includes Monirampore, Pulta, Ischapur Park, Tittaghur, Neilgunge, but above all the beautiful Barrackpore Park, one of the most charming spots in Lower Bengal, and one which offers many attractions to the entomologist.

There are practically three seasons in the year—the "cold weather" lasting from the end of October to the beginning of March, the "hot weather" from the middle of March to the middle of June, when the "rains" set in and last till October. Very few *Hymenoptera* (except ants) are about in the cold season. The hot and rainy seasons are the best for the collector, and the choicest time of all, a bright little interval in October, just as the rains are clearing up, and before the mornings and evenings show signs of the coming cold weather. The sun then shines out with beautiful brightness but without the severity of the hot weather, vegetation is unsoiled by dust, and there is everywhere a splendid burst and buzz of insect life.

The most attractive spots for collecting are undoubtedly Barrackpore Park and the jungly ground round the Pulta powder magazine, for curiously, Ischapur Park and Samnagar (with its extensive earthworks, the ruins of an old fort), Neilgunge and Tittaghur, though apparently possessing equally attractive features, never proved as rich in the number and variety of species, but Monirampore waterworks, with its heaps of white sand, used for filtering purposes, was always a sure find for the *Mutillidæ*, and the only spot where they could be looked for with confidence.

The flowers most frequented in the Park are Duranta plumieri, Quisqualis indica, Poinciana pulcherrima, Mussænda macrophylla, Thevetia nereifolia, and a tree with a small white hanging blossom (probably a variety of Duranta). At Pulta, a species of Pulicaria which grew in quantities was very attractive to a variety of species: and a low jungle shrub with a shiny leaf and greeny-white flowers, not unlike the privet (but the name* of which I could never find out), was a still greater favourite, and especially with the larger species of *Hymenoptera*. The Castor-oil plant, *Ricinus communis*, was also much frequented.

The following is a summary of the collection:—

ANALYSIS OF SPECIES.

	Species.	Percentage.	Species.	Percentage.
Chrysididæ.	13	2·78	13	2·78
Formicidæ.	—		—	
Dorylinæ.	3	·64		
Ponerinæ.	15	3·20		
Myrmicinæ.	44	9·40		
Dolichoderinæ.	5	1·07		
Camponotinæ.	25	5·34	92	19·65
Fossores.	—			
Mutillidæ.	54	11·54		
Thynnidæ.	2	·43		
Scoliidæ.	18	3·84		
Pompilidæ.	48	10·26		
Sphegidæ.	128	27·35	250	53·42
Diloptera.	—			
Eumenidæ.	27	5·77		
Vespidæ.	13	2·78	40	8·55
Anthophila.	—			
Colletidæ.	4	·85		
Apidæ.	69	14·75	73	15·60
			Total 468	

* Since writing this, Col. Bingham has very kindly named this plant for me at the Museum Herbarium, *Glycosmis pentaphylla*, Corr. I estimate that 40% of the species of the *Fossores* and *Apidæ* were captured at the flowers of this jungle plant.

From this it will be seen that the *Fossores* are much the strongest group, though it is only fair to state that the number of species of *Mutillidæ*, which help to swell the total, is out of proportion to the specimens, and they have, too, been much more closely collected than other families, for there is always something irresistibly attractive to the collector about *Mutilla*.

Tiphia and *Myzine*, on the other hand, are very poorly represented, and both appear to affect northern, or at least mountain, localities rather than the plains.

The *Scoliidæ*, *Pompilidæ*, and *Sphegidæ* are all well represented, both in numbers and species, many being exceedingly common and familiar objects of the bungalow and compound, as also are several species of *Eumenidæ* and *Vespidæ*.

The *Apidæ* are the poorest both in species and numbers in the Barrackpore district (they distinctly strengthen as you go up-country to the North-West Provinces at Allahabad, and still more so at the Mussoorie Hills): and with the exception of *Xylocopa*, a few species of *Megachile*, *Crocisa*, and *Anthophora*, there are no species sufficiently common to attract general attention; and even with *Xylocopa* it is more their great size, noisy booming ways, and the brilliant effulgence of their wings rather than their actual numbers which makes them so conspicuous.

In the *Formicidæ*, *Camponotus*, *Œcophylla*, *Prenolepis*, *Diacamma*, *Solenopsis*, *Cremastogaster*, and *Sima* are most in evidence, the three commonest species being *Camponotus compressus*, *Solenopsis geminata*, and *Sima rufonigra*. *Pheidole* curiously is not so strongly represented as it is in the Bombay and Madras Presidencies. Species of other genera are either local and uncertain in their appearance, or really uncommon and rare.

I never came across any *Ichneumons* in Barrackpore. No doubt they are to be found if carefully sought for, but they must, at least, be exceedingly rare. On the other hand, in hill-stations like Mussoorie and Darjeeling, they are fairly common.

Several species of *Chrysididæ* are not uncommon.

I am greatly indebted to Colonel C. T. Bingham, for his kindness in revising my list of *Formicidæ*, and to Mr. Peter Cameron for revising the *Fossores* and *Apidæ*, etc.

With very few exceptions, the types of all Mr. Cameron's species are in my collection.

CATALOGUE OF SPECIES.*

Chrysididæ.

Chrysis, Lin.

Perfecta, Cam. Rare.
Furiosa, Cam. Rare.
Mendicalis, Cam. Rare.
Cotesi, Dubuy. Common.
Disparilis, Cam. Rare.
Oculata, Fab. Common.
Principalis, Sm. Rare.
Orientalis, Guer. Rare.

Stilbum, Fab.

Splendidum, Fab. Type, common.
" var. *Amethystinum*, Fab.

Parnopes, Latr.

Viridis, Bé. Rare.

Hedychrum, Latr.

Lugubre, Cam. Rare.
Flammulatum, Dubuysson. Rare.

Family FORMICIDÆ.

Subfamily *DORYLINÆ*.

Dorylus orientalis, Westw. ♂ and ☿ common.
Ænictus pachycerus, Smith. Rare.
Ænictus brevicornis, Mayr. Rare.

Subfamily *PONERINÆ*.

Anochetus punctiventris, Mayr. Rare; found under bricks.
Bothroponera tesserinoda, Mayr. Common.
Platythyrea victoriæ, Forel. Rare.
Diacamma vagans, Smith. Common.
Diacamma sculptum, Jerdon. Rare.

* The number of Aculeata (other than ants) recorded from British India in Colonel Bingham's work published in 1897 is 995, but a considerable number of species have been described since.

Col. Bingham writes:—"I have carefully compared specimens in your collection with Smith's type of *D. versicolor*. *D. versicolor* is not an Indian species. The larger form of *Diacamma* found in India is, according to my ideas, *D. sculptum*.

Brachyponera jerdoni, Forel. Rare.
Ponera confinis, Roger, var. *Aitkeni*, Forel.
Lobopelta ocellifera, Roger. Rare.
" *chinensis*, Mayr. Common.
" *minchini*, Forel. Rare.
" *punctiventris*, Mayr. Rare.
" *diminuta*, Smith. Rare.
" *kitteli*, Mayr. Rare.
Lioponera longitarsus, Mayr. Rare.
Stigmatomma rothneyi, Forel. = *Amblyopone rothneyi*. Rare.

Subfamily *MYRMICINÆ*.

Cataulacus taprobanæ, Smith. Rare.
Meranoplus bicolor, Guer. Common.
Triglyphotrix striatidens, Emery. Rare.
Holcomyrmex scabriceps, Mayr. Common.
Myrmicaria brunnea, Saunders. Common.

Col. Bingham writes me:—"*M. fodiens*, Jerdon = *M. brunnea*, Saunders; latter has priority. *M. subcarinata*, Smith, is a local variety."

Tetramorium obesum, Andre. Rare.
" *smithi*, Mayr. Rare.
" *simillimum*, Smith. Rare.
" *denticulatum*, Forel. Rare.

In Col. Bingham's opinion the latter is only a var. of *simillimum*.

Monomorium salomonis, Linn. Common.
" *vastator*, Smith = *M. destructor*, Jerdon. Common.
" *pharaonis*, Linn. Common.
" *atomus*, Forel. Rare.
" *latinoda*, Mayr. Common.
" *orientale*, Mayr. Rare.
" *floricola*, Jerdon = *M. speculare*, Mayr. Col. Bingham writes:—"Jerdon's name has priority." Rare.

Cardiocondyla nuda, Mayr. Rare.

Solenopsis geminata, Fabr. Very common. *S. armata* is only a var. A very variable species.

Pheidologeton diversus, Jerdon = *P. ocellifera*, Mayr. Col. Bingham writes:—"Jerdon's name has priority." Rare.

Pheidologeton affinis, Jerdon = *P. laboriosus*, Smith. Col. Bingham writes:—"Jerdon's name has priority." Common.

Pheidole latinoda, Roger. Common.
„ *rhombinoda*, Mayr. Common.
„ *striativentris*, Mayr. Rare.
„ *indica*, Mayr. Common.
„ *parva*, Mayr. Rare.
„ *javana*, Mayr. Rare.
„ *watsoni*, Forel. Rare.
„ *spathifera*, Forel. Rare.
„ *smythiesi*, Forel, var. *bengalensis*, Forel. Rare.

Cremastogaster subnuda, Mayr. Common.
„ *rabula*, Forel. Rare.
„ *rogenhofferi*, Mayr. Common.
„ *rothneyi*, Mayr. Common.
„ *contemta*, Mayr. Common.
„ *aberrans*, Forel. Rare.
„ *minchini*, Forel. in lit. Rare.

Lophomyrmex 4-spinosus, Jerdon. Rare.

Sima rufonigra, Jerdon. Very common.
„ *nigra*, Jerdon. Common.
„ *allaborans*, Walker = *S. compressa*, Roger. Col. Bingham writes:—"Walker's name has priority." Rare.

Atopomyrmex ceylonicus, Emery, two, ♀.

Oligomyrmex bengalensis, Forel. Rare.
„ *rothneyi*, Forel. Rare.

Leptothorax taylori, Forel. Rare.

Subfamily *DOLICHODERINÆ*.

Technomyrmex albipes, Smith. Rare.

Iridomyrmex anceps, Roger = *I. excisus*, Mayr. Col. Bingham writes:—"Roger's name has priority." Rare.

Bothriomyrmex wroughtoni, Forel. Rare.

Tapinoma melanocephalum, Fabr. Common.

Dolichoderus taprobanæ, Smith = *D. gracilipes*, Mayr. Col. Bingham writes :—"Smith's name has priority. *D. gracilipes* is only a variety of Smith's insect." Common.

Subfamily *CAMPONOTINÆ.*

Camponotus compressus, Fabr. Very common.
,, *mitis*, Smith. Col. Bingham writes :—"Var. *fuscithorax* grades into genuine *mitis* when you get a big enough series." Common.
,, *arrogans*, Smith = *C. junctus*, Forel. Col. Bingham writes :—"It stands thus in my book. I have compared your specimens with the type." Rare.
,, *paria*, Emery. Common.
,, *sericeus*, Fabr. Var. *opaceventris*, Mayr. Common.
,, *taylori*, Forel. Rare.
Colobopsis rothneyi, Forel. Rare.
Polyrhachis lævissima, Smith. Common.
,, *bicolor*, Smith. Rare.
,, *argentea*, Mayr. }
,, *acasta*, Smith. } Rare.
,, *tibialis*, Smith. }
,, *spinigera*, Mayr. } Common.
,, *simplex*, Mayr. }
,, *thrinax*, Roger. Rare.
,, *tubericeps*, Forel. Rare.
Œcophylla smaragdina, Fabr. Common.
Prenolepis bengalensis, Forel. Common.
,, *longicornis*, Latr. Common.
,, *indica*, Forel. Rare.
,, *yerburyi*, Forel. Rare.
Plagiolepis longipes, Jerdon. Common.
,, *rothneyi*, Forel. Rare.
Acantholepis frauenfeldi, Mayr. Common.
,, *bipartita*, Smith. Rare.
,, *capensis*, Mayr. Common.

Tribe FOSSORES.

Family MUTILLIDÆ.

Mutilla sexmaculata, Swed. For ♂ see Cameron, Ann. and Mag. Nat. Hist., iv (7), 61. Common.
„ *4-carinata*, Cam. ♂ Rare.
„ *cona*, Cam. ♂ Rare.
„ *interrupta*, Lep. Common.
„ *perversa*, Cam. ♂ Rare.
„ *dilecta*, Cam. ♂ Rare.
„ *discreta*, Cam. ♂ Rare.
„ *sabellica*, Cam. ♂ Rare.
„ *labiena*, Cam. ♂ Rare.
„ *funebrana*, Cam. ♂ Rare.
„ *analis*, Lep. Rare.
„ *serena*, Cam. ♂ Rare.
„ *cleonyma*, Cam. ♂ Rare.
„ *maculicornis*, Cam. ♂ Rare.
„ *poesia*, Cam. ♂ Rare.
„ *phænna*, Cam. ♂ Rare.
„ *idyia*, Cam. ♂ Rare.
„ *ludovica*, Cam. ♂ Rare.
„ *illa*, Cam. ♂ Rare.
„ *erxia*, Cam. ♂ Rare.
„ *lena*, Cam. ♂ Rare.
„ *fianna*, Cam. ♂ Rare.
„ *cara*, Cam. ♂ Rare.
„ *selma*, Cam. ♂ Rare.
„ *fortinata*, Cam. ♂ Rare.
„ *bidens*, Cam. ♂ Rare.
„ *ædipus*, Cam. ♂ Cf. Cameron, Manchr. Mem., 1898, No. 11, p. 6. One specimen.
„ *interrupta*, Oliv. Rare.
„ *funeraria*, Sm. Common.
„ *argentipes*, Sm. Rare.
„ *aureo-rubra*, Rad. = *egregia*, Sauss. Rare.
„ *pulcherina*, Sm. Rare.
„ *dryta*, Cam. ♀ Rare.
„ *compactilis*, Cam. ♀ Rare.
„ *martialis*, Cam. ♀ Rare.
„ *pamphia*, Cam. ♀ Rare.
„ *marcia*, Cam. ♀ Rare.

Mutilla gnoma, Cam. ♀ Rare.
„ *emancipata*, Cam. ♀ Rare.
„ *parthenia*, Cam. ♀ Rare.
„ *lethargia*, Cam. ♀ Rare.
„ 3-*maculata*, Cam. ♀ Rare.
„ *valida*, Cam. ♀ Rare.
„ *læta*, Cam. ♀ Rare.
„ *ariel*, Cam. ♀ Rare.
„ *durga*, Bing. = *dives*, Cam. Common.
„ *peregrina*, Cam. ♀ Rare.
„ *cotesii*, Cam. ♀ Rare.
„ *rothneyi*, Cam. ♀ Rare.
„ *redacta*, Cam. ♀ Rare.
„ *agelia*, Cam. ♀ Rare.
„ *mithila*, Cam. ♀ Rare.
„ *ocellata*, Sauss. Common.

Family THYNNIDÆ.

Methoca bicolor, Cam. Rare.
„ *orientalis*, Smith. Rare.

Family SCOLIIDÆ.

Tiphia brevipennis, Cam. Rare.
Plesia (*Myzine*) *dimidiata*, Guer. Rare.
„ *bengalensis*, Cam. Rare.
„ *petiolata*, Sm. Rare.
Scolia capitata, Guer. Common.
„ *rubiginosa*, Fab. Rare.
„ *humeralis*, Sauss. Rare.
„ *redtenbacheri*, Sauss. Rare.
„ *aureipennis*, Lep. Common.
„ *quadripustulata*. Common.
„ *indica*, Sauss. Rare.
Elis marginella, Klug. Common.
„ *thoracica*, Fab. Common.
„ *annulata*, Fab. Common.
„ *hirsuta*, Sauss. Rare.
„ *brevipennis*, Cam. Rare.
Liacos analis, Fab. Rare.
„ *fulvopicta*, Cam. Rare.

Family POMPILIDÆ.

Mr. Cameron informs me that the name *Pompilus* is pre-occupied, and that its use cannot be retained in *Hymenoptera.* I have, however, retained the name here, and in the sense in which it is used by Col. Bingham. The family must hereafter be called *Ceropalidæ.*

Macromeris violacea, Lep. Common.
Pompilus analis, Fab. Common.
,, *zeus*, Cam. Rare.
,, *ariadne*, Cam. Rare.
,, *reflexus*, Sm. Rare.
,, *hecate*, Cam. Rare.
,, *incognitus*, Cam. Rare.
,, *lascivus*, Cam. Rare.
,, *maculipes*, Sm. Rare.
,, *pedalis*, Cam. Rare.
,, *canifrons*, Sm. Rare.
,, *simillimus*, Sm. Rare.
,, *hero*, Cam. Rare.
,, *rothneyi*, Cam. One specimen.
,, *vivax*, Cam. Rare.
,, *unifasciatus*, Sm. Very common.
,, *orientalis*, Cam. Rare.
,, *vagabundus*, Sm. Rare.
,, *incognitus*, Cam. Rare.
,, *vischnu*, Cam. Common.
,, *cellularis*, Cam. Rare.
,, *implactibilis*, Cam. Rare.
,, *perturbans*, Cam. Rare.
,, *ædilis*, Cam. Rare.
Planiceps orientalis, Cam. Rare.
Aporus bengalensis, Cam. Rare.
,, *cotesii*, Cam. Rare.
Pseudagenia deceptrix, Sm. Rare.
,, *ariel*, Cam. Rare.
,, *pedunculata*, Sm. Rare.
,, *cærulea*, Sm. Rare.
,, *blanda*, Guer. Rare.
,, *festinata*, Sm. Rare.
,, *veda*, Cam. Rare.
,, *tincta*, Sm. Rare.
,, *morna*, Cam. Rare.

Pseudagenia mutua, Cam. Rare.
Salius flavus, Fab. Very common.
,, *fulvipennis*, Fab. Common.
,, *bipartitus*, Sm. Rare.
,, *fulgidipennis*, Sauss. Rare.
,, *iridipennis*, Sm. Rare.
,, *peregrinus*, Sm. Rare.
,, *rothneyi*, Cam. One specimen.
,, *excellus*, Cam. = *atropus*, Sm., 1875, non Smith, 1855. Cf. Cameron, Manr. Mem., 1891, 443. Rare.
,, *madraspatanus*, Sm. Rare.
,, *mirandus*, Cam. Common.
,, *electus*, Cam. Rare.

Family SPHEGIDÆ.

Astata agilis, Sm. Rare.
,, *nigricans*, Cam. Rare.
Lyroda argenteofacialis, Cam. Rare.
Piagetia ruficornis, Cam. Rare.
Tachytes monetaria, Sm. A most beautiful species when alive and glistening in the Indian sun. Common.
,, *modesta*, Sm. Common.
,, *ornatipes*, Cam. Rare.
,, *rothneyi*, Cam. Mr. Cameron writes me that this is a different species from that named for him, *sinensis*, Sm., by the late Mr. F. Smith. It is rare.
,, *brevipennis*, Cam. Rare.
,, *maculitarsis*, Cam. Rare.
,, *vicina*, Cam. Rare.
,, *tarsata*, Sm. Rare.
Tachysphex varihirta, Cam., in litt. Rare.
,, *argyreus*, Sm. Rare.
,, *puncticeps*, Cam., in litt. Rare.
,, *auriceps*, Cam. Rare.
,, *striolata*, Cam., in litt. Rare.
Larra simillima, Sm. Common.
,, *tisiphone*, Sm. Rare.
,, *iridipennis*, Cam. Rare.
,, *longicornis*, Cam. Rare.

Larra rufipes, Sm. Rare.
,, *erythrogaster*, Cam. Rare.
,, *nigriventris*, Cam. Rare.
Leptolarra flavinerva, Cam. Rare.
,, *longitarsis*, Cam. Rare.
,, *reticulata*, Cam. Rare.
Spanolarra rufitarsis, Cam. Rare.
Cænolarra appendiculata, Cam. Rare.
Notogenia anthracina, Cam., in litt. Rare.
,, *picipes*, Cam., in litt. Rare.
,, *fuscistigma*, Cam., in litt. Rare.
,, *pygmæa*, Cam., in litt. Rare.
,, *varipilosa*, Cam., in litt. Rare.
,, *intermedia*, Cam., in litt. Rare.
,, *fuscipennis*, Cam. Rare.
,, *bengalensis*, Cam., in litt. Rare.
,, *striaticollis*, Cam., in litt. Rare.
,, *pilosa*, Cam., in litt. Rare.
,, *parva*, Cam., in litt. Rare.
,, *piliventris*, Cam., in litt. Rare.
,, *indica*, Cam., in litt. Rare.
,, *basalis*, Cam. Rare.
,, *subtesselata*, Sm. Common.
,, *jaculatrix*, Sm. Common.
,, *erythropoda*, Cam. Rare.
Liris auratus, Fab. Common. A beautiful species when seen in the sun.
Gastrosericus rothneyi, Cam. Three specimens.
,, *binghami*, Cam. One specimen.
Miscophus rothneyi, Bing. One specimen.
Pison suspiciosus, Sm. Rare.
,, *appendiculatus*, Cam. Rare.
,, *crassicornis*, Cam. Rare.
,, *rugosus*, Sm. Rare.
,, *orientalis*, Cam. Rare.
Parapison rothneyi, Cam. One specimen.
Ammophila atripes, Sm. Common.
,, *dimidiata*, Sm. Rare.
,, *nigripes*, Sm. Rare.
,, *punctata*, Sm. Rare.
,, *basalis*, Sm. Common.
,, *erythrocephala*, Fab. Rare.
Sceliphron madraspatanum, Fab. Very common.
,, *coromandelicum*, Lep. Common.

Sceliphron violaceum, Fab. One of the very commonest species of Barrackpore.
Sphex lobatus, Fab. Very common.
,, *pruiosus*, Ger. = *vicinus* Bing., var. *Rothneyi*, Cam. Cf. Cameron, Man. Memoirs, 1898, 24. Rare.
,, *luteipennis*, Mosc. Common.
,, *cinerascens*, Dbm. = *xanthopterus*, Cam. and Bing. Cf. Cameron, l. c. Rare.
,, *umbrosus*, Christ. Common.
,, *aurulentus*, Fab. Common.
Ampulex compressa, Fab. Very common.
Rhinopsis ruficornis, Cam. Rare.
Trirhogma cærulea, Westw. Rare.
Dolichurus clavipes, Cam. One specimen.
Cemonus fuscipennis, Cam. One specimen.
Passaloecus reticulatus, Cam. One specimen.
Nysson rugosus, Cam. Rare.
,, *erythropoda*, Cam. Rare.
Alyson annulipes, Cam. Rare.
Didineis orientalis, Cam. One specimen.
Gorytes amatorius, Sm. Rare.
,, *pictus*, Sm. Rare.
Stizus calopteryx, Handl. Rare.
,, *blandinus*, Sm. Rare.
,, *rufescens*, Guer. Rare.
,, *melleus*, Sm. Rare.
,, *reversus*, Sm. Common.
,, *lateralis*, Cam. Rare.
Bembex lunata, Fab. Rare.
,, *trepanda*, Dbm. Common.
,, *buddha*, Handl. Common.
,, *orientalis*, Handl. Rare.
,, *pinguis*, Handl. Rare.
,, *indica*, Fab. Rare.
Philanthus depredator, Sm. Two specimens.
Cerceris rothneyi, Cam. One specimen.
,, *orientalis*, Sm. Rare.
,, *humbertiana*, Sauss. Common.
,, *pictiventris*, Dbm. Rare.
,, *flavopicta*, Sm. Rare.
,, *instabilis*, Sm. Very common.
,, *pulchra*, Cam. Common.
,, *vischnu*, Cam. Rare.

Cerceris viligans, Sm. Very common.
„ *tristis*, Cam. Common.
„ *pentadonta*, Cam. Rare.
Trypoxylon pileatum, Sm. Rare.
„ *canaliculatum*, Cam. Rare.
„ *buddha*, Cam. Rare.
„ *bicolor*, Sm. Rare.
„ *geniculatum*, Cam. Rare.
„ *cognatum*, Cam. Rare.
„ *pygmæum*, Cam. One specimen.
Oxybelus squamosus, Sm. Rare.
„ *flavipes*, Cam. Rare.
„ *fulvopilosus*, Cam. Rare.
„ *canescens*, Cam. Rare.
„ *robustus*, Cam. Rare.
Crabro buddha, Cam. Rare.
„ *orientalis*, Cam. Rare.
„ *odontophorus*, Cam. Rare.
„ *ardens*, Cam. Rare.
„ *argentatus*, Lep. Rare.
„ *bellus*, Cam. Rare.
„ *nanus*, Cam. Rare.
„ *nitidus*, Cam. Rare.

Tribe DIPLOPTERA.

Family EUMENIDÆ.

Eumenes quadrispinosa, Sauss. Rare.
„ *architectus*, Sm. Common.
„ *punctata*, Sauss. Rare.
„ *buddha*, Cam. Rare.
„ *petiolata*, Fab. Very common.
„ *esuriens*, Fab. Very common.
„ *conica*, Fab. One of the very commonest species.
„ *flavopicta*, Blanch. Common.
„ *arcuata*, Fab. Rare.
„ *ceylonicus*, Sauss. Rare.
Rhynchium hæmorrhoidale, Fab. Very common.
„ *brunneum*, Fab. Common.
„ *abdominale*, Illig. Common.
„ *rugulatum*, Cam. Rare.
„ *nitidulum*, Fab. Common.
„ *argentatum*, Fab. Very common.

Rhynchium clypeatum, Cam. Rare.
„ *bengalense*, Sauss. Common.
„ *basimacula*, Cam. This species is easily separated from *R. flavomarginatum*, Sm. (which does not occur in Bengal), by the different form of the face and clypeus. Cf. Cameron, Ann. and Mag. Nat. Hist., Dec., 1900, p. 532. Rare.

Odynerus hindostanus, Cam. Rare.
„ *antoni*, Cam. Rare.
„ *sicheli*, Sauss. Common.
„ *punctum*, Fab. Very common.
„ *diffinis*, Sauss. Rare.
„ *bipustulatus*, Sauss. Common.
„ *ovalis*, Sauss. Common.
„ *sibilans*, Cam., in litt. Rare.

Family VESPIDÆ.

Icaria quadrimaculata, Cam. Rare.
„ *ferruginea*, Fab. Common.
„ *artifex*, Sauss. Rare.

Polistes rothneyi, Cam. One specimen only.
„ *rufolineatus*, Cam. Rare.
„ *hebræus*, Fab. The commonest species in Barrackpore.
„ *saggitarius*, Sauss. Rare.
„ *stigma*, Fab. Very common.
„ *nigritarsis*, Cam. Rare.

Vespa cincta, Fab. Very common.
„ *affinis*, Fab. Common.
„ *basalis*, Sm. Rare.
„ *orientalis*, Lin. Rare.

Tribe ANTHOPHILA.

Family COLLETIDÆ.

Prosopis feai, Vach. Rare.
„ *strenua*, Cam. Rare.
„ *absoluta*, Cam. Rare.
„ *bellicosa*, Cam. Rare.

Family APIDÆ.

Sphecodes crassiscornis, Sm. Rare.
„ *propinquus*, Sm. Rare.

Halictus itinerans, Cam., in litt. Rare.
,, *ciris*, Cam. Rare.
,, *interstitialis*, Cam., in litt. Rare.
,, *zonatulus*, Cam. Rare.
,, *bengalensis*, Cam., in litt. Rare.
Nomia elliotii, Sm. Common.
,, *westwoodii*, Grib. Rare.
,, *curvipes*, Fab. Common.
,, *thoracica*, Sm. Common.
,, *clypeata*, Sm. Rare.
,, *oxybeloides*, Sm. Common.
,, *scutellata*, Sm. Rare.
,, *albofimbriata*, Cam. Rare.
,, *aureobalteata*, Cam. Rare.
,, *argenteobalteata*, Cam. Rare.
,, *frederici*, Cam. Rare.
,, *lammellata*, Cam. Rare.
,, *zebrata*, Cam. Rare.
,, *purpureolineata*, Cam. Rare.
,, *latipes*, Cam. Rare.
Steganomus nodicornis, Sm. Common.
Nomada adusta, Sm. Rare.
,, *adrena*, Sm. Rare.
,, *ceylonica*, Cam. Rare.
Megachile bicolor, Fab. Very common.
,, *lanata*, Fab. Very common.
,, *umbripennis*, Sm. Rare.
,, *femorata*, Sm. Common.
,, *nigricans*, Cam. Rare.
,, *disjuncta*, Fab. Very common.
,, *albifrons*, Sm. Rare.
Anthidium rasorum, Sm. Rare.
Parevaspis carbonaria, Sm. Common.
Stelis parvula, Cam. Rare.
,, *flavomaculata*, Cam. Rare.
Ceratina viridissima, Dall. Common.
,, *hieroglyphica*, Sm. Common.
Allodape marginata, Sm. Rare.
Cœlioxys sexmaculata, Cam. Rare.
,, *argentifrons*, Sm. Common.
,, *basalis*, Sm. Common.
,, *cuneata*, Sm. Common.
,, *confusa*, Sm. Rare.
,, *discipiens*, Spin. Rare.

Cœlioxys fuscipennis, Sm. Rare.
Crocisa emarginata, Lep. Common.
„ *histrio*, Fab. Common.
Anthophora cincta, Lin. Common.
„ *zonata*, Lin. Very common.
„ *fallax*, Sm. Common.
„ *violacea*, Lep. Very common.
„ *bicincta*, Fab. Rare.
Xylocopa fenestrata, Fab. Common.
„ *tenuiscapa*, Westw. Common.
„ *latipes*, Drury. Common.
„ *æstuans*, Lin. Common.
„ *collaris*, Lep. Rare.
„ *amethystina*, Fab. Rare.
„ *auripennis*, Lep. Common.
„ *bryorum*, Fab. Rare.
„ *dissimilis*, Lep. Rare.
„ *acutipennis*, Sm. Rare.
„ *verticalis*, Lep. Rare.
Apis indica, Fab. Common.
„ *florea*, Fab. Common.
Melipona bengalensis, Cam. Rare.
„ *iridipennis*, Sm. Rare.

NOTES ON CONSPICUOUS BARRACKPORE SPECIES.

FORMICIDÆ.

Droylus orientalis, Westw.—Nests in the earth, under bricks, stones, or in masonry. The ♂ comes into your bungalows at night, attracted by light, generally at the end of the cold weather, February or early March.

Diacamma vagans, Smith.—Not uncommon; nests in walls or other brickwork, under bricks or stones; not populous; pungent sting; a most intelligent species.

Brachyponera jerdoni, Forel.—Found in some numbers in December amongst the *débris* of stacks of wood; also in the Botanical Gardens under the same conditions.

Lobopelta diminuta, Smith.—Rare in Barrackpore (but common in the Botanical Gardens, Calcutta), marches in long lines two deep.

Meranoplus bicolor, Guér.—Common in the Park; nests in the earth, particularly the bank and ditch separating it from the trunk-road. When built in exposed places, the entrances to the nests are often found covered with the little pink and blue flowers of some weed. Sexes end of May.

Holcomyrmex scabriceps, Mayr.—The Harvesting Ant of the Barrackpore district. Common in the Park. Swarms early in June; nests in roads or hard sun-baked earth, but always on or near grass land: easily found by the mounds of seed husks piled up round the entrances. Ants difficult to find after the rains commence.

Myrmicaria brunnea, Saunders.—Nests or colonies found round the stems of the great banyan tree in the Park by excavating large fosses, the earth being heaped up in mounds like regular fortifications. Swarms July 7th–10th (Note in the Proceedings Entom. Soc. February 24th, 1892, under the name *M. subcarinata*, Emery).

Solenopsis geminata, Fab.; *V. armata*, Forel.—The Red Ant. Very common, nests in the earth, under bricks or stones, or almost anywhere. Swarms several times from March to October.

Pheidologeton laboriosus, Smith = *P. affinis*, Jerdon.—Not uncommon in the Park; nests under bricks, stones, flower-pots, and rock work; occasionally found on the march changing quarters, when they construct elaborate covered ways, in which the huge-headed workers-major take an important and highly-specialized part.

Pheidole rhombinoda, Mayr.—Nests found in the Park where the grass has been worn bare; the ants cover these patches round the entrance to the nests with the leaflets of a species of mimosa; this covering is arranged in the form of a circle, and is apparently for protection from the sun.

Sima rufonigra, Jerdon.—Very common; nests in trees, particularly fruit-trees like the mango, baël and lychee, and a species of fig in the Park had its fruit completely riddled by this ant. Winged ♀ found in May; is armed with the most poisonous sting of any Aculeate with which I am acquainted. Nests frequented by a species of spider, *Salticus*; also by *Ampulex* (*Rhinopsis*) *ruficornis*, Cam., which very closely mimics the ant, and which I have never found in any other situation.

Sima nigra, Jerdon.—Not uncommon in trees; is also mimicked by a *Salticus*.

Camponotus compressus, Fab.—The Black Ant. Very common; nests in the earth; swarms in May or early June.

Polyrhachis lævissima, Smith.—Nests in the decayed wood of trees. Swarms June 15th to July 7th.

Polyrhachis thrinax, Roger.—Nest formed by binding together one or two leaves with a few silken threads; very small communities.

Polyrhachis simplex, Mayr.; *P. spinigera,* Mayr.—Nests formed by web-work binding together a few twigs of a spiny shrub.

Œcophylla smaragdina, Fab.—Common in the Park and along the trunk-road; nests in trees; sexes in the rains. The name gives a wrong impression of the colour, the ♀, which is seldom seen, alone answering the description; the workers, which may be seen in thousands, being a brilliant gamboge yellow.

In "Notes on Indian Ants," Trans. Entom. Soc. 1889, III., and 1895, II., I have described the habits of many of the Barrackpore species more fully.

FOSSORES.

Mutilla.—The species of this genus are never found in any numbers (except perhaps the males of *sexmaculata*); single specimens may be picked up anywhere, but the only spot where you could start out collecting with some certainty of finding them was Monirampore, where the heaps of white sand used for the filter-beds of the waterworks (and which in carting was scattered about the paths and roads leading to the grounds) formed a great attraction for these sun- and sand-loving insects. The waterworks are quite of modern date, and it seems very curious that imported sand should in a few years have proved an attraction sufficient to establish a known locality or resort. How can the slow-moving ♀ *Mutilla* discover that sand is to be found within the restricted area (a few acres) of the Monirampore compound?

The courting of the sexes of *sexmaculata* may occasionally be watched on the leaf of a tree or shrub in some secluded spot, and in its phases is almost ludicrous. The ♂ will caress, coax, and pet his lady-love for hours together (the antennæ being the chief means of conveying or expressing his feelings): at last, losing all patience, he will take her up in his mandibles and shake her, then perhaps feeling ashamed of himself, will redouble his caresses and begin the courting over again. I have several times captured them in their marriage flight.

Scolia.—Common in Barrackpore Park in the rains; they can often be seen flying along the grass at the edge of the roads, the beautiful iridescence of their wings flashing in the sun.

Scolia indica, Sauss., and *S. rubiginosa*, Fab.—Found in the jungle at Pulta. There would come a boom of some large insect, a flash of black and red, and it had disappeared with a thud in the low thick scrub, from which it would take much careful beating to rouse and secure.

Elis marginella, Klug.—Was very common about Pulta in the early rains, preferring shade to sun. I never found it in the Park.

Sceliphron violaceum, Fab.—One of the commonest species in India, frequenting the verandahs of our bungalows, and building its little mud-cells on the walls.

Sceliphron madrasapatanum, Fab.—Not so common as *violaceum*, but sufficiently so to attract the attention of any observer.

Sphex lobatus, Fab.—This is one of the most strikingly handsome of all the Indian Aculeates. It is common throughout the hot weather and rains, and makes its nests in the hard ground (being especially fond of bare patches in the grass land of the Park); it provisions its nests with a store of field crickets. Before taking a prisoner in, it will go in and out many times to see that all is secure, and if during this process you remove the cricket a few yards or so from the entrance, it will display great intelligence in finding it by working round and round in gradually increasing circles till the circumference at last crosses the cricket, which is always in too stupefied a state to escape. When the females settle on the ground they come with a clash and a clatter like the clank of cavalry, and in the brilliant sunlight suggest ideas of fifteenth-century knights blazing in plate-armour. The males are very fond of the flowers of the castor-oil plant.

Sphex umbrosus, Christ; *S. aurulentus*, Fab.; *S. luteipennis*, Mosc.—These three species are fairly common about the jungly ground round Pulta, particularly so at the close of the rains.

Ampulex compressa, Fab.—This is a common species, and is very often met with sunning itself on the trunks of peepul trees. I have found it occasionally in this situation busily engaged with the workers of *Sima rufonigra*, picking them up with its mandibles and tossing them off the tree, but with a sporting air rather than any serious or deadly purpose, for the ants were never in the least injured.

Rhinopsis ruficornis, Cam.—A rare species, only found frequenting the nests of *Sima rufonigra*, which it very closely mimics. For some years I had visited a particular nest of *Sima rufonigra* in the hope of finding the male, and at last I was rewarded with what at first sight looked like an undoubted ♂. I eagerly captured it; it was not an ant at all, but something even more interesting, a clever case of mimicry by a sand-wasp. I also found *Rhinopsis* at a second nest, and Mr. Wroughton at a later date, on discovering *Sima rufonigra* in the Konkan, found its understudy in a similar species, *Rhinopsis constanceæ*, Cam., in considerable numbers, a most convincing proof that this mimicry is genuine, and in no way accidental. The double mimicry by *Rhinopsis* and *Salticus* of a fierce and exceptionally armed ant appears to me to be specially interesting.

Gastrosericus rothneyi, Cam.; *G. binghami*, Cam.; *Nysson rugosus*, Cam.; *N. erythropoda*, Cam.; *Gorytes amatorius*, Smith; *G. pictus*, Smith, were all taken in a bank of fine earth in a little lane near Pulta, so shaded with dense jungle that at noon in the hottest weather it was like twilight and almost cool.

Bembex lunata, Fab.—A rare species. A small colony found in the sandy bank of a nullah at Pulta.

Bembex trepanda, Dbm.—Common in the rains in the low jungle about Pulta.

Bembex buddha, Handl.—Found in the hot weather on sandy patches of ground about Pulta.

Cerceris.—Found most commonly during the rains on flowers. A nullah between Barrackpore racecourse and Pulta overgrown with jungle, vegetation, and flowers was especially rich in this genus.

Eumenes conica, Fab.—One of the commonest and most familiar of Indian Aculeates, building its nests in verandahs and any other convenient spot, provisioning them with an abundant store of caterpillars, mostly geometers.

Rhynchium basimacula, Cam.—A rare species, but one that lends a zest to collecting, as you can never be quite certain when on the wing if one of the common species may not turn out to be *basimacula*, with its broad white band. On one occasion *basimacula* made its nest in the turret-staircase leading to the roof of my bungalow. The cells were very strongly formed and covered with a particularly sticky kind of cement like shell-lac.

Polistes hebræus, Fab.—The commonest wasp in Barrackpore, and generally known as the *Yellow wasp.* It will take up its position in a verandah, outhouse, or other building, and go on piling up its nest on nests year after year with a persistence which will take no denial. It varies greatly in size and colour, some specimens being pinched and starved in appearance and of a dirty grey-green colour, while others are really fine insects with a brilliant yellow colouring like fresh gamboge. Season and environment may have something to do with this variation. A most striking instance of this was a colony formed in a little white dome-shaped building which protected a monument to one of the former worthies of the Calcutta Botanical Gardens. It stands in one of the main roads of the gardens, without a particle of shelter or shade from the blazing sun, and here *hebræus* built its nests year after year, the wasps developing to such a size and of such an intense yellow as almost to suggest a new variety.

Vespa cincta, Fab.—This species may be taken as the Bengal hornet; it seldom frequents houses, but is common enough in trees, shrubs, and old out-buildings. For many years a large nest was established in the Chirya Khana (aviary) in the Park. Another, a very curious nest, was built in a large square terra-cotta flower-pot in the Park. A tree of some sort had died, leaving a bare stem about four feet high, and up this the nest was built and added to year after year. I had a great ambition to secure this nest for the British Museum, but the great difficulty of packing it for sea-transport compelled me to give up the idea. This species is very fond of frequenting the date palm when cut by the natives for collecting toddy. They will settle round the stems in thousands to feast on the exuding juice. It is curious that at such times the little grey Indian squirrel (*Sciurus palmarum*) will come and clear the hornets out with its paws, and take its fill of the toddy without being molested in any way, and yet it is not an unknown incident for *cincta* to attack even elephants, as the following cutting from *The Empress of India* will show :—

"To walk about Gaur is impossible; there are too many swamps and jungles; the only way to get about is on elephants, and even on these one's progress is sometimes checked, as happened when we were trying to force our way through the jungle to the Dakhil Gate. We were in single file, the Lieutenant-Governor and Mr. Hillow, the Rajah of Mymensing's agent, leading, when suddenly orders were passed back to right-about-face, much shouting took place, and we found that the whole line of elephants had been routed by a hornets' nest, an enemy which is by no means to be despised."—*Empress*, Aug., 1899 (Sir John Woodburn's Tour).

Vespa orientalis, Lin.—Only once have I found this species in the Barrackpore district. A native sweet-seller set up a stall one day under a peepul tree near the church, and with it appeared *orientalis.* After a few weeks sweet-seller and wasp disappeared and were not seen again. Although so rare at Barrackpore, this is about the commonest wasp up-country, and even at Burdwan, fifty miles from Barrackpore, it can be found in hundreds in the native bazar.

APIDÆ.

Nomia curvipes, Fab.—Occurred occasionally in the Park, but more commonly in a grassy lane between the Barrackpore Maidan and Pulta. It likes the long "dudh" grass which grows in damp ditches along hedgerows. At Nischindipore Nuddea it appeared in sufficient numbers to be quite a feature, and the beautiful gold-brown colouring and bright golden bands glittering in the sun as the bees flitted to and fro against the background of emerald green was an entomological pleasure not readily forgotten.

Steganomus nodicornis, Smith.—Somewhat rare in the Park, its chief habitat being Pulta, where it is common in the hot weather and rains. It is a charming little bee and has a quiet weird little flight of its own, which is very puzzling till you get accustomed to it. The little white flowers of a species of *Pulicaria* are much frequented, and it has a habit of settling drawn up in a little compact ball on the stem beneath the flower, when it is almost impossible to discover it. I have been out collecting with a friend a whole day where this bee was fairly common without his capturing a single specimen until initiated in their ways.

Nomada adusta, Smith.—You could always find one or two specimens of this little *Nomada* flitting about and settling on blades of grass in the shade of the big trees in Barrackpore Park, near the Vice-regal kitchens.

Parevaspis carbonaria, Smith.—Common in Barrackpore Park on the blossom of *Duranta plumieri* and other flowering shrubs and trees.

Megachile bicolor, Fab.; *M. lanata*, Fab.; *M. disjuncta*, Fab.—Three of the commonest bees in the district, and may be seen at any time anywhere, busy with their leaf-cutting operations.

Crocisa emarginata, Lep.; *C. histrio*, Fab.—Common in the Park on the flowers of various shrubs and trees, particularly the blossom of *Duranta plumieri*.

Anthophora cincta, Lin.; *A. bicincta*, Fab.—Common throughout the hot weather and rains about Pulta, frequenting the flowers of a plant much like our own dead-nettle, which is so attractive to our species in England; indeed, I came across this plant at Pulta one day before I had seen the bee. I felt *Anthophora* should be near, and sure enough in a few minutes *bicincta* and *cincta* appeared. My delight was great, for I had not been long in India and it reminded me of home.

Xylocopa.—Generally common, but more particularly so in both Barrackpore and Ischapur Parks. They form their colonies in the half-decayed trunks of trees, and can be found nearly the whole year round at the flowers of every tree, shrub, or plant. The yellow blossoms of *Thevetia nereifolia* are a constant attraction to them, also *Argyreia nervosa* (elephant creeper) and the always favoured *Duranta plumieri*.

The males of *Œstuans* have a curious habit of frequenting trees of the china-box which grow in the Park and also in the deserted gardens of some ruins at Pulta; they circle round and round the trees high up and well out of reach for hours together, but never settling or resting for a second.

Aphis indica, Fab.; *A. florea*, Fab.—Common in the Park and in one's gardens, but not to the same extent as our own honey bee is at home. The fine bee, *Aphis dorsata*, which is so common "up-country" in the North-West Provinces, Oudh and the Punjaub, I have never met with in the Barrackpore or Calcutta districts.

VI. *Descriptions of nineteen new species of* Larridæ, Odynerus *and* Apidæ *from Barrackpore.* By Peter Cameron. Communicated by George Alexander James Rothney, F.E.S.

[Read March 4th, 1903.]

Larrides.

Very little attention has been paid to the smaller Indian Larridæ. In Colonel Bingham's work only one species of 7 mm. is described. Hence, it is not surprising that many small species should be undescribed.

Notogonia anthracina, n. s.

Nigra, alis fusco-hyalinis, nervis fuscis, cellula cubitali 1ª longiore quam 2ª, metanoto reticulato. ♀. Long. 7 mm.

Hab. Barrackpore (*Rothney*).

Scape of antennæ brownish in the middle beneath, shining; the front closely punctured and with a shallow, narrow furrow in the middle; the vertex alutaceous; the ocellus has a short, narrow, conical point in front, and is longer than broad, the furrow in front of it is wide and deep; the curved furrow on the vertex is wide and shallow. Pro- and mesonotum closely punctured. Median segment irregularly reticulated; the basal two-thirds of the apex irregularly transversely striated; the apex with a few longitudinal striæ in the middle; the furrow is wide and deep and does not reach beyond the middle. Propleuræ irregularly striated; mesopleuræ below the furrow strongly and closely punctured; above it aciculated. The sternum between the middle coxæ is closely longitudinally striated; the furrow is deep; the sternal process is stoutly keeled down the middle and on the sides; the apex with a small incision in the middle, the sides oblique. The apical abscissa of the radius is oblique, large; the first cubital cellule above is shortly, but distinctly, longer than the second; the first transverse cubital nervure is angled from shortly below the middle, where it is bullated; the second recurrent nervure is received shortly behind the middle; the two recurrent nervures are separated by not much more than half the length of the top of the first cubital cellule. Abdomen pruinose; the middle ventral segments covered with longish black stiff hair.

Notogonia intermedia, n. s.

Long. 7 mm. ♀

Hab. BARRACKPORE (*Rothney*).

Is closely related to *N. anthracina*, from which it may be known by the top of the first cubital cellule being longer compared with the second; by its curved form; by the apical abscissæ being broader and rounder; and by the recurrent nervures being nearer each other, being separated by not much more than half the length of the top of the second cubital cellule.

Scape of antennæ brownish in the middle beneath, the lower part of the front of the face thickly covered with silvery pubescence; the front and vertex alutaceous, the latter closely punctured behind the keel; the ocellus circular; a narrow, pointed piece at the apex; the furrow in front of it is wide and deep; the raised part has a shallow, indistinct furrow in the middle. Palpi testaceous; pro- and mesonotum closely and distinctly punctured; the metanotum irregularly reticulated at the base, the apex irregularly transversely striated; the apical slope has a deep furrow to shortly beyond the middle; on either side of this it is obscurely striated; the apex has a few irregular longitudinal striæ. The propleuræ have some irregular striæ; the mesopleuræ closely and distinctly punctured below the furrow; the metapleuræ longitudinally striated, closely below, more widely above. Sternal process keeled down the centre, the keel widest at the base; the apical incision small, the sides slightly oblique. The apical abscissa of the radius is rounded below; the first cubital cellule is more than one-half longer than the second, the recurrent nervures are received close together at the apex of the basal third of the cellule; legs and abdomen pruinose.

In this species the recurrent nervures are more closely united than usual.

Notogonia piliventris, n. s.

Nigra, dense argenteo pilosa; alis hyalinis, nervis fuscis; metanoto reticulato ♂.

Long. fere 5 mm.

Hab. BARRACKPORE (*Rothney*).

Scape of antennæ covered with a silvery pile, the middle brownish beneath, the flagellum opaque. Head opaque, closely and distinctly punctured, the vertex behind distinctly raised, triangularly incised in the middle, the edges rounded; the front ocellus has a minute keel in the middle before and behind, the furrow in front of it is deep, narrow; the antennal foveæ are large, smooth and shining; the lower orbits, face and oral region are thickly covered with silvery pubescence. Mandibles broadly rufous in the middle; the palpi dark testaceous. Pro- and mesonotum closely punctured, covered with a pale down; the median segment is closely transversely reticulated; the apex is irregularly transversely striated; and is thickly covered with silvery hair. Propleuræ closely and distinctly punctured; below marked with curved striæ; mesopleuræ almost smooth above the furrow, below closely punctured; metapleuræ closely striated. The mesosternum behind is stoutly keeled round the edges behind, and has a narrow keel down the middle; the metasternal process is hollowed, and is slightly roundly incised in the middle at the apex. Legs pruinose, the spines blackish. Radial cellule short, wide, the apical abscissa of the radius is oblique, and makes an angle with the lower one, which has also an oblique slope; the first cubital cellule at the top is almost equal in length to the second; the second recurrent nervure is received shortly beyond the middle, the first half-way between it and the first transverse cubital nervure, which is straight, oblique, and has a large bulla shortly below the middle. Abdomen pruinose; the pile on the pygidium silvery; the third and following ventral segments are sparsely covered with long black hair.

Notogonia parva, n. s.

Long. 5 mm. ♂.

Hab. BARRACKPORE (*Rothney*).

In size this species agrees with *N. piliventris*, but is readily separated from it by the alar neuration.

Antennæ stout, the keel on the scape fuscous; the scape is almost bare. The front and oral region thickly covered with bright silvery pubescence, the front and vertex are strongly alutaceous; the furrow below the ocellus is deep, the ocellus projects triangularly behind; the raised portion of the vertex has a narrow furrow down the middle; behind, uniting the eyes, is a ⌒-shaped furrow. Mandibles piceous at the apex. Palpi dark testaceous. Pro- and mesonotum closely and distinctly punctured. The basal portion of the median segment is transversely striated; the striæ distinctly separated, and at the base they are irregularly joined by longitudinal ones; the apical slope has a few transverse striæ; the furrow is of equal width and extends to near the apex. Propleuræ strongly aciculated, and is for the greater part striated. Except above the furrow the mesopleuræ are distinctly and uniformly punctured, Metapleuræ closely and distinctly striated; near the base is a perpendicular furrow, divided above the middle by a fovea. The metasternal process is slightly and gradually widened towards the apex, which is incised in the middle, but not widely; there is an interrupted keel in the middle. The radial cellule is wide; the apical abscissa of the radius is rounded below; the first cubital cellule is, if anything, longer than the second; the first transverse cubital nervure is largely bullated below the middle and less distinctly at the top; the upper part has an oblique slope; the second recurrent nervure is received distinctly behind the middle; the two are separated by about one-half the length of the top of the first cubital cellule.

Abdomen pruinose, the ventral surface is covered with long black hair; the petiole below is closely strongly longitudinally aciculated.

Characteristic of this species is the shape of the radius, the apical abscissa of which does not form, on the lower side, a sharp angle, but is broadly rounded.

Notogonia indica, n. s.

Long. 5 mm.

Hab. BARRACKPORE (*Rothney*).

Comes near to *N. parva*; may be known from it by the apical abscissa of the radius not being rounded on the lower side, by the upper (and larger) part of the first transverse cubital nervure being more distinctly angled, by the first cubital cellule being slightly, but distinctly, shorter than the second; by the striation on the metapleuræ being closer; and the first recurrent nervure is more distinctly roundly curved.

Vertex and front alutaceous; the lower part of the front and the oral region densely covered with silvery pubescence. The ocellus is broader than long, rounded at the sides, and not produced in front or behind; the part behind it is distinctly raised and furrowed down the middle, the curved furrow behind this is distinct, and is produced backwards in the middle, but not very deeply. Palpi dark testaceous. Pro- and mesonotum closely and minutely punctured. The base of the median segment reticulated, more strongly at the base than at the apex; the apical slope is transversely striated; the striæ rather widely separated; the middle is deeply furrowed. Propleuræ irregularly striated. Mesopleuræ, below the furrow, strongly and distinctly punctured; metapleuræ closely longitudinally and somewhat irregularly striated. Wings hyaline, the stigma and nervures fuscous ; the apical abscissa of the radius oblique, straight ; the first cubital cellule is slightly but distinctly shorter than the second ; the upper two-thirds of the first transverse cubital nervure has a distinct curve, and is slightly rounded ; the second recurrent nervure is received near the basal third of the cellule, the space separating it from the first is less than the length of the first cubital cellule above. Abdomen shining, the segments banded with silvery pubescence ; the pile on the pygidium dense and silvery.

Notogonia striaticollis, n. s.

Nigra, dense pruinosa ; metanoto reticulato ; metapleuris striolatis ; alis hyalinis, nervis nigris ♀.

Long. 7 mm.

Hab. Barrackpore (*Rothney*).

Scape of antennæ aciculated, the sides covered with silvery pubescence ; beneath it is sharply keeled laterally, the flagellum is covered with a pale pile. Front and vertex closely minutely punctured ; the front thickly covered with minute silvery pubescence ; the face and clypeus covered thickly with silvery pubescence ; the clypeus bears also some long hairs. The ocellus is sharply triangularly produced on the lower side ; below it is a wide and deep furrow. Mandibles broadly rufous on the apex. The eyes at the top are separated by the length of the third antennal joint. Pronotum alutaceous, behind thickly covered with silvery pubescence ; the mesonotum is closely and distinctly punctured all over, and covered with a minute fuscous pile ; the scutellum is more shining, and is dictinctly punctured, but the punctures are not so closely pressed together as they are on the mesonotum. The basal part of the median segment is closely and distinctly reticulated in the middle, the sides transversely striated ; the apical slope is closely irregularly transversely striated ; the central furrow is narrow. The basal half of the propleuræ is covered with stout curved striæ ; mesopleuræ closely and distinctly punctured ; the metapleuræ closely obliquely striated. The metasternal process is rather deep, and is stoutly keeled down the middle. Legs thickly pruinose ; the tarsal and tibial spines black. The first cubital cellule above is shortly, but distinctly, longer than the second ; the first transverse cubital nervure is obliquely sloped at top and bottom ; both the recurrent nervures are received behind the middle of the cellule, and are close together. The basal three segments of the abdomen have broad pruinose bands ; the pygidium is thickly covered with dark silvery, almost golden, pubescence.

Notogonia varipilosa, n. s.

Nigra, thorace pallide fulvo pilosa, metathorace alutaceo; alis hyalinis, apice fumatis ♂.

Long. 7 mm.

Hab. BARRACKPORE (*Rothney*).

Antennæ stout, longish; the scape densely covered with silvery pubescence. Front and face densely covered with silvery pubescence; the vertex alutaceous, the ocellus triangularly produced in front, rounded behind.

The apices of the mandibles are rufous, the base thickly covered with silvery pubescence. Palpi dark testaceous. The upper side of the thorax is thickly covered with dark, somewhat fulvous, pubescence; the pubescence on the pleuræ is longer, brighter, and more silvery in tint. The pubescence is thicker on the median segment, which is alutaceous, and is only indistinctly striated near the apex; its apical furrow is distinct, narrow, of equal width throughout, and extends from the base to the apex. The sternal process is broad; the lateral keels are stout; there is none in the centre; the apical incision is narrow, twice longer than broad, of equal width throughout, and rounded at the base. Legs thickly pruinose; the spines black. Wings hyaline, the apex slightly, but distinctly, smoky; the two cubital cellules are equal in length above; the upper part of the first transverse cubital nervure has a more sharply oblique slope than the lower part; the second recurrent nervure is received, if anything, behind the middle of the cellule. The apices of the abdominal segments are broadly covered with silvery pile.

Notogonia fuscistigma, n. s.

Nigra, thorace supra dense fulvo pilosa; alis fere hyalinis, stigmate fusco, nervis nigris, cellula cubitali 2ª longiore quam 1ª ♀.

Long. 7 mm.

Hab. BARRACKPORE (*Rothney*).

Comes near to *N. varipilosa*, with which it agrees in the colour of the pubescence, but the latter is stouter built, and has the first cubital cellule as long as the second, whereas in the present species it is perceptibly shorter.

Front and vertex alutaceous; the ocellus is triangularly produced in front; the clypeus is distinctly punctured; the pile on the lower part of the front has a slight golden tint. Mandibles at the base thickly covered with silvery pubescence; from the incision they are, for the greater part, rufous. The pro-, meso-, and base of metanotum are covered densely with fulvous pubescence, the pubescence on the pleuræ and the apex of the metanotum silvery. Pro-, meso-, and base of metanotum alutaceous; there is a narrow furrow on the basal two-thirds of the metanotum; its apical slope is obscurely transversely striated and has a narrow deep furrow in the middle extending to the apex. The mesopleural furrow is distinct; the metapleuræ closely obscurely obliquely striated. The sternal process is large; the basal third has an oblique slope and is deeply furrowed in the middle; the apical laps are rounded at the apex; the incision is short. Legs densely covered with silvery pubescence. The first transverse cubital nervure is largely bullated at the top and near the bottom; above the lower bulla it has an oblique rounded slope; the first cubital cellule at the top is half the length of the second; the two recurrent nervures are separated by the length of the second cellule. Abdomen pruinose. Tegulæ brown.

N. bengalensis, here described, comes near to the present species, but it is a more slenderly-built insect; it may be known from it by the sternal keel not being depressed at the base and keeled down the middle; and by the second recurrent nervure being more sharply angled in the middle, the curve not being so broadly rounded.

Notogonia bengalensis, n. s.

Nigra, thorace dense, fulvo piloso; alis hyalinis, stigmate fusco; cellula cubitali 2ª duplo longiore quam 1ª ♀.

Long. 6 mm.

Hab. BARRACKPORE (*Rothney*).

Comes near to *N. varipilosa*, but is smaller, is more slenderly built, and is readily known from it by the shorter second cubital cellule, it being with *varipilosa* equal in length to the first.

Antennæ stout, covered with a pale pile; the scape shining, keeled on the under-side. Head alutaceous; the lower part of the front and the oral region thickly covered with silvery pubescence. Mandibles dark piceous in the middle. Palpi black, thickly covered with white pubescence. Pro-, meso-, and base of metanotum covered with fulvous; the apex of the metanotum and the pleuræ with bright, silvery pubescence. There is a shallow broad furrow in the centre of the metanotum; the base of the metanotum coarsely alutaceous, and with a keel in the middle; the apical slope is thickly covered with silvery pubescence, is obscurely transversely striated, and has a narrow furrow in the middle which extends to near the apex. Pleuræ alutaceous. Sternal process large, keeled down the middle, the keel much stronger on the base; the apex in the middle incised. Legs thickly pruinose, the spines black. Wings hyaline, slightly infuscated at the base; the first cubital cellule is half the length of the second; the first transverse cubital nervure is roundly curved, the second recurrent nervure is received shortly behind the middle of the cellule. Abdomen pruinose.

Notogonia pygmæa, n. s.

Nigra, dense argenteo pilosa, alis hyalinis, apice nervisque fuscis, cellula cubitali 1ma duplo longiore quam 2a ♀.

Long. 5 mm.

Hab. Barrackpore (*Rothney*).

Scape of antennæ bare, brownish in the middle beneath. The face and the lower part of the front thickly covered with silvery pubescence; the ocellus round; the furrow below it wide and not very deep; the transverse furrow behind it is wide, shallow, its sides slightly oblique; in its middle is a shining longitudinal furrow; mandibles broadly rufous at the apex; the base thickly covered with silvery pubescence. Palpi dark testaceous. Pro- and mesonotum thickly covered with sericeous pubescence; that on the former being brighter in tint than on the latter, which is alutaceous, and has a broad shallow furrow down the middle. The basal part of the median segment is alutaceous, neither striated nor reticulated; the apex is deeply, but not widely, furrowed down the middle. Pleuræ alutaceous, without any striations. The metasternal process is wide, is slightly incised in the middle at the apex, and has an obscure keel down the middle. The first cubital cellule at the top is one-half the length of the second, the first transverse cubital nervure has a gradually rounded slope to near the top; the second recurrent nervure is received shortly behind the middle of the cellule, and is sharply angled in the middle; the two are separated by slightly more than the length of the top of the first cubital cellule; the apical abscissa of the radius is straight, not oblique, and forms an acute angle with the lower part. Abdomen pruinose, especially on the apices of the segments. Legs thickly pruinose; the spines and calcaria black; the apices of the anterior tarsi testaceous. Tegulæ rufo-testaceous.

Notogonia picipes, n. s.

Nigra, femoribus posticis piceis ; alis hyalinis, stigmate fusco ♀.
Long. 7 mm.

Hab. Barrackpore (*Rothney*).

Comes near to *N. subtessellata*, but is not much more than half the length of the smaller examples of the latter ; the hinder femora, instead of being bright red, are only piceous-red above and almost black below ; the apex of the median segment is not so widely excavated, and not at all below the middle ; and the sternal process is not keeled down the middle, and not obliquely raised towards the apex.

Mandibles broadly rufous towards the apex. Palpi testaceous. Front and face thickly covered with silvery pubescence. Ocellus irregularly round. Thorax alutaceous; covered with a silvery pile, the middle of the metapleuræ irregularly striated at the base ; the apical slope is indistinctly transversely striated, its upper half is furrowed in the middle ; the sides of the furrow have an oblique slope. The sternal process is wide, and is not keeled in the middle ; its apical incision is small. Wings clear hyaline, the stigma fuscous, the apical abscissa of the radius is rounded below ; the first cubital cellule at the top is about one-third shorter than the second, the second recurrent nervure is received shortly, but distinctly, behind the middle of the cellule. Legs black, pruinose ; the hinder femora for the greater part above reddish-piceous ; the hinder tibiæ have a piceous tint ; spines and calcaria black. Abdomen pruinose, the apical segment is distinctly and roundly incised.

Notogonia pilosa, n. s.

Nigra, dense albo pilosa ; alis fusco-hyalinis, stigmate nervisque testaceis ♂.
Long. 12 mm.

Hab. Barrackpore (*Rothney*).

Front and vertex strongly and closely punctured, thickly covered with long fuscous hair ; the lower orbits, face and clypeus thickly with longer silvery pubescence ; the projecting apex of the clypeus smooth, shining and bare. The anterior ocellus is minute, glassy, slightly pointed in front ; in the middle of the front is a wide and shallow longitudinal furrow ; the depression on the vertex is wide, deep, transverse, and narrower at the sides. Mandibles black, at the base thickly covered with silvery pubescence. Palpi thickly covered with silvery pubescence; the apical joints testaceous. Pro- and mesonotum strongly and closely punctured and thickly covered with short white pubescence; the scutellum is closely punctured like the mesonotum; the post-scutellum has the punctures smaller and closer. Median segment thickly covered with white pubescence, closely rugosely punctured; on the apex the punctation is stronger; its sides are transversely striated; the central furrow is distinct in the middle. Propleuræ closely punctured, the punctures more closely pressed together behind; in the middle is a wide, shallow, oblique furrow; the tubercles are thickly fringed behind with grey pubescence; the perpendicular furrow is crenulated, deep and moderately wide; the longitudinal one is narrower and not so deep. Metapleuræ punctured, slightly so at the base; the lower part at the base and middle striated. Pro- and the basal part of the mesosternum keeled down the middle; the metasternal process closely punctured and thickly covered with long white hair; the apical lobes rounded; coxæ and femora thickly covered with white hair; the tibiæ more thickly and shortly with white pubescence, their spines pale rufous; the tarsi thickly pruinose, their spines rufous. Wings fusco-hyaline, the nervures pallid fuscous; the first cubital cellule above is slightly shorter than the second, the first transverse cubital nervure is oblique and bulges out slightly backwards in the middle; both the recurrent nervures are received shortly behind the middle of the cellule; the second recurrent nervure has a broadly rounded curve. Abdomen thickly pruinose, especially on the apices of the segments; the basal ventral segment is rufous.

Comes near to *N. laboriosa* and *N. jaculatrix*, but is quite distinct from either.

Tachysphex striolata, n. s.

Nigra, tegulis testaceis; alis clare hyalinis; nervis fuscis; segmento mediali striolato ♀.

Long. 8 mm.

Hab. BARRACKPORE (*Rothney*).

Head opaque, closely and distinctly punctured; the face and sides of the clypeus thickly covered with silvery pubescence; the front and vertex sparsely haired. The deformed hinder ocelli are oblique, shining, the anterior is broader than long; the ocellar region is raised and has a shallow furrow down the middle between the ocelli; behind them is a deep semi-circular furrow, behind which the vertex is raised ; behind the antennæ are two distinct oblique shining tubercles. The apex of the clypeus is shining, smooth, bare ; its extreme apex depressed. Mandibles broadly rufous in the middle, their base thickly covered with silvery pubescence. Pro- and mesonotum closely punctured, the former thickly covered with white pubescence. Scutellum less strongly punctured than the mesonotum. Median segment at the base closely obliquely striated ; in the middle with curved transverse striæ ; the apex is closely transversely striated. Propleuræ shining, aciculated above. Mesopleuræ closely punctured ; at the base is a wide perpendicular furrow which is striated above. The apex of the metanotum is longitudinally closely striated, the base above is sparsely, below closely punctured. Metasternal area with raised sides ; the central keel is broad and does not quite reach the base. Legs black, covered with a white down ; the tibial and tarsal spines are white ; the calcaria pale testaceous ; wings clear hyaline, iridescent ; the stigma and nervures dark fuscous ; the first cubital cellule above is about one-fourth longer than the second, the first transverse cubital nervure is oblique and is slightly elbowed on the lower side ; the second recurrent nervure is received shortly beyond the middle. Abdomen shining, the apices of the segments pruinose ; the pygidium shining, its apex rufous.

Comes near to *T. bituberculata*, but that species is larger ; its wings have a distinct yellowish tinge and are fuscous at the apex, otherwise may easily be known by the median segment being reticulated ; with the striæ stouter and not oblique.

Tachysphex puncticeps, n. s.

Nigra, capite thoraceque dense punctatis, metanoto reticulato, apice striato ; alis hyalinis, nervis fuscis ♀.

Long. 7 mm.

Hab. Barrackpore (*Rothney*).

Scape of antennæ smooth and shining, the sides bearing a pale microscopic pile ; the flagellum opaque. Vertex closely and distinctly punctured, the punctures distinctly separated ; behind the ocelli is a large depression, which is obliquely narrowed behind, the apex is deeper and shining, the front is closely rugosely punctured. The antennal tubercles are smooth and shining, the cheeks, face and clypeus are thickly covered with silvery pubescence, the clypeus is distinctly depressed, smooth, bare and shining. Mandibles broadly rufous in the middle ; the palpi dark testaceous. The eyes at the top are separated by slightly more than the length of the third antennal joint. Mesonotum closely and distinctly punctured and thickly covered with a short pale down. Scutellum shining, only very minutely punctured. Median segment closely reticulated ; the apex strongly and closely transversely striated ; the furrow is wide and deep and does not reach the middle. Propleuræ smooth ; mesopleuræ closely punctured ; the metapleuræ, closely, obliquely striated. Prosternum furrowed rather widely in the middle. Metasternal process not defined. Legs pruinose, the tibial and tarsal spines are white. Wings clear hyaline, the nervures fuscous, the first cubital cellule is shortly, but distinctly, longer than the second ; the upper (and larger) part of the first transverse cubital nervure has a distinct, oblique slope ; the second recurrent nervure is received in the middle of the cellule. The basal three segments of the abdomen are fringed with silvery pubescence.

Tachysphex varihirta, n. s.

Nigra, dense argenteo pilosa, basi metanoti rugoso, apice striolata ; alis hyalinis, cellula cubitali 1ª duplo longiore quam 2ª ; nervis stigmateque nigris ♂.

Long. fere 6 mm.

Hab. BARRACKPORE (*Rothney*).

Front and vertex closely punctured, the front more strongly than the vertex ; the lower part of the front closely covered with silvery pubescence, the inner orbits in the middle with pale golden pubescence ; the face and clypeus thickly covered with silvery pubescence ; its middle with a slight rounded incision ; the labrum smooth and shining. Base of mandibles thickly covered with silvery pubescence, the middle rufous. Palpi dark testaceous. The hinder part of the head is thickly covered with silvery pubescence. Pro- and mesonotum covered with silvery pubescence which is very thick and long near the tegulæ ; mesonotum closely and distinctly punctured ; the scutellum has the punctures more widely separated. Median segment closely rugosely longitudinally rugose ; in the middle, at the base, are some irregularly waved striæ and it is thickly covered with white pubescence ; the apical slope is closely transversely striated. Propleuræ strongly punctured above, below smooth and shining ; mesopleuræ closely, but not very strongly, punctured ; the lower part thickly covered with silvery pubescence ; metapleuræ closely striated, the striæ more widely separated at the base. Mesosternum closely punctured, shining ; the metasternal area closely punctured, the apex incised in the middle ; the raised sides stout, the middle indistinctly keeled. Legs thickly covered with silvery pubescence ; the four anterior calcaria pale testaceous. The first cubital cellule at the top is somewhat more than twice the length of the second, the first transverse cubital nervure is oblique, straight; the second recurrent nervure is received almost in the middle of the cellule. Abdomen shorter than the thorax, the basal three segments broadly banded with silvery pubescence on the apices; pygidium smooth and shining.

Odynerus sibilans, n. s.

Niger, flavo maculato; clypeo flavo, nigro maculato, flagello antennarum subtus rufo; pedibus flavis, coxis, trochanteribus femoribusque posticis nigris; alis hyalinis, apice violaceis ♀.

Long. 8 mm.

Hab. BARRACKPORE (*Rothney*).

Antennæ black, the scape yellow, the flagellum brownish beneath; head black, the clypeus, except a triangular black mark in the centre at the apex, the lower inner orbits, the eye incision, an irregular broad line across the vertex, dilated downwards in the middle and broadly incised above, and all united together and the upper half of the outer orbits, yellow. Front and vertex strongly rugosely punctured, the centre of the front between the antennæ shining and minutely punctured. Clypeus broad above, rounded there, obliquely narrowed towards the apex, sparsely punctured, the punctures rather large and deep, the apex with a broad shallow incision. Mandibles rufous, yellow at the base, the inner side black. Thorax black, closely and rather strongly punctured; the pronotum broadly above, a round spot below the tegulæ, scutellum, post-scutellum and the sides of the median segment broadly yellow. Median segment rugosely punctured, the middle stoutly keeled and transversely striated; from the keel near the top, a transverse, stout, slightly curved keel runs from either side. Pleuræ closely punctured, the base of the meso- and metapleuræ smooth. Legs yellow, the fore coxæ, the others behind, the trochanters base of anterior femora and the posterior entirely, black. Wings hyaline, infuscated along the fore margin; the apex violaceous, the second cubital cellule is much narrower above, being not one-fourth of the length of the third. Abdomen black, the apex of the petiole, its sides broadly, a large mark on the sides of the second segment, its apex broadly, the sides narrowly, the apices of the third and fourth and the fifth and sixth in the middle, yellow. The ventral segments are broadly yellow.

There is an indistinct keel, more distinct on the sides than in the middle, on the petiole behind the yellow mark.

APIDÆ.

Halictus itinerans, n. s.

Black, thickly covered with longish white hair; the sides and apex of the median segment closely and distinctly reticulated; the apices of the segments depressed and less strongly punctured than the base ♂.

Long. 7–8 mm.

Hab. BARRACKPORE (*Rothney*).

Antennæ stout, the flagellum bare, the scape covered with longish white hair. Vertex shining, sparsely and minutely punctured; the front is closely, somewhat strongly and uniformly punctured; its lower side, the face and the vertex are thickly covered with white pubescence. Clypeus strongly, but not very closely, punctured, its apex transverse. Mesonotum distinctly, but not very strongly punctured and with a narrow furrow on either side towards the apex. Scutellum shining, punctured. The area on the median segment is large and extends to the top of the apical slope; it is closely, strongly, longitudinally punctured; the apical slope and the metapleuræ are closely reticulated; the pleuræ more closely reticulated, with the reticulations less clearly defined than on the apex. Mesopleuræ rugosely punctured. The apical slope of the median segment is distinctly margined and is furrowed down the middle. Wings clear hyaline, the stigma dark fuscous, the nervures black; the first recurrent nervure is received quite close to the second transverse cubital. Legs black, rather thickly covered with white hair; the hair on the under-side of the tarsi and their spines are rufous; the spurs are pale rufous. Abdomen closely and distinctly punctured, except on the apices of the segments which are depressed; the base of the dorsal segments are covered with white hair; the ventral surface is thickly covered with longer white hair. The base of the last ventral segment is distinctly raised, the raised part forming a semi-circle; the apex of the segment is transverse. Tegulæ black.

Comes near to *H. ciris* and *H. vishnu*, but cannot well be confounded with either.

Halictus interstitialis, n. s.

Black, the apices of the tarsi testaceous, the mesonotum and the scutellum reticulated closely, the base of the median segment more widely and less regularly reticulated, the abdomen impunctate, the base of the second segment with a broad band of grey pubescence; the front distinctly keeled ♀.

Long. 6 mm.

Hab. BARRACKPORE (*Rothney*).

Antennæ black, the apical half of the flagellum brownish, black above. The clypeus is strongly, regularly but not very closely, punctured—the face is less strongly punctured—the front and vertex are coarsely alutaceous; the front has a narrow distinct keel which extends from the ocelli to the base of the antennæ; the front, face and clypeus are covered with white pubescence; the vertex more sparsely with longish pale hair. The reticulation on the mesonotum becomes stronger towards the apex; the scutellum is less strongly reticulated at the sides; the post-scutellar region is thickly covered with white hair. The apex of the pronotum is raised laterally at the base into a sharp plate-like projection, which above is thickly covered with white pubescence. Mesopleuræ obscurely reticulated. The base of the median segment is irregularly reticulated, the longitudinal striæ are regular; the transverse ones much more irregular and more or less broken, the sides and the apical slope are thickly covered with white pubescence, the hair on the sides is much longer than elsewhere. The hair on the tibiæ and tarsi are fulvous, on the femora, sparser, longer and white, the hair is fringed; the outer spur on the hinder tibiæ is armed with stout spines. Wings clear hyaline, the stigma and nervures testaceous, the first recurrent nervure is interstitial. Abdomen smooth, shining, impunctate; the base of the second segment has a band of white, depressed pubescence at the base; the other segments are broadly, but not thickly, fringed, with white pubescence on the apex, the anal fimbra is rufous, the ventral surface is covered rather thickly with long white soft hair.

The hinder tibiæ and tarsi are distinctly rufous, this being also the case with the femora beneath; the tegulæ are rufo-piceous; there are no transverse furrows on the abdominal segments.

Comes near to *H. liodomus*, Vachal.

Halictus bengalensis, n. s.

Long. 7 mm.

Hab. BARRACKPORE (*Rothney*).

This species comes near to *H. ceylonicus*, but it wants the blue tint on the head and thorax; the base of the median segment is strongly marked with stout twisted keels, the clypeus is more strongly and distinctly punctured all over, and there is a distinct transverse furrow on the basal two abdominal segments.

Antennæ black, brownish beneath towards the apex. Front closely and uniformly punctured, the vertex is less closely and distinctly punctured especially near the ocelli. The cheeks are thickly covered with white pubescence; the face is sparsely and minutely punctured; the clypeus is much more strongly and distinctly punctured except at the apex. The punctures are large and elongate, the centre at the apex is narrowly depressed. The labrum projects slightly in the centre, it is closely and coarsely aciculated with the sides smooth. Mesonotum shining, closely punctured, more closely punctured at the sides than in the middle. There is a distinct basal central furrow which extends beyond the middle and a shorter one on the sides. Scutellum smooth, the sides and apex punctured. Post-scutellar region covered closely with white pubescence. The base of the median segment is covered with stout irregularly twisted striæ, which are more oblique laterally than in the centre. The apical slope is smooth, shining, and is distinctly bordered round the edges; its top in the centre is slightly bent downwards with the edges oblique: in the centre of the apical half is a deep, clearly defined, furrow. The lower part of the propleuræ is irregularly striated; below the middle at the base is an oblique furrow. Mesopleuræ thickly covered with white hair. Wings hyaline, the stigma testaceous, the nervures of a darker testaceous colour; the second recurrent nervure is interstitial. Legs black, the hair white; on the under-side of the tarsi fulvous, the calcaria testaceous; the spines on the hinder calcaria are long at the base and become gradually shorter towards the apex. Abdomen smooth, shining and impunctate; the segments at the base with a band of white depressed pubescence. The anal fimbra is brownish and broad; the segment is brownish and the hair covering on it is long and fuscous.

The eyes converge slightly below, there is a distinct keel on the lower part of the front, the metathoracic area is not defined at the apex by a keel or distinct margin; there is a distinct transverse furrow beyond the middle of the basal two abdominal segments; the apices of the tarsi are rufous. The pubescent band on the base of the second segment is broader than it is on the other segments.

Comes near to *H. albesens,* which may be known from it by the front not being carinate. It is related to *H. carinifrons,* Cam.; that is a smaller, more slenderly-built insect; the striated area reaches to the top of the apical slope and the sides at the top are rounded, not straight and oblique; the basal two segments of the abdomen, too, want the transverse furrows. The calcaria are more distinctly spined than usual.

VII. *Notes on the nests of Bees of the genus* Trigona. By CHARLES OWEN WATERHOUSE, F.E.S.

[Read March 4th, 1903.]

PLATE VI.

FROM time to time portions of the resinous masses formed by species of *Trigona* have been received by our National Museum, and I believe have been exhibited at meetings of this Society: but so far as I know no complete nest has ever been shown. When my friend Mr. Ridley, of the Royal Botanic Gardens, Singapore, was last in England, I asked him to endeavour to procure me one. This is attended with some difficulty, as the nests are generally built in hollow trees away in the forest, and usually at a considerable height from the ground. Soon after his return to Singapore, Mr. Ridley was fortunate enough to see a large nest of *T. collina* from Malacca being exhibited at an Agricultural Show, and he very kindly purchased it and sent it home to me. The bees were still alive in it when it arrived. As soon as they ceased to come out, I had the great mass of resin, which weighed 40 lbs., sawn in half. Roughly speaking the nest is 24 inches long, and 9 inches wide. The resinous parts, about 8 inches at the top, and nearly the same at the bottom, have numerous irregular galleries and cavities. Some of these cavities are empty, but many of them are filled with pollen. This was soft and spongy when the nest arrived; now it is very hard, but the appearance is the same. The central part of the block is occupied by what one may call the nest proper. This is about 7 inches by 6. It consists of innumerable galleries and chambers which are quite irregular, separated by yellowish waxy partitions that are not thicker than stout paper. In these partitions are seen the oval cells containing immature bees.

The cells are 8 millimetres long, and about $4\frac{1}{4}$ broad.

They are placed quite irregularly as to position and direction, sometimes in groups, sometimes isolated. (Fig. 1.)

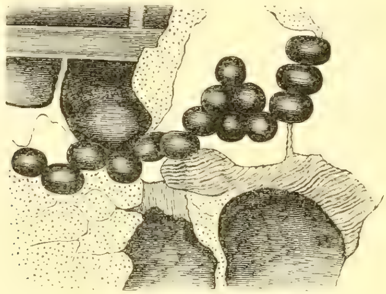


Fig. 1.

Although the Eastern *Trigonæ* are numerous and we have a fair number in the British Museum, all the specimens are workers, and only workers appear to have been described. I was very glad to find some males in the nest described.

Trigona collina, ♂.

The male so closely resembles the worker that it might easily escape observation. The antennæ are a trifle longer, and more slender, with the second joint of the flagellum very short and strongly transverse. The face is relatively narrower; the clypeus with its limits ill-defined, and with only the front margin obscure ferruginous. The posterior tibiæ are nearly of the same form as in the worker, but the metatarsus, instead of being very broad and inclined to be triangular, is parallel and as long as the following joints of the tarsus taken together. The abdomen instead of being obtusely acuminate and pubescent at the apex, is almost truncate and beset with long, stiff, black hairs. On the under-side it is longitudinally concave, and generally more or less testaceous. The genitalia are nearly always more or less visible.

The entrance to the nest of *T. collina* is by means of a long resinous tube, that stands out from the trunk of the tree. The only complete one which has reached me and which was exhibited at this Society in March 1900, is 14 inches in length, with a somewhat spoon-shaped prolongation at the entrance.

Trigona ruficornis, Smith.*

When the nest above described was received, Mr. Ridley also sent a nest of *Trigona ruficornis*, Smith, one of the smallest bees known. This was in a post in the Botanic Gardens at Singapore, in a cavity evidently excavated by Termites. The nest from which the type of this species was described (Tr. Zool. Soc., vii, p. 185) was in a similar excavation.

The nest is 8 inches long, in a cylindrical cavity of about $2\frac{1}{2}$ inches diameter. There are various irregular galleries or means of communication formed of black waxy substance. In the lower part for about $4\frac{1}{2}$ inches the space is occupied by closely-placed irregular closed chambers, generally about one quarter of an inch in length, formed of very thin, brownish wax. (Fig. 2.) These chambers were nearly all filled with honey; two or three with pollen. In the upper part of the nest are the brood

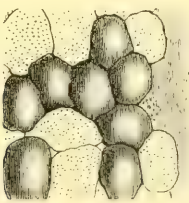


Fig. 2.

Fig. 3.

cells. These are oval, about $3\frac{1}{4}$ mm. long, and nearly 3 mm. broad, formed of brownish-yellow wax, either isolated or massed together. (Fig. 3.) Many of them are on a short peduncle. Most of them were filled with pollen, but many contained immature bees. Those containing the bees were of a lighter, more testaceous colour. This difference is no doubt due to the pollen having been consumed, so that they are dry.

Among the bees (which were alive when the nest arrived) there were males and workers. They are extremely alike, but nearly all the workers have the abdomen entirely yellow; a few, however, have the apex

* If the genus *Trigona* is united with *Melipona* as is done by some authors, the name *smithii*, proposed for it by Col. Bingham (Fauna Indica) will have to be adopted on account of the older *Melipona ruficornis*, Latr.

dusky. Possibly this is due to staining. All the males have it fuscous at the apex, with the base clear yellow. The apices of the genitalia are nearly always visible. The form of the posterior legs is almost identical in the male and worker, but the hairs forming the fringe on the upper margin of the tibiæ in the worker are white and brush-like at the tip, whereas in the male they are nearly all simple.

The type specimens of this species, which are from N.W. India, have the antennæ rusty-red. All the males from the nest above described have them dark-brown, nearly black. In the workers the scape is clear yellow, and the flagellum light-brown.

Explanation of Plate VI.

Nest of *Trigona collina*, about one-fourth natural size.

P, P, chambers filled with pollen.

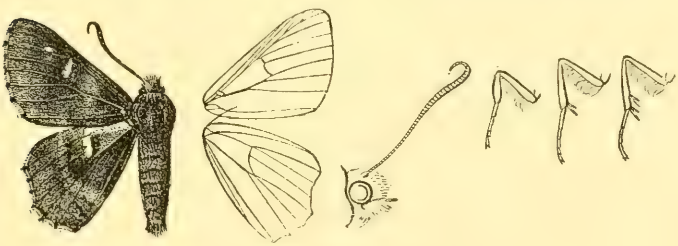
R, R, solid resin.

VIII. *A remarkable new Lepidopterous Insect from Zululand.* By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S.

[Read April 1st, 1903.]

Genus APOPROGONES, nov.

Proboscis fully developed; palpi porrect extending about the length of head, the 1st and 2nd joints fringed with long hair below, the 3rd rather long, smoothly scaled; frons smooth with large tuft of woolly hair; eyes widely separated on vertex of head, large, round, naked, overhung by long cilia; ocelli absent; antennæ simple, dilated into a club before the terminal hook; vertex of head and thorax thickly clothed with rough scales mixed with some hair; pectus with long hair; tibiæ smoothly scaled, the mid-tibiæ with one, the hind-tibiæ with two pairs of moderate spurs; abdomen with some rough scales and hair on dorsum especially towards base.



Apoprogones hesperistis, ♂ 1/1

Fore-wing broad with the costa arched towards apex which is rounded, the termen evenly curved; vein 1a forming a fork with 1b; 1c absent; 2 from two-thirds length of cell; 3 from before angle; 5 from above middle of discocellulars; 6 from upper angle; 7, 8, 9, 10 strongly stalked from just before upper angle, 10 from long beyond 7; 11 from cell, straight; retinaculum a corneous bar from subcostal nervure; frenulum strong. Hind-wing with the costa moderately arched; the termen excised from below apex to vein 4, then crenulate, the inner margin long; the inner area narrow, vein 1a not extending to tornus; 1c absent; vein 2 from near angle of cell; 3, 4 from angle; 5 from above middle of discocellulars; 6, 7 from upper angle; 8 bent down and touching cell near base, then widely separated.

Apoprogones hesperistis, n. sp.

♂. Head, thorax and abdomen black with a few grey scales and hairs; pectus with the hair mostly grey; tarsi with white rings. Fore-wing dark leaden grey irrorated and striated with black, forming very ill-defined antemedial, medial and two postmedial waved lines; a small pink spot above base of vein 1; an ill-defined white bar beyond the cell between veins 6 and 4, and a small triangular post-medial spot above vein 6; a subterminal series of white points in the interspaces with a small rufous spot before the one above vein 4. Hind-wing black-brown, the costal area whitish towards base, the inner area clothed with large rough leaden-blue scales and crossed by numerous indistinct waved black lines with very ill-defined pink striæ between them towards tornus; an oblique white bar just beyond the cell and traces of the white postmedial band of under-side; cilia of both wings chequered black and white. Under-side of fore-wing with the basal area pale yellow slightly irrorated with brown; a large elliptical black discoidal spot with a white bar beyond it; a postmedial white band straight from costa to vein 4, then incurved; hind-wing with the basal area pale yellow thickly irrorated with black-brown; an elliptical black discoidal spot with oblique white bar beyond it; a postmedial white band with waved outer edge, bent inwards and narrower towards costa; the inner area whitish to the postmedial line, interrupted below end of cell and before the postmedial band.

Hab. ZULULAND, Eshowe 1500 feet, very thickly-wooded country (*Mrs. W. M. Mercer*). *Exp.* 46 mill.

Type in Brit. Mus. A good deal rubbed.

The genus must be assigned to the family EUSCHEMONIDÆ represented by the single species *Euschemon rafflesia*, Westw., from Australia, that however is a typical Hesperid, except in having a strong frenulum and retinaculum, whilst the present genus has veins 7, 8, 9, 10 of the fore-wings stalked, in *Euschemon* and all HESPERIADÆ all the subcostal veins arising from the cell. *Apoprogones* must therefore be considered a development from the Lepido-pterous stock at the point where the butterflies branched off.

In what part of the world the butterflies first arose we cannot of course say, but all the surviving forms at all closely related to their point of origin belong to the scattered remnants of the old Antarctic fauna; we have first the *Castniadæ* found in the Neotropical region and again in Australia, then the *Neocastniadæ* represented by *Tascina orientalis*, Westw., from Singapore, *Neocastnia nicevillei*, Hmpsn., from Tenasserim, and *N. metallica*, Pag., from Palawan, next the *Euschemonidæ* represented by *Euschemon rafflesia* from Australia, and finally *Apoprogones* from Zululand. From this Antarctic fauna probably is derived the greater part of the Australian fauna, a few scattered representatives in Christmas Island, the Nicobars, Singapore, the Malay Peninsula, Borneo and Palawan, some in the Ceylonese subregion and Madagascar, a few in South Africa, and it seems likely that the very specialized and characteristic Neotropical fauna is derived from the same stock.

April 29, 1903.

IX. *On Lepidoptera from the White Nile, collected by* Mr. W. L. S. Loat, F.Z.S.; *together with further notes on Seasonal Dimorphism in Butterflies.* By Dr. Frederick A. Dixey, M.A., M.D., Fellow of Wadham College, Oxford.

[Read March 18th, 1903.]

Plate VII.

Mr. W. L. S. Loat, during his tenure of office as superintendent of the Nile Fish Survey under the Egyptian Government, spent more than three years in a scientific investigation of the waters of the Nile and its tributaries. Though his biological activities were mainly engaged in other directions, he took several opportunities of collecting butterflies; and the specimens captured by him in April 1901, and in January and March 1902, are in many respects of great interest. They are generally in excellent condition, and are accompanied by ample data; but the collection (which has been liberally presented by Mr. Loat to the Hope Museum at Oxford) derives what is perhaps its greatest value from the fact that the specimens are marked in such a manner as to allow all those caught at one time and in one spot to be grouped together. The captor informs me that on these occasions no voluntary selection was made on his part; that he tried, in fact, to catch all he saw; so that each of his "bags" may be taken as a fair sample of the butterfly life that was at that particular time on the wing.

The localities of Mr. Loat's captures are as follows:—

I. White Nile; Gharb-el-Aish, near Kaka; about 11° N. Lat.
II. White Nile; near Kaka; about 10° 30′ N. Lat.
III. Bahr-el-Gebel (Nile); near Mangala; about 5° N. Lat.
IV. Bahr-el-Gebel (Nile); Gondokoro; 4° 43′ N. Lat.

Several of the species obtained from all these localities are well known to be seasonally dimorphic. As will be seen later, the present collection contains a preponderance of "dry-season" forms. The large proportion of Pierines to the whole number is remarkable; as also is the general resemblance borne by the whole assemblage to the butterfly fauna of Aden. It was remarked by Dr. Butler in Proc. Zool. Soc., 1901, p. 25, that the collection made by Captain Dunn on the Bahr-el-Zeraf (White Nile) had a very Aden-like aspect, and in particular that it contained all the forms of *Limnas chrysippus*, Linn., just as they occur at Aden. In Somaliland, as is well known, the prevailing form of *L. chrysippus* is *L. klugii*, Butl., with a sprinkling of its modification *L. dorippus*, Klug; in other respects the present collection recalls the Somaliland fauna almost as distinctly as it does that of Aden.

It will be noticed that Mr. Loat's insect-collecting was limited to a very few occasions, and to only three months in the year. This will no doubt account for the absence from his collection of a few species which occur in that of Captain Dunn (*loc. cit.*). Among such are *Precis boöpis*, Trim., *Atella phalantha*, Drury, and especially *Hypolimnas misippus*, Linn. There is no new species among Mr. Loat's captures, but they include the male of *Pinacopteryx venatus*, Butl., of which the female only has hitherto been known to science.

Subjoined is an account of the places and dates of capture, as carefully recorded by Mr. Loat, together with a list of the specimens taken on each occasion. It has been thought worth while to preserve his details, even to the time of day at which the captures were made.

I. White Nile; Gharb-el-Aish, near Kaka; about 11° N. Lat.

1901, April 13.

A. Between 1 and 2 p.m.

PIERINÆ.

Teracolus glycera, Butl.

Teracolus glycera, Butl., Proc. Zool. Soc., 1876, p. 144; Ann. Mag. Nat. Hist., 1897, vol. ii, p. 461; Proc. Zool. Soc., 1901, p. 25.

4 ♂, 3 ♀. This, as Dr. Butler remarks, is a form of the *T. antigone* group. It is barely, if at all, distinguishable from *T. evagore*, Klug (*T. saxeus*, Swinh.). See below, p. 161.

HESPERIIDÆ.

GEGENES NOSTRODAMUS, Fabr.

1 ♀; with sharper wings and paler than Mr. Bennett's Socotran example (also a ♀).*

B. Between 3 and 5 p.m.

DANAINÆ.

LIMNAS CHRYSIPPUS, Linn.

L. chrysippus, Linn., 4 ♂; *alcippoides,* Moore, 2 ♂; *alcippus,* Cram., 1 ♀; *klugii,* Butl., 1 ♂; *dorippus,* Klug, 1 ♂.

These are of the colouring usual in examples from the northern districts of the "East African" subregion. The *chrysippus* are duller and darker in hue than specimens from Socotra, and the subapical white spots are less discrete. The specimen of *klugii* is somewhat paler than the average of that form. It is remarkable that all five variations of *chrysippus* are represented in these nine examples taken at the same time and in the same place.†

NYMPHALINÆ.

BYBLIA ILITHYIA, Drury.

1 ♀; intermediate between "wet" and "dry."

PRECIS CEBRENE, Trim.

1 ♀; wet.

PIERINÆ.

TERACOLUS GLYCERA, Butl.

6 ♀.

BELENOIS MESENTINA, Cram.

2 ♂, 3 ♀; wet.

LYCÆNINÆ.

CHILADES TROCHILUS, Freyer.

1 ♂, 1 ♀.

TARUCUS THEOPHRASTUS, Fabr.

1 ♀; rather small and dark.

* Proc. Zool. Soc., 1898, p. 382.

† On the varying forms of *Limnas chrysippus,* Linn., with their distribution, see Poulton in Trans. Ent. Soc. Lond., 1902, pp. 473–482, *ibique citata;* to which may be added a note by the present writer in Proc. Zool. Soc., 1900, pp. 10, 11.

POLYOMMATUS BÆTICUS, Linn.

2 ♀; small.

HESPERIIDÆ

GEGENES NOSTRODAMUS, Fabr.

1 ♂.

April 14.

Between 9 and 10 a.m.

DANAINÆ.

LIMNAS CHRYSIPPUS, Linn.

L. klugii, Butl., 1 ♂.

NYMPHALINÆ.

VANESSA CARDUI, Linn.

1 ♀.

PIERINÆ.

TERACOLUS GLYCERA, Butl.

1 ♂, 1 ♀.

BELENOIS MESENTINA, Cram.

1 ♂; wet.

LYCÆNINÆ

TARUCUS THEOPHRASTUS, Fabr.

1 ♂.

TARUCUS TELICANUS, Lang.

1 ♂; rather small.

POLYOMMATUS BÆTICUS, Linn.

1 ♀.

HESPERIIDÆ.

GEGENES NOSTRODAMUS, Fabr.

2 ♂.

At the time of the two days' collecting above recorded, the dry weather was breaking up. Thunder was heard in the distance, and the rains were just about arriving. The next batch of butterflies was caught at a point on the Nile a little further south, and a week later in the season.

II. White Nile; near Kaka; 10° 30′ N. Lat.

1901, April 21.

A. Between 9 and 11 a.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. alcippoides, Moore, 2 ♂; *alcippus*, Cram., 1 ♂; *klugii*, Butl., 3 ♂.

NYMPHALINÆ.

Precis cebrene, Trim.

1 ♂; wet.

PIERINÆ.

Teracolus glycera, Butl.

1 ♂.

Teracolus daira, Klug.

3 ♂, 2 ♀; all somewhat lightly marked.

Teracolus leo, Butl.

1 ♂, "dry," but with no pink shade beneath; 1 ♀, white, with very slight orange flush. Inclined towards "wet."

Teracolus phisadia, Godt.

1 ♀; with orange flush on upper surface of fore-wing, and decided reddish shade beneath.

Teracolus protomedia, Klug.

2 ♀.

Belenois gidica, Godt.

Northern form (*B. abyssinica*, Luc.), 2 ♂, 3 ♀. The males tend to the wet form; one has the wings very sharply pointed. Of the females, one is wet, one intermediate, and the remaining one verges towards dry.

Belenois mesentina, Cram.

1 ♂, 1 ♀; wet.

LYCÆNINÆ.

Chilades trochilus, Freyer.

1 ♀.

Polyommatus bæticus, Linn.

2 ♀.

HESPERIIDÆ.

CHAPRA MATHIAS, Fabr.

1 ♂.

B. Between 3 and 5 p.m.

DANAINÆ.

LIMNAS CHRYSIPPUS, Linn.

L. chrysippus, Linn., 1 ♂; *alcippus,* Cram., 3 ♂; *klugii,* Butl., 3 ♂.

PIERINÆ.

TERACOLUS PHLEGYAS, Butl.

1 ♂, 1 ♀ (yellow); both wet.

TERACOLUS EUPOMPE, Klug.

1 ♂, 1 ♀. Both of these are "dry" in character, but the male is without the pinkish shade beneath, and the female only has it to a moderate extent. Mr. Loat describes the flight of the male in this and the preceding species as "wild." *

TERACOLUS GLYCERA, Butl.

1 ♂, 2 ♀.

TERACOLUS DAIRA, Klug.

1 ♂.

TERACOLUS LEO, Butl.

1 ♀; yellow, with orange flush. Under-side pinkish, as in the dry-season form.

TERACOLUS PLEIONE, Klug.

1 ♀; intermediate, verging towards wet.

TERACOLUS PHISADIA, Godt.

5 ♂, 1 ♀. Three of the males are full wet-season forms, the other two show an infusion of flesh-colour in the yellow of the under-side. The female is less reddish beneath than the specimen of the same sex taken earlier on the same day.

* Cf. Mr. G. A. K. Marshall's observations on the flight of "purple-tips."—Trans. Ent. Soc. Lond., 1902, pp. 354, 371; see also Trimen, "South-African Butterflies," vol. iii, 1889, p. 107.

TERACOLUS AMELIA, Luc.

1 ♀. Dry-season; no basal duskiness on the upper surface.

TERACOLUS PROTOMEDIA, Klug.

3 ♀.

BELENOIS GIDICA, Godt.

Northern form (*B. abyssinica*, Luc.). 1 ♂, wet; 2 ♀, dry.

BELENOIS MESENTINA, Cram.

2 ♂, 2 ♀; all wet.

III. BAHR-EL-GEBEL (Nile); near MANGALA; about 5° N. Lat. More or less open wooded country, with scrub and dried grass in places; near the river.

1902, January 8.

Between 3.30 and 5 p.m.

PIERINÆ.

TERACOLUS EUPOMPE, Klug.

1 ♂, 1 ♀, intermediate; 1 ♀, dry. All these have more or less basal duskiness.

TERACOLUS EVARNE, Klug.

7 ♂, 1 ♀; all dry.

TERACOLUS EPIGONE, Feld.

T. microcale, Butl. See Ann. Mag. Nat. Hist., 1897, ii, p. 472.

3 ♀; all dry.

TERACOLUS GLYCERA, Butl.

7 ♂, 4 ♀.

TERACOLUS DAIRA, Klug.

2 ♂, 1 ♀.

BELENOIS SEVERINA, Cram.

Form *boguensis*, Feld. 1 ♂, intermediate.

January 9.

Between 9 and 11 a.m.

PIERINÆ.

TERACOLUS EUPOMPE, Klug.

2 ♂, 1 ♀, intermediate; 1 ♀ dry.

TERACOLUS EVARNE, Klug.

19 ♂, 3 ♀; all dry. The dry-season character especially well-marked in the females.

TERACOLUS EPIGONE, Feld.

1 ♂, 3 ♀; all dry.

TERACOLUS GLYCERA, Butl.

11 ♂, 1 ♀.

TERACOLUS DAIRA, Klug.

5 ♂, 1 ♀.

BELENOIS SEVERINA, Cram.

1 ♂, wet. Form *boguensis*, Feld., 3 ♂, 1 ♀ (yellow); all dry.

BELENOIS MESENTINA, Cram.

2 ♂, 1 ♀, wet; 1 ♀, intermediate.

ERONIA CLEODORA, Hübn.

1 ♂, wet.

LYCÆNINÆ.

TARUCUS THEOPHRASTUS, Fabr.

1 ♂, 1 ♀. The male corresponds very closely with specimens in Coll. Hope from Syria. The female, which is of the blue form, comes very near to *T. sybaris*, Hopff.

AZANUS JESOUS, Guér.

1 ♂.

LYCÆNESTHES AMARAH, Guér.

1 ♂.

In a letter to Prof. Poulton, which he kindly permits me to quote, Mr. Loat describes the present collecting-ground as follows:—"The country was flat, ground hard and dry, very little undergrowth, a few large trees, open bare patches of ground, a good deal of thorny scrub in clumps, and every here and there tufts of dried grass. The thorny scrub was mostly composed of a low-growing shrub bearing a small whitish flower with a slight nondescript scent; this seemed rather attractive to the whites and their allies." The great preponderance of Pierines in this two-days collection at Mangala will be noticed.

The remaining captures were all made at Gondokoro or in its immediate vicinity. With respect to them Mr. Loat writes as follows:—"The series caught at Gondokoro [Jan. 12, 16] were collected on a strip of land cleared of elephant-grass and weeds, and turned into a kind of garden with sweet potatoes, etc., growing in it, and a few wild flowers about, close to the edge of the river. The *L. chrysippus*, with hardly an exception, and also the *Acræas* were obtained on, or close to, the same strip of ground, some of the remainder [Jan. 13, March 8] were taken on ground like that described at Mangala. The weather on January 8, 9, 12, 13, was dry, sunny and warm. The rainy season generally begins [at Gondokoro] about the 15th of March, but this year (1902) it commenced about one month earlier; that is to say, we had occasional showers and squalls, with long intervals of fine weather. About the end of March the rains start with a certain amount of regularity, and last off and on till about October." In the neighbourhood of Kaka, 6° further north, the rains are later. As was stated above, at Gharb-el-Aish, on April 13 (1901), they were only just beginning.

IV. Bahr-el-Gebel (Nile); Gondokoro; 4° 43′ N. Lat. Strip of ground by the river.

1902, January 12.

Between 3 and 4 p.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. chrysippus, Linn., 4 ♂ (one with slight white powdering round gland-patch); *alcippoides*, Moore, 1 ♂; *alcippus*, Cram., 2 ♂; *klugii*, Butl., 2 ♂; *dorippus*, Klug, 1 ♂.

ACRÆINÆ.

Acræa vinidia, Hewits.

31 ♂, 1 ♀. "Very numerous; takes a long time to die when put in the killing-bottle."—W. L. S. L.

NYMPHALINÆ.

Neptis agatha, Cram.

1 ♂.

PIERINÆ.

Terias brigitta, Cram.

1 ♂, wet. The occurrence in January of this well-marked wet-season form is remarkable.

PAPILIONINÆ.

Papilio pylades, Cram.

1 ♀. "Rare."—W. L. S. L.

LYCÆNINÆ.

Polyommatus bæticus, Linn.

1 ♀.

V. Gondokoro and neighbourhood. Ground as at Mangala.

January 13.

Between 3 and 3.30 p.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. chrysippus, Linn., 2 ♂; *klugii*, Butl., 1 ♂ and 1 ♀. Mostly on the strip of ground by the river.

ACRÆINÆ.

Acræa vinidia, Hewits.

3 ♂. On the strip of ground by the river.

PIERINÆ.

Terias senegalensis, Boisd.

1 ♂, dry or intermediate.

Teracolus eupompe, Klug.

2 ♂, 1 ♀; all somewhat "dry."

Teracolus glycera, Butl.

1 ♂.

Belenois gidica, Godt.

Northern form. 1 ♀, dry.

Belenois mesentina, Cram.

1 ♀, dry.

LYCÆNINÆ.

Tarucus theophrastus, Fabr.

1 ♂.

Jan. 16.

A. Between 10 and 11 a.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. chrysippus, Linn., 8 ♂, of which two are small, and several have a faint white powdering on the hind-wing; *alcippus*, Cram., 1 ♂; *klugii*, Butl., 3 ♂, one with faint white powdering on hind-wing.

B. Between 11 and 12 a.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. chrysippus, Linn., 3 ♂, 1 ♀; *alcippus*, Cram., 1 ♀; *klugii*, Butl., 1 ♂ and 1 ♀, the latter with a slight powdering of white on the hind-wings; *dorippus*, Klug., 1 ♂.

ACRÆINÆ.

Acræa encedon, Linn.

1 ♂. This specimen is intermediate between typical *A. encedon* and the form *A. daira*, Godm. & Salv. The apical area is dusky, but the subapical bar is scarcely paler than the general ground-colour. On the various forms of *A. encedon*, and their relation with the corresponding forms of *L. chrysippus*, see Poulton and Marshall in Trans. Ent. Soc. Lond., 1902, pp. 479–484, etc., Plates XIV, XV.

NYMPHALINÆ.

Precis clelia, Cram.

1 ♂; rather small, intensely coloured; no trace of ocelli on upper surface; under-side looks "dry."

Neptis agatha, Cram.

1 ♂.

PIERINÆ.

Terias brigitta, Cram.

1 ♀; wet or intermediate.

Terias senegalensis, Boisd.

2 ♂, dry, one small; 1 ♀ dry or intermediate, also small.

Teracolus eupompe, Klug.

1 ♀, rather worn; dry or intermediate.

Belenois gidica, Godt.

Northern form. 1 ♂, dry or intermediate.

Belenois severina, Cram.

1 ♂, dry or intermediate.

All the captures on Jan. 16 were made in the "garden strip," on a patch of ground 50 yards square.

Jan. 18.

PIERINÆ.

Teracolus protomedia, Klug.

1 ♂ and 1 ♀, paired.

March 8.

Between 9.30 and 11.30 a.m.

DANAINÆ.

Limnas chrysippus, Linn.

L. klugii, Butl., 1 ♀.

PIERINÆ.

Teracolus eupompe, Klug.

5 ♂, 1 ♀; intermediate and dry.

Teracolus evarne, Klug.

15 ♂, 1 ♀; all dry, most of them markedly so.

Teracolus glycera, Butl.

3 ♂.

Leuceronia buquetii, Boisd.

1 ♀.

Pinacopteryx venatus, Butl.

1 ♂. This interesting *Pinacopteryx* is represented in the National Collection by only two specimens, both females. The first of these is the type, described and figured by Dr. Butler in Trans. Ent. Soc. Lond., 1871, p.

169; Pl. VII, fig. 7. It was collected on the White Nile by Petherick. The second is Captain Dunn's, and was captured in 1900 on the Bahr-el-Zeraf (Giraffe River, White Nile). The former is much the more heavily marked. Mr. Loat's male corresponds rather with the second specimen, which has more sharply-pointed and narrower wings than the type, and probably belongs to the dry-season phase of the species. The male appears to be hitherto undescribed.

Pinacopteryx venatus, Butl.—*Male.*—General aspect somewhat like that of *P. liliana*, Grose Smith; but smaller, and with fore-wings narrower and more sharply pointed.

Exp. al. 40 mm.

Upper surface:—Wings white. *Fore-wings* with inner third of costa and basal half of cell greyish; a marginal black point at the extremity of the third median branch, and marginal black spots at the extremities of the first and second median, the two radial branches, and the third subcostal. These spots increase in size from behind forwards, and those belonging to the first radial and the subcostal branches become fused, together with a costal spot, into a dark apical patch, in which however the separate constituents are still visible. A thin dark costal streak unites the apical black patch with the basal grey. In the *hind-wing*, the marginal extremity of each vein or branch, except the internal, is marked by a small black spot; the spots belonging to the second subcostal, radial, and second and third median, are somewhat linear, being elongated in the direction of the vein. *Lower surface:*—*Fore-wings* white, slightly greyish along costa and towards base; a small roundish black spot on lower disco-cellular venule. A fuscous mark, wedge-shaped with the base uppermost, passes downwards from the second subcostal near its termination to the space between the first and second radial veins, crossing the common trunk of the third and fourth subcostals; and a large roundish dark spot is situated between the second and third median branches, about half-way between cell and margin. All the veins and their branches, except the submedian, are beset near the margin with a slight powdering of fuscous scales, which at the extremity of each vein or branch become collected into a more or less definite spot. *Hind-wings* creamy white towards base and costa, elsewhere white like the fore-wings; costa edged with pale yellow. A dark oval spot, several times larger than the discoidal spot on the fore-wing, occupies the anterior half of the lower disco-cellular vein, the latter forming its long axis. There is a large fuscous spot on the costa at the termination of the costal vein, continued posteriorly by another similar spot in the interspace between the subcostals. From the posterior extremity of the latter spot a fuscous band passes across the wing as far as the interspace between the median and submedian veins, half-way across which it terminates. This band is of irregular width and runs generally parallel with the margin of the wing, about half-way between the cell and border. The veins are more richly powdered with fuscous scales than in the fore-wing, and the marginal spots are more prominent, all but that on the submedian being linear, like most of those on the upper surface. The fuscous powdering is more strongly marked on the third median branch than elsewhere, and is continued inwards along two-thirds of the posterior area of the cell as a definite dark streak. There is a rudimentary light fuscous spot in the interspace between the costal vein and the cell, a little internal to the origin of the first subcostal.

In the Hope Collection, Oxford. This form appears to be quite distinct from *P. simana*, Hopff., and *P. liliana*, Grose Smith. On the whole it most resembles the dry-season phase of the latter; but the absence of veining on the upper surface, and the much paler costal margin in *P. venatus* ♂, together with the well-developed apical dark patch and the dark marginal spots, seem to be distinctive.

BELENOIS SEVERINA, Cram.

1 ♂, dry.

A few moths were included in Mr. Loat's collection. They are as follows:—

SYNTOMIDÆ.

SYNTOMIS, sp.

LYMANTRIIDÆ.

DASYCHIRA ACRISIA, Plötz.

PYRALIDÆ.

SURATTHA, sp.

The above were all taken by Captain Bell on board a White Nile steamer between 5° and 6° 30′ N. Lat., Feb.—March, 1902.

ARCTIIDÆ.

DEIOPEIA PULCHELLA, Linn.

2 ♀; near Kaka, April 21, 1901.

GEOMETRIDÆ.

CÆNINA AURIVINA, Butl.

Gondokoro, Jan. 14, 1902.

FURTHER NOTES ON SEASONAL DIMORPHISM, SUGGESTED BY THE ABOVE COLLECTION.

It will have been noticed that Mr. Loat's specimens fall roughly into three series; the first (*A*) consisting of the butterflies captured near Kaka from April 13 to April 21, 1901; the second (*B*) comprising those collected at Mangala and Gondokoro from Jan. 8 to Jan. 18, 1902; and the third (*C*) being the final batch from Gondokoro caught on March 8, 1902. From the accounts that have been given above of the meteorological conditions prevalent at these periods in the several localities, we should expect all three series to show a preponderance of dry-season forms, though some specimens in series *A* might exhibit the influence of the early rains. The facts are well in accordance with this expectation, but it will be seen that series *B*, though belonging in point of time to the height of the dry season, affords examples of the statement that "in many cases where the existence of seasonal modification has been reasonably presumed, or even actually demonstrated, the seasonal relation is far from being rigidly fixed." *

Thus, the two January specimens of *Terias brigitta* are both wet-season forms; and the same series (*B*) contains several wet-season examples of *Belenois mesentina* and one of *B. severina*. But the most curious instance of apparent seasonal irregularity occurs in the case of *Teracolus daira*. All the specimens of this form caught at Mangala on Jan. 8 and 9 are heavily marked on the upper surface, and would certainly be pronounced at once by most authorities to belong to the wet season. Those on the other hand taken near Kaka on April 21, when the rains had well started, are lightly marked, and bear all the appearance of dry-season examples. Facts of this kind help to emphasise the need that exists for still fuller and more accurate data than we at present possess, if the problems of seasonal dimorphism are to be satisfactorily unravelled.

Persistence of dry-season coloration in the females of seasonally dimorphic species.—Mr. G. A. K. Marshall has lately drawn attention to the fact that in the genus *Acræa* "where the summer males exhibit any particular brilliancy, as *petræa*, *atolmis*, or *nohara*, it is always compensated for by an exceptional dulness on the part of their respective

* Trans. Ent. Soc. Lond., 1902, p. 193.

females." * This dulness of coloration in the wet-season females mentioned is with some hesitation interpreted by Mr. Marshall as being protective in its object. The present is perhaps a fitting opportunity for pointing out that the case of these three *Acraeas* seems to bear some relation to a far-reaching principle which has met with less notice than it deserves, and as to the significance of which no suggestion has hitherto been made. The principle I refer to is this :—that the dry-season garb of a seasonally dimorphic butterfly, at least as regards its under-surface, is often far better marked and more persistent in the female than in the male. This is obviously of interest in view of Professor Poulton's interpretation of the cryptic character of dry-season and desert forms.† It would accord with all that we know as to the special importance attaching to the life of the female, and the means that are taken for preserving it, that the more efficient mode of protection, such as on Professor Poulton's hypothesis the dry-season colouring must be, should be more completely and persistently adopted by the sex whose safety from enemies is of such vital moment to the species. The interest of the point perhaps justifies a slight digression, and I propose to give here a few instances which will serve to support the above generalization.

Xanthidia nicippe, Cram. North and Central America. The wet-season female retains on the under-surface a tinge of the dry-season purple.

Ixias pyrene, Linn. India, etc. Here also the wet-season female usually retains the dry-season mottling.

Ixias marianne, Cram. India. The wet-season female is nearly always brown beneath, as are both sexes in the dry season. The under-side of the wet-season male is yellow.

Catopsilia pomona, Fabr. Oriental and Australian Region. In the wet-season form (*C. crocale*, Cram.)‡ the female often retains in some degree the dry-season

* Trans. Ent. Soc. Lond., 1902, pp. 433, 434. It is hardly necessary to remark that the peculiar need for protection experienced by the female sex was first pointed out by Mr. Wallace. Some of the provisions towards this end were recognized by him as cryptic (as in many birds); others were supposed to be pseudaposematic. It is now known that synaposematism may also play an important part in the special protection enjoyed by female insects. See Trans. Ent. Soc. Lond., 1902, pp. 466, 467, *ibique cit.*

† *Ibid.*, pp. 431–433, etc. ‡ *Ibid.*, p. 109.

ocellation and other characters, though there is an extreme *crocale*-form in which they are lost. The "dry-season" form *C. catilla*, Cram., which is probably strongly cryptic, belongs solely to the female sex.

Pyrisitia proterpia, Fabr. Central and South America. This is a wet-season form of which there is every reason to suppose that *P. gundlachia*, Poey, is the dry-season modification. The seasonal changes of this species afford an interesting parallel with those in the genus *Precis* which have lately been so completely dealt with by Mr. Marshall and Professor Poulton.* The cryptic under-side of the dry phase is rendered still more leaf-like by the uncination of the fore-wing and the prolongation of the hind-wing into a tail-like process, as in *Precis archesia* and *P. antilope*. This applies to both sexes, but is better marked in the female, as can be seen in the specimens figured (Pl. VII, figs. 1–4). In the wet season both sexes have lost their leaf-like contour, but the female remains of a duller hue than the male. A somewhat similar case is that of *Teracolus auxo*, Luc., both sexes of which in the dry-season form (*T. topha*, Wallgr., or *T. keiskamma*, Trim.) often show a slight uncination in the fore-wing, though in this species "tails" are not developed. The cryptic colouring of the dry-season under-side is to some extent retained by the wet-season female (Pl. VII, figs. 5–8).

This latter is a common feature in the African and Indian genus *Teracolus*. *T. phlegyas*, Butl., *T. ione*, Godt., *T. regina*, Trim., *T. danae*, Fabr., *T. eucharis*, Fabr., *T. eris*, Klug, are all cases in point, for in each of them the wet-season female shows beneath at least a trace of the characteristic dry-season tinge. Even where this does not occur, the under-side of the female in the wet season is usually more cryptic than that of the male, as may be seen, *e. g.*, in *T. omphale*, Godt., and *T. achine*, Cram.

In *Teracolus phisadia*, Godt., and *T. puellaris*, Butl. (Pl. VII, figs. 9–12, 13–16) the principle receives perhaps its highest development. The female of the latter species retains its cryptic sand-coloured under-side at all seasons, the under-side of the male in the wet season being bright yellow. In the former species the female is always, on the under-side, a cryptic, sand-coloured, "dry-season" form; the male in the dry season may be similarly cryptic, or

* See Trans. Ent. Soc. Lond., 1902, pp. 424 *et sequ.*, Pl. XII, XIII.

may possess, as it always does in the wet season, a bright yellow under-surface, like that of *T. puellaris.*

Simultaneous occurrence of diverse seasonal forms.—Attention has frequently been called to the fact that at Aden, and probably in other arid districts, "dry," "wet" and "intermediate" forms may all be found on the wing together. Colonel Yerbury remarks with reference to Aden that "seasonal dimorphism does not seem to occur to any extent in the neighbourhood; though it may possibly do so in the case of *Teracolus calais* and *dynamene.*"* We may take this to mean, not necessarily that the different phases usually associated with different times of year are never found at Aden (for the occurrence of some of them at that spot is well attested), but that they do not there undergo, as in many places, a regular alternation in correspondence with the change of season. On the exceptional case of *T. calais* Colonel Yerbury remarks further as follows:—"The year 1883 was very wet, heavy rain having fallen in May, consequently in July a large number of Butterflies appeared—among others, a very brightly-coloured form of *T. calais* (all, I believe, females however): this may point to *T. calais* being the rainy-season form and *T. dynamene* the dry. I never met with this unusually brightly-coloured form in after years."

It may be noted in this record that at least a month must have elapsed between the heavy rain and its supposed effect on the numbers and aspect of the butterfly fauna; this seems to point (like the facts recounted by Poulton for the genus *Precis* †) to the larval being the susceptible stage. On the other hand, the effect of rain may in some instances be less remote, as appears from another statement by Colonel Yerbury,‡ as follows:—"Few passengers (for the matter of that, no great number of the residents) have any idea of the effect on 'the barren rocks of Aden' of a few heavy showers; how almost immediately, as if by magic, vegetation springs up in every ravine and watercourse, accompanied by a tolerably abundant insect fauna." In the discussion that followed the reading of the author's paper on "Seasonal Dimorphism" (Proc. Ent. Soc. Lond., March 19, 1902), Colonel Yerbury further observed that "a temporary rainfall in a dry season in dry

* Proc. Zool. Soc., 1896, p. 257.

† Trans. Ent. Soc. Lond., 1902, p. 457, etc.

‡ Journal Bombay Nat. Hist. Soc., vol. vii, 1892, p. 208.

places had a marvellous effect in producing intermediate and wet-season forms." That the meteorological conditions prevailing at or about the time of emergence may in some cases influence the aspect of a brood appears also from many experiments of Mr. Merrifield, especially those with *Selenia tetralunaria*, Hufn., by which it was conclusively proved that for certain effects of seasonal coloration "the later days of the pupal period were especially important."* It is worthy of notice that the rule which obtains in *Precis*, as to the superiority in size of the dry-season form, is not of universal application. Mr. Marshall rightly points out † that Mr. Barker's statement as to the generally smaller size of dry-season forms is too sweeping; but there can be no doubt that in many instances the statement in question holds good. This is perhaps especially the case among the *Pierinæ*, concerning the Indian species of which group Captain Watson says:—"In all genera the dry-season forms are as a rule smaller than the rainy-season forms." ‡ In other instances there appears to be no constant difference.

The superiority in bulk of the dry-season form in certain species of *Precis*, resting as it does upon the result of a careful series of weighings of the two forms by Professor Poulton, is quite beyond doubt; but it may be well to remember that in other instances a difference in size may sometimes be more apparent than real. This may possibly be the case with the broods mentioned by Mr. Merrifield in Trans. Ent. Soc. Lond., 1892, pp. 40, 41, on which, together with a similar experience of Weismann's, he bases a guarded opinion that both size and shape may be individually altered during the pupal state. This is a point that no doubt calls for further investigation, but in the meantime it will probably be allowed that, whatever may be the case with *Precis*, there is reason to believe that the seasonal aspect is not in all instances determined before the assumption of the pupal condition. It is, as has just been remarked, by no means certain that the differences in size noticed by Mr. Merrifield were as real as those in *Precis*, but, whether they were so or not, they could not under the circumstances have originated in the larval state.§

* Trans. Ent. Soc. Lond., 1891, pp. 155–167.

† *Ibid.*, 1896, p. 551; 1895, p. 413.

‡ Journal Bombay Nat. Hist. Soc., vol. viii, 1894, p. 492.

§ In considering the case of *Precis* it should not be forgotten that

The foregoing may perhaps help us towards an explanation of the well-attested facts relating to the simultaneous occurrence of seasonal forms in generally dry localities like Aden. A feature in Colonel Yerbury's graphic description of a temporary rainfall and its effects is the rapid springing-up of vegetation and the accompanying increase of insect life. As Professor Poulton has shown, these are the exact conditions which allow of the assumption of aposematic colouring and habits in exchange for those of a cryptic character. Now if we assume, as it seems from Colonel Yerbury's observations we may, that many of the Aden species are in a condition to respond almost immediately to a sudden access of moisture, the occurrence of the more conspicuous "wet-season" contemporaneously with the cryptic "dry-season" forms receives some explanation. Where there is a regular alternation of long periods of drought and humidity, the seasonal phases of the insect fauna fall into a corresponding regularity of succession; but where, as at Aden, a general state of aridity is liable to be occasionally disturbed by heavy rainfalls of a temporary character, the intermittent meteorological conditions are apt, we may suppose, to be reflected in a similar intermixture of aposematic and cryptic forms of insect life. It would not be difficult for residents in such localities to test the suggestion here offered.*

Note on Teracolus daira *and* T. evagore, *Klug.*—Dr. Butler, in his "Revision of the Genus *Teracolus*" (Ann. Mag. Nat. Hist., 1897), distinguishes *Teracolus yerburii*,

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the usual rule as to the superiority in weight of the *sesamus* form did not obtain in the instance of Mr. Marshall's *P. sesamus* and *P. natalensis* bred from two eggs laid by the same mother. The weights as determined by Professor Poulton (Trans. Ent. Soc. Lond., 1902, p. 451) show that in this case the *natalensis* form was the heavier of the two. Whatever then may have been the influence which caused the diversity between the two offspring, it did not find expression in any increased bulk of the *sesamus* larva. It should also be borne in mind that the larval conditions of the first dry- or wet-season brood will probably differ from those of the second and subsequent broods (should there be more than one) of the same season.

* See Mr. G. A. K. Marshall's account of the simultaneous flight of different seasonal phases during an abnormal season in Mashonaland (Ann. Mag. Nat. Hist., 1901, vol. ii, p. 402), and compare the discussion of the succession of seasonal phases in *Precis* by Professor Poulton and Mr. Marshall in Trans. Ent. Soc. Lond., 1902, pp. 443–449.

Swinh., from *T. daira*, Klug. Specimens of *T. yerburii*, however, collected at Lahej, Arabia, by Captain Nurse and determined by Colonel Swinhoe, who presented them to the Hope Collection, correspond closely with *T. daira* as figured by Klug. The locality given by Klug for *T. daira* being "Arabia felix," it seems improbable that *T. yerburii* can be more than a synonym for *T. daira*, though Mr. G. A. K. Marshall and Professor Aurivillius agree with Dr. Butler in keeping them distinct. *T. evagore*, Klug, which is no doubt identical with *T. saxeus*, Swinh., is regarded by Butler as the dry-season form of *T. yerburii*. Whether *T. glycera*, Butl., be considered as a species, or as a mere local race of *T. antigone*, there is no doubt that it is barely, or perhaps not at all, separable from *T. evagore*. Hence, if *T. evagore* be the dry-season form of the Arabian *T. yerburii* (i.e. *T. daira*), *T. glycera* should be the dry-season phase of the form of *T. daira* occurring in the same locality with itself, viz. on the White Nile. When, however, Captain Dunn's collection arrived from the Bahr-el-Zeraf branch of that river, it was found to contain *T. glycera* in different seasonal phases, all of which were quite distinct from the specimens of *T. daira* captured in the same district. In dealing with Captain Dunn's collection Dr. Butler * makes no attempt to unite these two forms, and the examination of Mr. Loat's specimens convinces me that he is right in keeping them distinct. But this seems to carry with it a similar conclusion with regard to the Arabian *T. evagore*, which, if the foregoing be correct, cannot be considered as the dry-season form of "*T. yerburii*" or *T. daira*. The only piece of evidence that seems to make against this view is the supposed breeding of *T. yerburii* and *T. evagore* by Captain Nurse from similar larvæ. Since writing the note in Trans. Ent. Soc. Lond., 1902, p. 195, I have been strongly disposed to think that the inference drawn from Captain Nurse's account needed confirmation, and I was accordingly quite prepared to agree with Colonel Yerbury when I found him urging in Miss Sharpe's very useful "Monograph of the Genus *Teracolus*" (p. 137) that "too much stress should not be laid on the fact that Captain Nurse bred a specimen of *T. evagore* from a caterpillar taken with the larvæ of *T. yerburii*. . . . *T. evagore* and *T. yerburii* may be seasonal forms [of each other], but

* Proc. Zool. Soc., 1901, pp. 25, 26.

at present the fact is not proved." Mr. Loat's collection appears to me to bring positive evidence against the view of their identity, and from the above considerations I think there can be little doubt that Mr. G. A. K. Marshall is right in entirely dissociating *T. eragore* in all its forms (including *T. nouna,* Luc.) from *T. yerburii* (i.e. *T. daira*).

I am indebted to Professor Poulton, F.R.S., for the opportunity of working out Mr. Loat's interesting collection, and also for the Plate which accompanies this paper.

Explanation of Plate VII.

Fig. 1. *Pyrisitia proterpia*, Fabr., wet-season form, male.
,, 2. ,, ,, ,, ,, female.
,, 3. *P. proterpia*, dry-season form (*P. gundlachia*, Poey), male.
,, 4. ,, ,, female.

The *wet-season* ♀ (Fig. 2) is less brightly coloured than the corresponding ♂ (Fig. 1).

In the *dry season* both sexes adopt cryptic colouring on the under-side, accompanied by leaf-like shaping of the fore- and hind-wing, more pronounced in the ♀ (Fig. 4) than in the ♂ (Fig. 3).

Fig. 5. *Teracolus auxo*, Lucas, wet-season form, male.
,, 6. ,, ,, ,, ,, female.
,, 7. *T. auxo*, dry-season form (*T. topha*, Wallgrn. = *T. keiskamma*, Trimen), male.
,, 8. ,, ,, female.

The *wet-season* ♀ (Fig. 6) retains some of the colouring of the dry-season form.

Both sexes in the *dry season* (Figs. 7 and 8) show slight uncination of the fore-wing.

The specimens represented in Figs. 6 and 8 were bred by Mr. Mansel Weale, and belong to the series referred to in Trans. Ent. Soc., Lond., 1902, p. 201.

FIG. 9. *Teracolus phisadia*, Godt., wet-season form, male.
,, 10. ,, ,, ,, ,, female.
,, 11. *T. phisadia*, dry-season form, male.
,, 12. ,, ,, female.

The under-side of the hind-wing in the ♂ (Figs. 9 and 11) is generally bright yellow, especially in the *wet season.*

The under-side of the hind-wing in the ♀ (Figs. 10 and 12) is sand-coloured at *all* seasons.

FIG. 13. *Teracolus puellaris*, Butl., wet-season form, male.
,, 14. ,, ,, ,, ,, female.
,, 15. *T. puellaris*, dry-season form (*T. ochreipennis*, Butl., = *T. vorus*, Swinh.), male.
,, 16. ,, ,, female.

The under-side of the ♂ is bright yellow in the *wet season* (Fig. 13), sand-coloured in the *dry* (Fig. 15).

The under-side of the ♀ is sand-coloured at *all* seasons.

See pp. 157, 158 above. In all the figures, the under-side alone is represented.

It should be borne in mind that in the absence of colour it is impossible to represent the tone-values with complete accuracy. The difference, *e. g.*, between the clear yellow of Figs. 9, 13, and the sandy tint of Figs. 10, 14, is far more conspicuous in nature than in the Plate.

X. *An Entomological Excursion to Bejar, Central Spain.* By GEORGE CHARLES CHAMPION, F.Z.S.

[Read March 18th, 1903.]

IN our Transactions for last year (pp. 115–129) I gave a short account of a journey made by Dr. T. A. Chapman and myself in 1901 to Cuenca and other places in Central Spain, with a list of the principal Coleoptera and Hemiptera met with. In 1902 we made another excursion to Central Spain, our objective point on this occasion being the Sierra de Bejar, at the extreme southern extremity of the large province of Leon, about forty miles south of Salamanca. The locality was not a new one, entomologically, Dr. G. Seidlitz having spent a few days in the district in 1865, at the same time of year, and published some notes on the species of beetles he met with (*cf.* Berl. ent. Zeitschr. 1867, pp. 167–178).* Leaving London on the morning of June 21st, we reached San Sebastian the following afternoon, and after spending a few days at this attractive seaside resort on the north coast, proceeded on our way to Bejar, arriving at 8 a.m. on June 26th, passing over the dreary plains of Castile and Leon during the night and early hours of the morning, but little of the country being visible after daylight, owing to fog. Making our head-quarters at the Fonda del Nuevo Siglo, we remained at Bejar till July 17th. From this place we made numerous excursions, chiefly to the summit of the Sierra, about 8000 feet, the small omnibus running daily to Candelario in the early morning and evening helping us each way, and to Baños, through the "puerto," or gap in the range separating Leon from Estremadura, whence there is rough track back to Bejar over the mountains by La Garganta. The town of Bejar, which is situate at an elevation of about 3300 feet, is built on a narrow rocky ridge just under the mountains sloping down to it on the southern side, and on the north side the river Cuerpo del

* Dr. Chapman has already published some notes on the Lepidoptera observed during our journey (Proc. Ent. Soc. London, 1902, pp. xxxv–xxxvii; Ent. Record, 1903, pp. 14–16 *et seq.*).

Hombre runs in a deep hollow, beyond which the arid adjacent slopes are mostly occupied by terraced vineyards. The hillsides were very gay on our arrival with one of the various species of "broom" characteristic of the district, viz. *Genista florida*, this being in full flower at the end of June. On the higher parts of the Sierra this plant was replaced by *Cytisus purgans*, the dense masses of its yellow flowers being visible from a long distance. On the slopes near the town, the vegetation chiefly consisted of chestnut and small deciduous oaks, of which latter there were woods at an elevation of quite 5500 feet, near La Garganta, as well as low down on the other side of the river near San Gil; and amongst the broom there was a great deal of arborescent heath, lavender, and other aromatic plants, etc. The whole of the Bejar region visited seemed to be of granite formation, and no pines or other Coniferæ were seen. From the summit of the Sierra de Bejar, on which there were large patches of snow up to the beginning of July, a magnificent view was obtained of the higher Sierra de Gredos, with its numerous jagged, snowy peaks, this range extending far to the eastward towards the Guadarrama, becoming gradually lower in that direction; the Sierra de Gata,* and some of the mountains of Portugal, none of these appearing to be much over 6000 feet; the plains of Leon and Castile, and a portion of those of Estremadura, etc. The abundance and variety of "brooms" and the vast number of insects to be found on them when in flower, especially on *Genista florida*, was to us the most interesting feature of the district, nothing of the kind having been noticed by us at Cuenca, etc., the previous year. On the higher parts of the Sierra many beetles were to be found, such as *Asida castellana*, *Dorcadion dejeani* (the only species of the genus met with during the entire trip), *Corymbites* of several species, including *C. hæmapterus*, a very elongate *Athous*, *Otiorrhynchus dentipes*, two *Nebriæ*, *Cymindis* of several species, *Amara ooptera*, *Trechus pandellei*, a *Bembidium* of the *B. glaciale*-group, *Pterostichus azaræ*, four species of *Zabrus*, including *Z. constrictus*, *Byrrhus depilis*, *Olocrates*, *Heliopates*, *Tentyria*, *Timarcha*, etc., many of them in plenty. A little lower down *Chlænius dives* ran about on the grassy slopes,

* Dr. Seidlitz visited Alberca and the Peña de la Francia in this district in 1865. We had intended also to go there, but deferred the journey till too late.

or among the stones, often with *Dorcadion dejeani;* and *Platycerus spinifer* was taken on the wing amongst *Cytisus purgans,* this plant not ascending much over 7000 feet. On its flowers, or on those of *Genista horrida,* a *Zonabris* occurred in abundance, with *Lytta vesicatoria, Cryptocephalus koyi, Gynandrophthalma amabilis,* and a striped *Rhagonycha.* On the grass-stems thereabouts *Barypithes sulcifrons, Polydrusus affinis,* a *Dasytes,* a large *Henicopus*—the ♂ with long black hair, and the ♀ with greyish-white hair—*Meloe majalis,* etc., were met with. *Aphodius bonvouloiri,* too, was very common at about this elevation. The tracks made by the goats amongst the dense growth of *Cytisus* seemed to be the favourite haunts of *Asida, Tentyria, Olocrates,* various Coprophaga, Histeridæ, etc., as many of the specimens captured had evidently been trodden upon and injured by these animals. On the lower summits, especially in the walled-in enclosures where the goats are driven in to rest, lots of common Coprophaga were noticed—*Ateuchus, Gymnopleurus, Sisyphus, Geotrupes,* etc., as well as *Scaurus, Pimelia,* and other Tenebrionids, Histeridæ, etc. In some of the open grassy places in or near these enclosures the males of a *Chasmatopterus* flew in the greatest profusion in the sunshine, close to the ground, looking like bees on the wing, and they could be caught in any quantity with a butterfly-net, paired specimens frequenting flowers later in the day. In an oak wood above La Garganta, in which there were many "brooms," *Cardiophorus signatus* and other members of the genus, *Lebia trimaculata, Strophosomus erinaceus,* various *Cryptocephali, Clythra, Agrilus biguttatus, Melanotus, Athous, Brachyderes, Polydrusus, Phyllobius,* and other species were taken, some of them in plenty. On the hillsides near the town of Bejar the *Genista florida,* while in flower, produced a great variety of beetles, as *Luperus nigrofasciatus* (in the greatest profusion), *Cneorrhinus,* sp. (in abundance, but all females), *Sciaphilus carinula, Apion argentatum* and others of the genus, *Sitones, Polydrusus, Melanotus, Cardiophorus, Corymbites, Rhagonycha, Dasytes, Haplocnemus, Danacæa, Malachius, Malthinus, Ebæus, Amauronia, Helops, Agrilus, Coræbus, Cryptocephalus, Zonabris, Lebia,* etc.; *Elater præustus,* var. *aurilegulus* (in plenty), a large *Lachnæa,* various *Cryptocephali, Athous,* etc., occurred on oak; a brassy *Haltica* on heath, etc. In the open places on these slopes *Corymbites gougeleti* was frequently taken on the wing, or found on grass-stems; and *Cerocoma schreberi* was locally common on flowers. In an oak wood on the dry slopes near San Gil, in which there were many small flowering plants, a number of interesting insects were captured, especially towards evening, as *Coræbus fasciatus* (rarely, on oak, and also found in an ants' nest under a stone), *Anthaxia hungarica* and others of the genus, *Serica mutata, Lagria rubida* (in abundance, but apparently all males), a fine *Pachytychius* (*P. sparsutus*) on *Cytisus welwitschi, P. scabricollis, Smicronyx, Orchestes, Cryptocephalus globicollis*, etc., *Pachybrachys*, various Clythrids, etc. On the slopes between this wood and the river a species of the remarkable Neuropterous genus *Nemoptera* flew freely towards evening. The river itself, or a small affluent of it, produced many Hydradephaga, as *Bidessus minutissimus, Deronectes carinatus, D. bicostatus, Hydroporus flavipes, H. bilineatus, H. lepidus, Agabus heydeni, A. brunneus, A. didymus, A. paludosus*, etc., also *Gyrinus urinator, Orectochilus*, and various Hydrophilidæ. On the walls of the town, as already recorded,* we noticed various galls on the stems of a species of *Cotyledon*, a plant growing very commonly in such situations, and these were found to contain specimens of *Nanophyes durieui* in all its stages, a species not mentioned by Dr. Seidlitz in his list of Bejar insects, and originally described from Algeria.

Leaving Bejar on July 17th, we went on by the diligence to Piedrahita, about five hours' journey, in the heat of the day, where we remained till the 23rd, our road beyond the "puerto" being fairly level and extending through a somewhat arid country, where the ground was everywhere cultivated, even between the very old scattered olive-like, evergreen oaks (? *Quercus gramuntia*) to be seen in many places, the river Tormes being crossed by an ancient bridge at about half-way. At Piedrahita the best collecting-ground was the slope and summit of the adjacent Sierra, about 5500 feet elevation, which runs parallel with the Gredos, and is separated from it by large elevated tracts and valleys, affording extensive pasturage for cattle in the summer months. *Cytisus purgans* grew in abundance in these places (the old stems apparently being in much demand for fuel), extending down the slopes for about five hundred feet. Below this again was

* Trans. Ent. Soc. Lond. 1903, pp. 87–91.

a belt of oak wood. On the summit of the Sierra a few *Dorcadion dejeani* were seen, but all too worn to take; also *Chlænius dives, Amara aptera*, various *Cymindis* and *Harpalus, Asida castellana, Steropus ghilianii*, a small *Olocrates, Zabrus*, etc. Here, on *Cytisus purgans*, a curious *Cneorrhinus* was met with: the ♂ of elongate shape and with greyish scales, the ♀ much larger, pyriform, and with green scales, the female in abundance, and the two sexes often in company; and with these occurred a few females of the species found at Bejar on *Genista florida*. On the stems of the *Cytisus* the local *Cryptocephalus crosus* was often to be seen, but rarely captured, also various Clythrids. In grassy places amongst this plant, on the Sierra, *Acmæodera tæniata* was to be found in profusion on flowers; and wherever there was any dung *Aphodius bonvouloiri* could be taken in any quantity, occasionally in company with the brilliantly-coloured *Geotrupes* [illegible]. A patch of uncultivated rocky ground near the town of Piedrahita, on which there were many ancient evergreen oaks, and *Genista cinerea* and the usual brooms, *Eryngium*, etc., produced a good many interesting insects not seen elsewhere. On July 19th an excursion was made to El Barco, on the Tormes, in the valley between the "Bejar" and the "Gredos," whence a rough road extends to the plains of Estremadura. The long time occupied on the journey, which was made in a not uncomfortable country cart (tartana), gave us, however, but a few hours at the place, our investigations being limited to the ground in the immediate vicinity of the river. Here there was an abundance of alder, sallow, and familiar marsh-plants, but very little to be got by beating. *Anomala rugatipennis* flew about pretty freely in the sunshine; and on the flowers or stems of the gigantic Umbelliferæ were *Cardiophorus rufipes, Leptura fontenayi*; (♂ and ♀), *Clytanthus trifasciatus, Trichodes octopunctatus*, an *Agapanthia*, and *Cerocoma schreberi*, and an abundance of conspicuous common Hymenoptera and Hemiptera. By the banks of the Tormes *Perileptus, Pæderus, Bledius*, etc., were found, as well as *Pseudophlæus, Emblethis*, and other Hemiptera.

On July 23rd we left Piedrahita for Avila, by the diligence, a wearisome journey of six hours, remaining in the last-mentioned place for three days. From this most interesting old city the high ground was quite inaccessible, though visible, so we had to content ourselves by collecting in the immediate vicinity. The season was now too far advanced for many of the beetles, though *Zonabris*, *Cerocoma*, *Clytanthus trifasciatus*, and various Clythrids were to be seen on flowers, and a *Thylacites* abounded under stones, exposed to the full heat of the sun. In the sandy bed of the nearly-dried-up River Adaja there was, however, an abundance of interesting insects, including many species of *Bembidium* and *Philonthus*, *Aleochara rufipennis*, an undescribed *Lathrobium*, *Tachyusa coarctata*, *Pæderus ruficollis*, *Heterocerus*, *Parnus*, *Aphodius*, etc.

On our homeward journey we spent a day or two at both Burgos and St. Jean de Luz, but the insects noticed at these places do not call for special comment. At San Sebastian, however, on June 23rd, we met with *Orina rugulosa*, Suffr., in some numbers, on a species of *Centaurea*, a species that does not appear to have been recorded from Spain.

The Coleopterous fauna of the Bejar and Piedrahita districts seems, on the whole, to be very similar to that of the Guadarrama, yet many genera are represented by one or more different species, as *Dorcadion*, *Nebria*, *Cneorrhinus*, etc. The total absence of Coniferous trees, so abundant at La Granja, must, however, make a great difference, and it is probable therefore that the Guadarrama is much the richer of the two. Unfortunately, we were unable to work the higher main Gredos range, though rough accommodation could no doubt be obtained at one or other of the small villages lower down in the valleys on its northern or southern slope. The genus *Dima*, amongst the Elateridæ, well known from the Guadarrama, was not found by us. The Sierra de Bejar, it may be noted, could be much better worked from Candelario, than from the more distant town of Bejar. As regards the Hemiptera-Heteroptera, several of the species have not previously been recorded from Spain, two of the Capsidæ being new.

The following is a list of the species of Coleoptera and Hemiptera-Heteroptera taken, so far as at present identified. To avoid repetition the principal localities are in most cases abbreviated thus:—S. Bej. = Sierra de Bejar; Bej. = Bejar; Piedr. = Piedrahita; Av. = Avila.

Coleoptera.*

Cicindela hybrida, L., rarely, Av. *Carabus melancholicus*, F., and *C. latus*, Dej., rarely, under stones, S. Bej. *Nebria pazi*, Seidl., one example, and *N.* sp. n.?, a few specimens, at the source of a small stream, near the melting snow, S. Bej.: the types of the former were obtained in the same locality. *Bembidium carpetanum*, Sharp (the Guadarrama form of *B. glaciale*, Heer, of the Swiss Alps, has been recently named *B. carpetanum*, and the Sierra Nevada form *B. montanum*, Ramb., by Dr. Sharp), in plenty, on the summit of the Sierra de Bejar, near the melting snow. *B. elongatum*, Dej., *B. paulinoi*, Heyd., *B. quadripustulatum*, Serv., *B. quadriguttatum*, F., *B. octomaculatum*, Goeze, *B. hispanicum*, Dej., in profusion, and others of the genus, Av., in the sandy bed of the River Adaja; *B. punctulatum*, Drap., Av. and on the banks of the Tormes at El Barco; *B. maculatum*, Dej., El Barco; *B. ibericum*, Pioch., Piedr.; *B. laterale*, Dej., in plenty, on the banks of streams, Bej., Piedr., Av. *Tachys parvulus*, Dej., and *T. sexstriatus*, Duft., Bej. *Trechus pandellei*, Putz., S. Bej. *Perileptus areolatus*, Creutz., banks of the Tormes, El Barco. *Platynus marginatus*, L., Av.; *P. viridicupreus*, Goeze, Bej. *Abacetus salzmanni*, Germ., Bej. *Steropus ghilianii*, Putz., under stones, S. Bej., Piedr.; *S. sp.?*, Piedr. *Pœcilus crenulatus*, Dej., Bej. *Pterostichus nigrita*, F., Bej.; *P. azaræ*, Perez, S. Bej., four specimens. *Amara ooptera*, Putz., under stones, summit of the Sierra de Bejar, a few specimens. *Zabrus constrictus*, Graells, abundant, and *Z. neglectus*, Schaum, *Z. silphoides*, Dej., and *Z. estrellanus*, Heyd., sparingly, S. Bej. *Chlænius dives*, Dej., sparingly, and varying greatly in colour, running in grassy places, near the summit of the Sierras de Bejar and Piedrahita; *C. velutinus*, Duft., banks of the Cuerpo del Hombre, Bej. *Lebia cyanocephala*, L., and *L. trimaculata*, Vill., sparingly, by beating broom, oak, etc., Bej. *Lionychus albonotatus*, Dej., banks of the Tormes, El Barco. *Cymindis melanocephala*, Dej. (*ruficollis*, Graells), in plenty, and others of the genus more sparingly, S. Bej.; *C. variolosa*, F., S. Bej., Piedr.

* I am indebted to MM. Bedel, Fauvel, Reitter, and Schilsky, and Dr. J. Daniel, for assistance in the determination of several of the species enumerated.

Haliplus spp., *Bidessus minutissimus*, Germ., *Deronectes bicostatus*, Schaum,* rarely, *Hydroporus lepidus*, Oliv., *H. flavipes*, Oliv., *H. varius*, Aubé, and *H. tessellatus*, Drap., commonly, and various other species of the genus, *Liopterus ruficollis*, Schall., *Agabus brunneus*, F., and *A. didymus*, Oliv., in plenty, and *A. paludosus*, F., *A. heydeni*, Wehncke, *A. bipustulatus*, L., and *A. nitidus*, F., sparingly, *Ilybius fenestratus*, F., etc., in a small affluent of the Cuerpo del Hombre, Bejar; *Deronectes carinatus*, Aubé, not rare, and *Dytiscus marginalis*, L., in the river itself, Bej. *Gyrinus urinator*, Ill., *Orectochilus villosus*, F., Bej.

Paracymus æneus, Germ., *Cœlostoma hispanicum*, Küst., and various species of *Philhydrus*, *Helochares*, *Limnebius*, *Laccobius*, *Hydrochus*, *Helophorus*, *Hydræna*, and *Parnus*, Bej.

Aleochara rufipennis, Er., not rare, in the sandy bed of the Adaja, Av.; *A. brevipennis*, Grav., *A. fuscipes*, F., Bej. *Tachyusa coarctata*, Er., Av. *Notothecta laevicollis*, Rey, in an ants' nest, Bej. *Philonthus suavis*, Bris., in abundance, and *P. atratus*, Grav., and *P. punctus*, Grav., rarely, in the bed of the Adaja, Av.; *P. varius*, Gyll., var. *bimaculatus*, Grav., *P. laminatus*, Lac., *P. politus*, L., Bej. *Scopaeus didymus*, Er., Av. *Sunius (Astenus)* n. sp., singly, under a stone, Bej. *Lathrobium* n. sp.? (near *L. punctatum*, Zett.), banks of the Cuerpo del Hombre, Bej. *Pæderus ruficollis*, F., common on banks of streams, Av., Bej.; *P. fuscipes*, Curt., El Barco. *Stenus longitarsis*, Thoms., rarely, *S. nanus*, Steph., and *S. leprieuri*, Cussac, in plenty, banks of stream, Bej. *Bledius fracticornis*, Payk., Av.; *B. hispidulus*, Fairm., banks of the Tormes, El Barco. *Anthobium hispanicum*, Bris., *A. torquatum*, Marsh., *A. minutum*, F., *Philorhinum sordidum*, Steph., Bej.

Mastigus palpalis, Latr., a few specimens by beating herbage in damp places, Bej., also at Baños. *Silpha* sp., S. Bej. *Olibrus bisignatus*, Mén., in plenty on thistles, Bej.; *O. ænescens*, Küst., not rare, Av. *Dapsa acuticollis*, Reitt., one specimen, Bej., with the *Mastigus*. *Meligethes fuscus*, Oliv., Bej. *Brontes planatus*, L., and *Silvanus unidentatus*, Oliv., under bark of an old cherry-tree, Baños. *Airaphilus* sp., Bej. *Attagenus trifasciatus*, F., common on

* The *D. bicostatus* of my Cuenca list (Trans. Ent. Soc. Lond. 1902, p. 122) was incorrectly identified; it is unknown to Dr. Sharp, and is probably an undescribed species.

flowers, Bej. *Ctesias serra*, Bej. *Orphilus niger*, Rossi, Bej. *Byrrhus depilis*, Graells, S. Bej. *Limnichus incanus*, Kies., Bej., El Barco. *Hister major*, L., *H. inæqualis*, Oliv., *H. amplicollis*, Er., here and there, S. Bej.; *H. sinuatus*, Ill., common in dung, Bej., Piedr., Av.

Lucanus cervus, L., *Dorcus parallelopipedus*, L., Bej. *Platycerus spinifer*, Schauf., a few specimens taken on the wing amongst old plants of *Cytisus purgans*, high up on the Sierra de Bejar.

Ateuchus sacer, L., *A. laticollis*, L., S. Bej. *Sisyphus schæfferi*, L., abundant, Bej. *Gymnopleurus pilularius*, L., El Barco; *G. flagellatus*, F., S. Bej. *Bubas bubalus*, Oliv., S. Bej. *Onitis hungaricus*, Herbst, Av. *Onthophagus schreberi*, L., common in dung, and other species of the genus, Bej.; *O. verticicornis*, Laich., Piedr.; *O. furcatus*, F., Av. *Oniticellus flavipes*, F., Piedr., Av. *Aphodius bonvouloiri*, Harold, in abundance, Sierras de Bejar and Piedrahita; *A. ferrugineus*, Muls., Bej.; *A. scrofa*, F., Piedr.; *A. niger*, Panz, and others of the genus, Bej.; *A. varians*, Duft., Av. *Ammæcius* sp., Bej. *Pleurophorus cæsus*, Panz., Bej. *Geotrupes coruscans*, Chevr., Sierra de Piedr.; *G. lævigatus*, F., *G. hypocrita*, Serv., etc., S. Bej. *Rhizotrogus pygialis*, Muls., Piedr., Av., flying in the sunshine; *R. pineticola*, Graells, El Barco. *Serica mutata*, Gyll., commonly, by beating herbage in open places in an oak wood towards evening, Bej. *Triodonta aquila*, Lap. (?), Bej. *Hymenoplia*, sp., in plenty, on stems of grass, etc., S. Bej., Piedr. *Chasmatopterus villosulus*, Ill., males found in profusion flying over grass, near the ground, looking very much like Hymenoptera on the wing, paired specimens found on flowers, later in the day, the black females comparatively scarce, Bej. and S. Bej.; *C. hispidulus*, Graells, *C. hirtulus*, Ill., sparingly, Bej. *Anomala rugatipennis*, Graells, not rare, on *Echium* or flying in the sunshine, banks of the Tormes, El Barco; *A.* sp., on the wing towards evening, Av. *Anisoplia bætica*, Er., Bej. *Hoplia* spp., Bej. *Cetonia oblonga*, Gory, *C. morio*, F., Bej., Piedr. *Epicometis hirta*, Poda, El Barco. *Leucocelis stictica*, L., Bej.

Anthaxia hungarica, Scop., rarely, by sweeping low plants, Bej.; *A. hypomelæna*, Ill., not uncommon on *Eryngium*, Piedr.; *A. funerula*, Ill., *A. millefolii*, F., Piedr., Bej. *Acmæodera tæniata*, F., in abundance on *Hieracium* flowers, amongst the dense growth of *Cytisus purgans*, Sierra de Piedr.; *A. discoidea*, F., *A. adspersula*, Ill., etc., Bej. *Chrysobothrys affinis*, F., one specimen, on an old stem of *Cytisus*, S. Bej. *Coræbus fasciatus*, Vill., rarely, by beating herbage, also found dead in an ants' nest under a stone, San Gil, near Bejar; *C. æneicollis*, Vill., Bej.; *C. gibbicollis*, Ill., Piedr., Bej. *Agrilus biguttatus*, F., on oak, Bej.; *A. cinctus*, Oliv., not rare on *Genista florida*, Bej., Piedr., El Barco; *A. roscidus*, Kies., *A. solieri*, Cast., *A. hyperici*, Cr., *A. angustulus*, Ill., Bej. *Aphanisticus elongatus*, Villa, and *A. emarginatus*, F., Bej., by sweeping. *Trachys reflexa*, Gené, one specimen, by sweeping on the banks of a small stream, Bej., perhaps new to the Spanish list.

Drasterius bimaculatus, Rossi, Bej. *Elater præustus*, F., var. *aurilegulus*, Schauf., in numbers, by beating oak, on the hillside near the town of Bejar; *E. nigerrimus*, Lac., one specimen, with the preceding, Bej. *Melanotus tenebrosus*, Er., and *M. castanipes*, Payk., common, Bej. *Cardiophorus signatus*, Oliv., in abundance by beating broom, etc., in oak woods; *C. equiseti*, Herbst, *C. graellsi*, Cand., etc., with *C. signatus*, but more sparingly, Bej.; *C. rufipes*, Goeze, El Barco. *Athous godarti*, Muls., and other species of the genus, not yet determined, Bej. *Corymbites hæmapterus*, Ill., under stones, on the summit of the Sierra de Bejar, not rare; *C. gougeleti*, Fairm., in numbers on the hillside close to the town of Bejar, on stems of low plants, on the wing, etc.; *C. kiesenwetteri*, Bris. (?), *C. latus*, F., *C. amplicollis*, Germ., *C. nivicola*, Kies., etc., rarely, S. Bej. *Silesis rutilipennis*, Ill., Bej.

Hydrocyphon sp.?, in plenty on sallows, Bej. *Lampyris* sp., Bej. *Telephorus*, *Rhagonycha*, *Malthinus*, *Malachius*, *Attalus*, *Charopus*, *Hypebæus*, *Dasytes*, spp. undetermined, *Haplocnemus albipilis* Kies., etc., Bej. *Henicopus*, 2 spp., S. Bej., Piedr.: (1) (*H. heydeni*, Kies.) very large, the ♂ deep black, with entirely black pubescence, the ♀ with greyish-white hairs, the ♂ in abundance, and the ♀ rarely, on grass-stems, etc., on the mountain slopes; (2) (? *H. rugosicollis*, Duv.) ♂ and ♀ with grey pubescence. *Danacæa atripes*, Graells, Bej. *Amauronia elegans*, Kies., Bej. *Trichodes octopunctatus*, F., not rare, on Umbelliferæ, El Barco., *T. leucopsideus*, Oliv., *T. ammios*, F., Bej. *Lasioderma læve*, Ill., on flowers, Bej., Piedr. *Xylopertha* sp., Bej.

Tentyria spp., S. Bej., in plenty, running about on the slopes, S. Bej. *Dichillus subcostatus*, Sol., rarely, under stones, Bej. *Akis acuminata*, F., in abundance, under old straw, under the shelter of a large rock, Av. *Scaurus striatus*, F., in numbers, under dung, etc., S. Bej. *Asida castellana*, Graells, in abundance at or near the summit of the Sierra de Bejar, and rarely on that of Piedrahita, running about in the sunshine, especially about dung in the tracks made by goats amongst the *Cytisus* bushes; *A. goudoti*, Sol., rarely, S. Bej., also taken at Burgos, and at Guadalaviar and Albarracin, in 1901; *A. sericea*, Oliv., S. Bej., also taken at Burgos, and at Tragacete and Albarracin, in 1901. *Pimelia* sp., a few specimens, on the paths, near dung, S. Bej. *Crypticus kraatzi*, Bris. (?), and *Oochrotus unicolor*, Luc., rarely, under stones, Bej. *Olocrates saxicola*, Muls. (*saxeticola*, Graells), a few specimens apparently belonging to this species, found under stones, summit of the Sierra de Piedrahita; *O. foveolatus*, Graells, in abundance, summit of the Sierra de Bejar, running about in the sunshine, frequently in copula. *Dendarus*, *Heliopates*, *Micrositus ulyssiponensis*, Germ., *Gonocephalum*, spp. undetermined, Bej., Av., etc. *Calometopus clypeatus*, Germ., rarely, under bark of an old cherry-tree, and also under a stone, Baños, Bej.: recorded by Graells as having been found in a rotten chestnut-tree at Tornavacas. *Helops laticollis*, Küst. (?), by beating *Genista*, etc., not rare, Bej. *Hymenalia rufipes*, F., not rare, Bej. *Omophlus ruficollis*, F., in abundance everywhere on flowers, Bej., Piedr.; *O. incertus*, Muls., *O. picipes*, Fabr., rarely, Bej. *Lagria lata*, F., common on stone walls, etc., Piedr., Av.; *L. grenieri*, Bris., Bej.; *L. hirta*, L., *L. atripes*, Muls., *L. rubida*, Graells (*parvula*, Perris), Bej., the last mentioned in abundance by sweeping low plants towards evening, but males only seen, Bej. *Scraptia dubia*, Oliv., by beating oak, Bej. *Notoxus trifasciatus*, Rossi, Bej., El Barco, Av.; *N. platycerus*, Laf., banks of the Tormes, El Barco. *Anthicus rodriguesi*, Latr., common, on the ground beneath low plants, Bej.; *A. quadriguttatus*, Rossi, Av.; *A. tristis*, Schmidt, Bej. *Ochthenomus unifasciatus*, Bon., Bej. *Mordella aculeata*, L., *Mordellistena* spp., *Anaspis* spp., Bej. *Silaria brunnipes*, Muls., *S. trifasciata*, Chevr., common on flowers, Bej. *Emenadia larvata*, Schrank, one specimen, on a flower, Piedr. *Meloe majalis*, L., common, occurring even high up on the Sierra, Bej.

Cerocoma schreberi, F., locally common, on flowers, Bej., Piedr., Av. *Lytta vesicatoria*, L., in plenty in various places, numerous males often seen near a single female, on *Cytisus purgans* and *C. scoparius*, Bej., Piedr., most of the specimens with a space down the middle of the disc of each elytron coppery or golden. *Zonabris*, various species, some in great abundance on the *Cytisus purgans* and *Genista florida*: *Z. quadripunctata*, L., Bej., Piedr., Av.: *Z. dejeani*, Gyll., Bej.; *Z. amori*, Graells (?), Bej., El Barco; *Z. geminata*, F., Piedr., and others. *Coryna billbergi*, Gyll., Bej. *Zonitis præusta*, F., El Barco. *Œdemera simplex*, L., Bej., Piedr.

Otiorrhynchus dentipes, Graells, in plenty, running about in the sunshine, summits of the Sierras of Bejar and Piedrahita. *Phyllobius* sp. (near *P. tuberculifer*, Chevr.), not rare by beating herbage, Bej. *Polydrusus setifrons*, Duv., *P. confluens*, Steph. (?), on the *Genista*, and others of the genus, Bej., Piedr.; *P.* (*Homapterus*) *affinis*, Chevr., very rarely, by sweeping long grass, S. Bej. *Sciaphilus carinula*, Oliv. (*cristatus*, Graells), in plenty on *Genista florida*, Bej. *Barypithes sulcifrons*, Boh., commonly, by sweeping long grass, in a damp place on the mountain slope, S. Bej. *Strophosomus erinaceus*, Chevr., in numbers, by beating oak, etc., Bej. *Brachyderes incanus*, L. (?), in abundance, with the preceding, Bej. *Sitones gressorius*, F., *S. regensteinensis*, Herbst, *S. crinitus*, Herbst, *S. flavescens*, Marsh., and its var. *cinnamomeus*, All., and others of the genus, chiefly on *Genista florida*, Bej. *Cneorrhinus*: various species of the subgen. *Atactogenus* occurred at Bejar or Piedrahita, and although these were the most characteristic and interesting forms of Curculionidæ obtained during the trip, I am quite unable to name them with any certainty from the published descriptions of Boheman, Graells, etc. One of these forms, found in abundance on or near the summit of the Sierra de Piedrahita, on *Cytisus purgans*, is very nearly allied to *C. pyriformis*, Boh., and *C. dispar*, Graells: the female is of large size and uniformly clothed with green scales; the male, which was comparatively rare, and, when seen, usually in company with the female, is narrow and elongate in form, and clothed with greyish scales, there being always a few green scales round the eyes, and sometimes several more scattered about on the elytra or legs. [A very similar species occurs at La Granja, specimens of which have been given me by M. Bedel: this insect, too, has a green female * and a grey male; the male, however, is less elongate than the Piedrahita examples of the same sex.] Another form, occurring in abundance in the immediate vicinity of Bejar, on *Genista florida*, varying greatly in size and colour, with dull greyish scales, the prothorax bi- or trivittate, and the elytra with the margins whitish and the disc often mottled with lighter or darker colour, may be referable to *C. dispar*, var. *meleagris*, Graells: all the specimens obtained at Bejar appear to be of the female sex (the smallest and narrowest examples have been dissected, to make certain), and a few females taken at Piedrahita, on *Cytisus purgans*, seem to belong to the same species, which I also have from Ferrol, N. Spain. A third form, represented by a single female specimen from Bejar, similar in colour to (and perhaps an extreme form of) the preceding, has the eyes more prominent, the prothorax more transverse, and the punctures of the striæ closely placed and rather coarse. [*C. graellsi*, Bris., quoted in Reitter's Catalogue as a synonym of *C. dispar*, var. *meleagris*, it may be noted, is recorded as having been taken in plenty at the Escorial, though females only were found; it is unknown to me. The species of the *Atactogenus*-group of *Cneorrhinus* evidently require a thorough revision. It is a curious fact that in two different localities a species has been taken in abundance, without the males being obtained, and that when specimens of this sex have been noticed, as at Piedrahita, they were far outnumbered by the females.] *C. spinipes*, Perez, sparingly on *Cytisus*, Bej. *Thylacites turbatus*, Gyll., in abundance on the arid hillsides, under stones fully exposed to the great heat of the sun, Av.; *T. spp.* (?), Piedr. *Lixus iridis*, Oliv., *L. ascanii*, L., *L. spartii*, Oliv., and *L. cardui*, Oliv., Bej., one or two of them on *Cytisus* or *Genista*. *Larinus* spp., *Anisorrhynchus* spp., and *Smicronyx* sp., Bej. *Pachytychius sparsutus*, Oliv., not rare, on the woolly pods of *Cytisus welwitschi*, Piedr., Bej., Baños; *P. scabricollis*, Rosenh., in plenty by sweeping low plants in dry places, Bej. *Ceuthorrhynchidius urens*, Gyll., Bej. *Ceuthorrhynchus geographicus*, Goeze, *C. biscutellatus*, Chevr., *C. larvatus*, Schultze, *C. squamulatus*, Bris., *C. melanostictus*, Marsh., var. *murinus*, Gyll. *C. denticulatus*,

* This form should certainly be named *C. pyriformis*, the type of which, from Lusitania, I have recently seen.

Schr., *C. gougelti*, Bris., *C. elegantulus*, Faust, var. *gracilis*, Schultze, Bej. *Baris timida*, Rossi, Bej. *Sibinia* spp., Bej. *Rhynchænus quercus*, L., *R. sparsus*, Fåhr., *R. avellanæ*, Don., *R. ilicis*, F., Bej. *Rhamphus flavicornis*, Clairv., Bej. *Cionus blattariæ*, F., Bej. *Nanophyes durieui*, Luc., bred in abundance from galls on *Cotyledon*, Bej., and one specimen swept from herbage, El Barco; *N. lythri*, F., in plenty on *Lythrum*, Bej.; *N. niger*, Waltl, *N. rubricus*, Rosenh., and other species of the genus, Bej. *Apion elongatissimum*, Desbr., Bej., on *Cytisus welwitschi*, in numbers, and subsequently bred from seed-pods of that plant brought home to England; *A. putoni*, Bris., and *A. argentatum*, Gerst., more or less plentiful, on *Genista florida*, Bej.; *A. brevirostre*, Herbst, *A. cyanescens*, Gyll., *A. alcyoneum*, Germ., *A. cantabricum*, Desbr., *A. kraatzi*, Wenck., *A. striatum*, Marsh., *A. immune*, Kirby, *A. lævigatum*, Payk. (*sorbi*, F.) (♂ ♀), *A. æthiops*, Herbst, and others of the genus, Bej.; *A. schönherri*, Boh., Piedr. *Hypoborus ficus*, Er., Bej.

Leptura fontenayi, Muls., a few specimens on Umbelliferæ, Piedr., El Barco. *Strangalia nigra*, L., and *S. maculata*, Poda, Bej. *Stenopterus ater*, L., Piedr. *Phymatodes testaceus*, L., Bej. *Plagionotus arcuatus*, L., a few specimens, Bej. *Clytanthus trifasciatus*, F., common on flowers (*Eryngium*, Umbelliferæ, etc.), Bej., El Barco, Av.; *C. ruficornis*, Oliv., one specimen, Piedr. *Dorcadion dejeani*, Chevr., in abundance on or near the summit of the Sierra de Bejar (whence it has been recorded by Dr. Seidlitz), at the beginning of July, and a few worn specimens seen later in the month on the Sierra de Piedrahita; it frequents grassy places, and runs about in the sunshine. *Tetrops præusta*, L., Bej. *Agapanthia cardui*, L., and others of the genus, Bej., El Barco. *Calamobius filum*, Rossi, Bej. *Phytœcia virescens*, F., etc., Bej.

Donacia thalassina, Germ., Bej.; *D. discolor*, Panz., Piedr. *Labidostomis lusitanica*, Germ., Bej. *Lachnæa vicina*, Lac., Bej., Piedr.; *L. pubescens*, Duf., not rare, on *Genista cinerea*, Bej., Piedr.; *L. sexpunctata*, Scop., common, on oak, readily taking to wing in the sunshine. *Titubæa sexmaculata*, F., Bej., El Barco, Av.; *T. biguttata*, Oliv., Piedr. *Gynandrophthalma affinis*, Hellw., Piedr.; *G. concolor*, F., common, on *Genista florida*, etc., Bej., Piedr.; *G. amabilis*, Lac., on *Genista horrida* and *Cytisus purgans*, on the mountain slopes, Bej., Piedr. *Clythra atraphaxidis*, Pall., Av.; *C. læviuscula*, Ratz., on oak, Bej. *Coptocephala scopolina*, L., Av., Piedr. *Cryptocephalus bimaculatus*, F., Bej., Piedr.; *C. imperialis*, Laich., Bej.; *C. sexmaculatus*, Oliv., Bej., Piedr.; *C. bipunctatus*, L., Bej.; *C. quadripunctatus*, Oliv., Bej.; *C. erosus*, Seidl., frequently seen and occasionally caught, on *Cytisus purgans*, Piedr., Bej. (originally described from Bejar); *C. moræi*, L., Bej.; *C. crassus*, Oliv., not rare, Piedr., Bej., one specimen bred from a cocoon found on *Genista; C. koyi*, Suffr., the commonest species of the district, on flowers, etc., the sexes differing considerably in the coloration of the prothorax, and the markings of the elytra varying in both sexes, Bej., Piedr.; *C. globicollis*, Suffr., not rare on flowers in dry places, the elytra usually of a coppery or golden colour, Bej.; *C. cærulescens*, Sahlb., Bej.; *C. violaceus*, Laich., common, on flowers, Bej., Piedr.; *C. celtibericus*, Suffr., occasional, on *Cytisus* and *Genista; C. pygmæus*, F., El Barco, Bej.; and others of the genus. *Pachybrachys viridissimus*, Suffr., Bej., Piedr.; *P. pteromelas*, Graells, rarely, on *Genista cinerea*, Piedr.; *P.* sp. (?), Bej. *Stylosomus* sp., on arborescent heath, Bej. *Timarcha* sp. (with femora and tibiæ partly red), not rare, near the snow, S. Bej. *Chrysomela americana*, L., and others of the genus, Bej. *Phytodecta variabilis*, Oliv., and *P. olivacea*, Forst., on *Cytisus* or *Genista*, Bej. *Malacosoma lusitanicum*, L., abundant, on flowers, etc., Bej., Piedr., etc. *Luperus nigrofasciatus*, Goeze (*circumfusus*, Marsh.), in profusion, on *Genista florida; L. lividus*, Joann., Bej.; *L. niger*, Goeze, Piedr., Bej. *Adimonia tanaceti*, L., Bej. *Dibolia timida*, Ill. (?), not rare, on *Eryngium*, Piedr., and others of the genus, Bej. *Psylliodes cyanoptera*, Ill., etc., Bej. *Chætocnema chlorophana*, Duft., Bej. *Apteropeda*, *Phyllotreta*, *Longitarsus*, *Aphthona*, spp. undetermined, Bej. *Haltica* sp., in profusion on arborescent heath, specimens often brassy in colour, Bej. *Hispa atra*, L., rarely, Piedr. *Cassida* spp., Bej.

Epilachna argus, Fourc., Bej. *Coccinella* 14-*pustulata*, L., *C. variabilis*, F., Bej., Piedr. *Adalia mutabilis*, Scriba, Bej. *Exochomus auritus*, Scriba, Bej. *Platynaspis villosa*, Fourc., Bej. *Hyperaspis reppensis*, Herbst, Bej. *Scymnus arcuatus*, Rossi, and others of the genus, Bej.

Hemiptera-Heteroptera.*

Odontotarsus grammicus, Linn., Bej. *Psacasta cerinthe*, Fabr., one specimen, Bej. *Eurygaster maura*, Linn., *E. nigrocucullata*, Goeze, Bej. *Graphosoma lineatum*, Linn., on flowers, Bej., El Barco. *Geotomus punctulatus*, Costa, Bej. *Brachypelta aterrima*, Forst., Piedr. *Ochetostethus nanus*, H.-S., Bej. *Schirus dubius*, Scop., Bej. *Sciocoris helferi*, Fieb., Bej. *Ælia rostrata*, Poh., Bej., Piedr. *Neottiglossa leporina*, H.-S., Bej. *Rhaphigaster nebulosa*, Poda, Bej. *Prionotylus brevicornis*, M. & R., Bej. *Carpocoris purpuripennis*, De G., Bej. *Peribalus sphacelatus*, Fabr., Bej. *Eurydema festivum*, Linn., El Barco; *E. oleraceum*, Linn., Bej. *Zicrona cærulea*, Linn., Bej. *Verlusia sulcicornis*, Fabr., and *V. quadrata*, Fabr., Bej. *Coreus hirticornis*, Fabr., Bej. *Pseudophlœus fallení*, Schill., at the roots of plants on the banks of the Tormes, El Barco; *P. waltli*, H.-S., Bej. *Strobilotoma typhæcornis*, Fabr., Bej. *Centrocoris spiniger*, Fabr., Bej., Av. *Micrelytra fossularum*, Rossi, Bej. *Camptopus lateralis*, Ger., Piedr., Bej. *Stenocephalus agilis*, Scop., Bej. *Corizus crassicornis*, Linn., *C. hyalinus*, Fabr., *C. rufus*, Schill., *C. parumpunctatus*, Schill., Bej. *Neides aduncus*, Fieb., in plenty by sweeping low plants in dry places, Bej., Piedr.; *N. tipularius*, Linn., Bej. *Berytus hirticornis*, Brullé, *B. montivagus*, Fieb., Bej. *Lygæus pandurus*, Scop., *L. saxatilis*, Scop., *L. albomaculatus*, Goeze, Bej.; *L. superbus*, Poll., in abundance under stones, Bej. *Nysius graminicola*, Kol., *N. lineatus*, Costa, Bej.; *N. punctipennis*, H.-S., two specimens, in sandy places on the banks of the Tormes, El Barco. *Cymus melanocephalus*, Fieb., common, Piedr., Bej. *Cymodema tabidum*, Spin., Bej. *Ischnorrhynchus geminatus*, Fieb., Bej. *Geocoris siculus*, Fieb., El Barco. *Heterogaster artemisiæ*, Schill., Bej. *Microplax interrupta*, Fieb., Piedr., Bej.; *M. plagiata*, Fieb., Av. *Metopoplax ditomoides*, Costa, in plenty on low plants, Bej. *Macroplax fasciata*, H.-S., Bej. *Pterotmetus staphylinoides*, Burm., Bej., Piedr. *Plinthisus brevipennis*, Latr. (macropt. form), Bej. *Aoploscelis bivirgatus*, Costa, Av., Piedr. *Peritrechus sylvestris*, Fabr., Piedr. *Rhyparochromus sabulicola*, Thoms., Bej., also found at Burgos.

* I am indebted to Dr. O. M. Reuter for the determination of most of the Capsids and Anthocorids, and to Dr. G. Horvath and Mr. E. Saunders for assistance with the Lygæids, etc.

Trapezonotus arenarius, Linn., *T. ullrichi*, Fieb., Bej. *Aphanus pini*, Linn., El Barco; *A. quadratus*, Fabr., El Barco, Bej. *Beosus maritimus*, Scop., Bej. *Lasiocoris anomalus*, Kol., Bej. *Emblethis angustus*, Mont., in numbers, Bej., El Barco. *Notochilus andrei*, Puton, three specimens, Bej., probably not previously recorded from Spain. *Monanthia echii*, Wolff, in profusion in all its stages, on *Echium*, El Barco, Bej. *Phyllontocheila auriculata*, Costa, Bej.; *P. cardui*, Linn., Bej. *Dictyonota fuliginosa*, Costa, in numbers, by sweeping low plants, Bej.; *P. strichnocera*, Fieb., Bej. *Catoplatus carthusianus*, Goeze, in abundance on *Eryngium*, Piedr. *Hydrometra stagnorum*, Linn., Bej. *Gerris najas*, De G., River Cuerpo del Hombre, Bej. *Harpactor iracundus*, Poda, Bej.; *H. sanguineus*, Fabr., Bej. *Coranus ægyptius*, Fabr., El Barco. *Nabis reuterianus*, Puton, Piedr.; *N. rugosus*, Linn., Bej.; *N. ferus*, Linn., Bej.; *N. lativentris*, Boh., Bej. *Salda cocksi*, Curt., Bej., Piedr.; *S. pilosella*, Thoms. (?), in the dried-up bed of the Adaja, Av. *Piezostethus maculipennis*, Baer., Bej.; *P. terricola*, Reut., one specimen under a stone, Bej. *Triphleps discolor*, Reut., Bej. *Pithanus mærkeli*, H.-S., Bej. *Megaloceræa erratica*, Linn., Bej. *Lopus gothicus*, Linn., Bej. *Homodemus M-flavum*, Goeze, Piedr. *Adelphocoris vandalicus*, Rossi, Bej. *Calocoris roseomaculatus*, De G., Bej.; *C. sulphureus*, Reut., Av. *Camptobrochis lutescens*, Schill., Bej. *Brachycoleus triangularis*, Goeze, in abundance on *Eryngium*, and varying greatly in colour, Piedr., Bej. *Capsus cordiger*, Hahn, and var. *fastidiosus*, Reut.,* *C. scutellaris*, Fabr., *C. ruber*, Linn., Bej. *Strongylocoris leucocephalus*, Linn., and *S. obscurus*, Ramb., common, Bej. *Cyllocoris histrionicus*, Linn., Bej. *Globiceps picteti*, Fieb., Bej., El Barco. *Tinicephalus discrepans*, Fieb., Bej. *Conostethus roseus*, Fall., Bej. *Dicyphus geniculatus*, Fieb., var. *disjunctus*, Reut.,* Bej.; *D. hyalinipennis*, Klug., not rare, by sweeping low plants, Bej.; *D. pallicornis*, Fieb., var., Piedr., Bej. *Grypocoris noualhieri*, Reut., Bej. *Orthocephalus saltator*, Hahn, Bej. *Dimorphocoris lividipennis*, Reut.,* Bej., not rare. *Hypsitylus prasinus*, Fieb., Bej. *Platycranus metriorhynchus*, Reut., Piedr. *Systellonotus championi*, Reut.* (♂ and ♀), Bej. *Megalocoleus bolivari*, Reut., Bej., in great abundance on a yellow-flowered aromatic composite plant (? *Santolina* sp.), the species in life being of the same colour as the flowers. *Sthenarus ocularis*, M. & R., Piedr., Bej. *Onychumenus decolor*, Fall., Bej.

The species or varieties marked with an asterisk are described in the Entomologist's Monthly Magazine for May 1903, pp. 119–121.

The following species of Capsidæ may be added to my previous list (Trans. Ent. Soc. Lond. 1902, p. 129):—*Phytocoris exoletus*, Costa, Albarracin; *P. femoralis*, Fieb., Bronchales; *P. vittiger*, Reut., var., Albarracin.

XI. *An Account of a Collection of* Rhopalocera *made on the Anambara Creek in Nigeria, West Africa.* By Percy I. Lathy, F.E.S.

[Read February 4th, 1903.]

Plate VIII.

The collection of Rhopalocera dealt with in the following pages is the largest that has yet been made on the Niger River; in all it contains two hundred and twenty-six species, twelve of which are undescribed.

Messrs. Godman, Salvin, and Druce, P.Z.S., 1884, pp. 219–229, and Mr. G. H. Carpenter, Proc. R. Dubl. Soc. (2) 8, pp. 304–310, 1895, have written two papers on Lepidoptera from this district; these two papers enumerate seventy-two species, seventeen of which are not in the collection here described, the names of these I give later.

I am indebted to Mr. Alex. J. Braham, the collector, for the following information on the district.

The Anambara Creek flows into the Niger River just above Asaba; the mouth of the creek is about three hundred miles from Forcados, and it extends (navigably) about a hundred miles inland. The whole country is flat, with only a few slight hills about sixty to eighty metres above sea-level; the banks of the waterways are densely clothed with forest and undergrowth, away from the water open bush prevails. The vegetation is chiefly of mushroom growth, soft sap trees of the "paw-paw" type, mingled largely with cocoanut and date-palms; ebony and mahogany are also to be found, and small mangroves are in profusion; orchids are rarely seen in flower, in fact flowers, the majority of which are glaring yellow in colour, are seldom seen. The rainfall is very heavy, the difference in the height of the rivers in wet and dry seasons being as much as sixty feet; in the wet season the whole country is practically under water, the high forest trees appearing merely as bushes on its surface.

The season may be divided as follows: middle of January to May intensely hot and damp, with many fierce tornadoes; the weather is then cooler till July, when the rainy season commences and lasts till the second week in October; during November and December dry winds prevail, and all vegetation is dried up, the temperature at noon rising as high as 110° Fahr. in the shade, and dropping to 60° Fahr. at night.

I wish to express my thanks to Mr. Francis A. Heron, of the Natural History Museum, South Kensington, for his assistance in determining many of the species, and to Mr. Henley Grose-Smith, who was so kind as to look over the new Lycænidæ.

The types of all the new species here described are in the collection of Mr. Herbert J. Adams.

1. *Danais chrysippus.*
Pap. chrysippus, L., Syst. Nat., ed. 10, p. 471 (1758).

The variety *alcippus*, Cram., appears to be the prevalent form.

2. *Danais petiverana.*
D. petiverana, D. and H., Gen. D. L., p. 93 (1847).

3. *Amauris vashti.*
D. vashti, Butl., Cist. Ent. i, p. 1 (1869).

4. *Amauris niavius.*
Pap. niavius, L., Syst. Nat., ed. 10, p. 470 (1758).

5. *Amauris psyttalea.*
A. psyttalea, Plötz, S. E. Z. xli, p. 189 (1880).

6. *Amauris hecate.*
D. hecate, Butl., P. Z. S. 1866, p. 44.

7. *Elymnias phegea.*
Pap. phegea, Fabr., Ent. Syst. iii, 1, p. 132 (1793).

8. *Elymnias bammakoo.*
Mel. bammakoo, Westw., Gen. D. L., p. 405 note, t. 68, f. 3 (1851).

9. *Melanitis leda.*
Pap. leda, L., Syst. Nat., ed. 10, p. 474 (1758).

10. *Gnophodes parmeno.*
G. parmeno, D. and H., Gen. D. L., t. 61, f. 2 (1851).

11. *Bicyclus phalanthus.*
B. phalanthus, Stgr., Exot. Schm., p. 229, t. 82 (1887).

12. *Mycalesis tænias.*
M. tænias, Hew., Exot. Butt. Mycalesis, t. 8, f. 55, 56 (1866).

13. *Mycalesis ignobilis.*
M. ignobilis, Butl., Trans. Ent. Soc. Lond., 1870, p. 124.

14. *Monotrichtis sandace.*
Mycalesis sandace, Hew., Exot. Butt. Mycalesis, t. 10, f. 65 (1877).

15. *Monotrichtis milyas.*
Mycalesis milyas, Hew., Exot. Butt. Mycalesis, t. 6, f. 34 (1864).

16. *Monotrichtis safitza.*
Mycalesis safitza, Hew., Gen. D. L. ii, p. 394 note, t. 66, f. 3 (1851).

17. *Monotrichtis vulgaris.*
Mycalesis vulgaris, Butl., Cat. Satyr., p. 130, t. 3, f. 8 (1868).

18. *Monotrichtis nebulosa.*
Mycalesis nebulosa, Feld., Reise Novar. Lep., p. 502 (1867).

All the specimens belong to the form *agraphis*, Karsch.

19. *Monotrichtis dorothea.*
Pap. dorothea, Cram., Pap. Exot. iii, p. 19, t. 204, f. E, F. (1799).

20. *Ypthima doleta.*
Y. doleta, Kirby, Pr. R. Dublin Soc. (2) ii, p. 336 (1880).

21. *Ypthima simplicia.*
Y. simplicia, Butl., An. N. H. (4) xviii, p. 481 (1876).

22. *Acræa admatha.*
A. admatha, Hew., Exot. Butt. Acræa, t. 3, f. 16, 17 (1865).

23. *Acræa seis.*
A. seis, Feisth., Ann. E. Fr. (2) viii, p. 247 (1850).

24. *Acræa camæna.*
A. camæna, Dru., Ill. Exot. Ins. ii, p. 12, t. 7, f. 2 (1773).

25. *Acræa zetes.*
Pap. zetes, L., Syst. Nat., ed. 10, p. 487 (1758).

26. *Acræa egina.*
Pap. egina, Cram., Pap. Exot. i, p. 128, t. 81, f. C, D (1775).

27. *Acræa abdera.*
A. abdera, Hew., Exot. Butt. Acræa, t. 1, f. 1, 2 (1852).

28. *Acræa pseudegina.*
A. pseudegina, Westw., Gen. D. L., p. 531 (1852).

29. *Acræa terpsichore.*
Pap. terpsichore, L., Syst. Nat., ed. 10, p. 466 (1758).

30. *Acræa vinidia.*
A. vinidia, Hew., Ent. M. Mag. xi, p. 130 (1874).

31. *Acræa bonasia.*
Pap. bonasia, Fabr., Syst. Ent., p. 464 (1775).

32. *Acræa pharsalus.*
A. pharsalus, Ward, Ent. M. Mag. viii, p. 81 (1871).

33. *Acræa encedon.*
Pap. encedon, L., Syst. Nat., ed. 10, p. 488 (1758).

A variable series, including several examples of *ab alcippina*, Auriv.

34. *Acræa pentapolis.*
A. pentapolis, Ward, Ent. M. Mag. viii, p. 60 (1871).

A variable series showing specimens intermediate between the type, and the form described by Oberthür under the name of *thelestis;* this name will therefore have to sink as a synonym.

35. *Acræa orestia.*
A. orestia, Hew., Ent. M. Mag. xi, p. 131 (1874).

36. *Acræa parrhasia.*
Pap. parrhasia, Fabr., Ent. Syst. iii, 1, p. 175 (1893).

37. *Acræa peneleos.*
A. peneleos, Ward, Ent. M. Mag. viii, p. 60 (1871).

38. *Acræa lycoa.*
A. lycoa, Godt., Enc. Meth. ix, p. 239 (1819).

39. *Acræa jodutta.*
Pap. jodutta, Fabr., Ent. Syst. iii, 1, p. 175 (1793).

The series includes ♀ *ab. carmentis*, D. and H.

40. *Planema epæa.*
Pap. epæa, Cram., Pap. Exot. iii, p. 64, t. 230, f. B, C (1779).

41. *Planema consanguinea.*
    P. consanguinea, Auriv., Ent. Tidskr. xiv, p. 282, f. 8 (1893).
42. *Planema camerunica.*
    P. camerunica, Auriv., Ent. Tidskr. xiv, p. 282, t. 6, f. 4, 5 (1893).
43. *Planema umbra.*
    Pap. umbra, Dru., Ill. Exot. Ins. iii, p. 23, t. 18, f. 1, 2 (1782).
44. *Planema vestalis.*
    Acræa vestalis, Feld., Reise Novar. Lep., p. 369, t. 46, f. 8, 9 (1865–7).
45. *Atella phalantha.*
    Pap. phalantha, Dru., Ill. Exot. Ins. i, p. 41, t. 21, f. 1, 2 (1773).
46. *Hypanartia delius.*
    Pap. delius, Dru., Ill. Exot. Ins. iii, p. 18, t. 14, f. 5, 6 (1782).
47. *Pyrameis cardui.*
    Pap. cardui, L., Syst. Nat., ed. 10, p. 475 (1758).
48. *Precis madagascariensis.*
    Junonia madagascariensis, Guén., Vinson, Voy. Mad. Lep., p. 37 (1864).
49. *Precis clelia.*
    Pap. clelia, Cram., Pap. Exot. i, p. 33, t. 21, f. E, F (1775).
50. *Precis sophia.*
    Pap. sophia, Fabr., Ent. Syst. iii, 1, p. 248 (1793).
51. *Precis octavia.*
    Pap. octavia, Cram., Pap. Exot. ii, p. 60, t. 135, f. B, C (1777).
52. *Precis pelarga.*
    Pap. pelarga, Fabr., Syst. Ent., p. 513 (1775).
53. *Precis laodice*, Cram., Pap. Exot. ii, p. 64, t. 138, f. G, H. (1777).
54. *Precis milonia.*
    P. milonia, Feld., Reise Novar. Lep., p. 403 (1867).
55. *Precis terea.*
    Pap. terea, Dru., Ill. Exot. Ins. ii, p. 32, t. 18, f. 3, 4 (1773).

56. *Precis chorimene.*
Vanessa chorimene, Guér., Icon. R. Anim., p. 476 (1844).

57. *Catacroptera cloantha.*
Pap. cloantha, Cram., Pap. Exot. iv, p. 93, t. 338, f. A, B (1781).

58. *Salamis temora.*
S. temora, Feld., Reise Novar. Lep., p. 404 (1867).

59. *Salamis anacardii.*
Pap. anacardii, L., Syst. Nat., ed. 10, p. 467 (1758).

60. *Hypolimnas misippus.*
Pap. misippus, L., Mus. L. Ulr., p. 264 (1764).

61. *Hypolimnas dubius.*
Pap. dubius, Palisot, Ins. Afr. et Amér., p. 238, Lep. t. 6, f. 2*a*, 2*b* (1805).

62. *Hypolimnas anthedon.*
Diadema anthedon, Doubld., Ann. N. H. xvi, p. 181 (1845).

63. *Kallima rumia.*
K. rumia, Doubld. and Westw., Gen. D. Lep., p. 325, t. 52, f. 2 (1850).

64. *Kallima cymodoce.*
Pap. cymodoce, Cram., Pap. Exot. ii, p. 5, t. 99, f. G, H (1777).

A single male of this rare species.

65. *Eurytela hiarbas.*
Pap. hiarbas, Dru., Ill. Exot. Ins. iii, p. 17, t. 14, f. 1, 2 (1782).

66. *Eurytela dryope.*
Pap. dryope, Cram., Pap. Exot. i, p. 125, t. 78, f. E, F (1775).

67. *Neptidopsis ophione.*
Pap. ophione, Cram., Pap. Exot. ii, p. 27, t. 114, f. E, F (1777).

68. *Ergolis enotrea.*
Pap. enotrea, Cram., Pap. Exot. iii, p. 73, t. 236, f. A, B (1779).

69. *Mesoxantha ethosea.*
Pap. ethosea, Dru., Ill. Exot. Ins. iii, p. 51, t. 37, f. 3, 4 (1782).

70. *Byblia götzius.*
Pap. götzius, Herbst, Naturs. Schm. ix, p. 193, t. 258, f. 3, 4 (1798).

71. *Crenis amulia.*
Pap. amulia, Cram., Pap. Exot. ii, p. 128, t. 180, f. C (1777).

72. *Cyrestis camillus.*
Pap. camillus, Fabr., Spec. Ins. ii, p. 11 (1781).

73. *Neptis nemetes.*
N. nemetes, Hew., Exot. Butt. Neptis, t. 1, f. 1, 2 (1868).

74. *Neptis agatha.*
Pap. agatha, Stoll, in Cramer's Pap. Exot. iv, p. 76, t. 327, f. A, B (1780).

75. *Neptis melicerta.*
Pap. melicerta, Dru., Ill. Exot. Ins. ii, p. 34, t. 19, f. 3, 4 (1773).

76. *Pseudacræa lucretia.*
Pap. lucretia, Cram., Pap. Exot. i, p. 71, t. 45, f. C, D (1775).

77. *Pseudacræa boisduvalii.*
Diadema boisduvalii, Doubld., Ann. N. H. xvi, p. 180 (1845).

78. *Pseudacræa eurytus.*
Pap. eurytus, Linn., Syst. Nat., ed. 10, p. 487 (1758).

79. *Pseudacræa striata.*
P. striata, Butl., Cist. Ent. i, p. 215 (1874).

80. *Pseudacræa semire.*
Pap. semire, Cram., Pap. Exot. iii, p. 3, t. 194, f. B, C (1779).

81. *Pseudoneptis cœnobita.*
Hesperia cœnobita, Fabr., Ent. Syst. iii, 1, p. 247 (1793).

82. *Catuna angustata.*
Euomma angustatum, Feld., Reise Novar. Lep., p. 425 (1867).

83. *Aterica galene.*
Pap. galene, Brown, New Ill. of Zool., p. 94, t. 37 (1776).

84. *Hamanumida dædalus.*
Pap. dædalus, Fabr., Syst. Ent., p. 482 (1775).

85. *Euphædra ruspina.*
Romalæosoma ruspina, Hew., Exot. Butt. Romalæosoma, t. 2, f. 6, 7 (1865).

86. *Euphædra cleus.*
Pap. cleus, Dru., Ill. Exot. Ins. iii, p. 14, t. 12, f. 1, 2 (1782).

87. *Euphædra ceres.*
Pap. ceres, Fabr., Syst. Ent., p. 504 (1775).

88. *Euphædra nigrocilia,* sp. nov. (Plate VIII, fig. 1.)

Upper-side.—Fore-wing blue-black, shot with greenish along costa and about apex ; a large oval, greenish-yellow patch beyond cell, between upper discoidal and upper median nervules ; a large triangular yellowish-green patch on inner margin. Hind-wing shining blue, with yellowish-green discoidal patch ; outer margin black, widely so at apex ; two large black spots near margin between upper and lower median nervules.

Under-side.—Fore-wing greenish-yellow, inner margin slate colour, outer margin and apex greenish ; the following black markings : a spot in cell near base, two larger spots beyond, and a bar at end of cell, with another bar outside ; a spot between upper and middle median nervules, and an obliquely placed bar between middle and lower median nervules ; a submarginal row of large spots increasing in size towards anal angle. Hind-wing greenish-yellow, deep yellow at anal angle and inner margin, greenish on outer margin, and with the following black markings : a curved sub-basal band extending nearly half-way along costa, a round spot in upper part of cell, and an oval spot at end of cell ; a series of four patches between subcostal nervure, and submedian nervule, decreasing in size towards latter, a submarginal series of large patches. Cilia of both wings black above and below.

Exp. 78 millim.

Allied to *E. ceres,* Cram., from which it differs in the fore-wing having a subapical patch instead of a band, the shining blue ground colour of hind-wing, and the black cilia.

89. *Euphædra themis.*
Najas hilaris themis, Hübn., Exot. Schm. 1, t. 60 (1806–16).

90. *Euphædra janetta.*
Romalæosoma janetta, Butl., P. Z. S. 1871, p. 80.

91. *Euphædra aurata.*
E. aurata, Carpenter, Proc. R. Dubl. Soc. (2) viii, p. 305 (1895).

92. *Euphædra aureofasciata*, sp. nov.

Upper-side.—Fore-wing black, costa shot with green; a wide golden-yellow band extending from costa to below middle median nervule; a triangular bluish-green patch on basal half of inner margin, the centre of this patch golden. Hind-wing shining bluish-green, outer margin widely black, a faint trace of golden-yellow on disco-cellulars.

Under-side.—Fore-wing yellowish-green, with inner margin black below lower median nervule, and the following black markings: two large spots in basal half of cell, each touching median nervure; two round spots in centre of, and a bar at end of cell; a series of five patches beyond cell, of which the lowest is the largest, and obliquely placed, a submarginal series of square patches; outer margin blackish. Hind-wing golden-yellow, greenish about cell, and along outer margin; a wide crimson band along costa extending from base to near apex; the following black markings: a large spot in upper part of cell with a small one below it, a bar at end of cell, four markings beyond cell, of which the upper and lower are nearer the base than the others; the upper is the largest, and the lower much the smallest of this series; a submarginal series of large patches, the inner edges of which are dentate; outer margin black. Cilia of hind-wing greyish between nervules.

Exp. 90 millim.

This is probably a local race of *E. crockeri*, Butl., from which it may be distinguished by the bright golden-yellow band of the fore-wing and the darker cilia.

Only a single female was obtained, but there are several specimens in the Natural History Museum from Nigeria which agree with that here described.

93. *Euphædra medon.*
Pap. medon, L., Cent. Ins., f. 19 (1763).

94. *Euphædra harpalyce.*
Pap. harpalyce, Cram., Pap. Exot. ii, p. 78, t. 145, f. D, E (1779).

95. *Euphædra losinga.*
Romalæosoma losinga, Hew., Exot. Butt. Romalæosoma, t. 1, f. 1 (1864).

One male and two females were taken.

96. *Euryphene theognis.*
E. theognis, Hew., Exot. Butt. Euryphene, t. 1, f. 3, 4 (1864).

97. *Euryphene mardania.*
Pap. mardania, Fabr., Ent. Syst. iii, 1, p. 249 (1793).

98. *Euryphene sophus.*
Pap. sophus, Fabr., Ent. Syst. iii, 1, p. 46 (1793).

99. *Euryphene lætitia.*
E. lætitia, Plötz, S. F. Z. xli, p. 192 (1880).

100. *Euryphene tentyris.*
E. tentyris, Hew., Exot. Butt. Euryphene, t. 5, f. 21, 22 (1866).

101. *Diestogyna veronica.*
Pap. veronica, Cram., Pap. Exot. iv, p. 73, t. 325, f. C, D (1780).

102. *Euryphura chalcis.*
Harma chalcis, Feld., Wien. Ent. Mon. iv, p. 234 (1860).

103. *Euryphura plautilla.*
Euryphene plautilla, Hew., Exot. Butt. Euryphene, t. 3, f. 14, 15 (1865).

One male has both wings fulvous to beyond middle; the form *claudianus,* Druce, is also fulvous, and has hitherto been regarded as a female aberration; it is possible that this specimen is the male of *claudianus,* and a distinct species.

104. *Cymothoë theobene.*
Harma theobene, D. and H., Gen. D. Lep., p. 288, t. 40, f. 3 (1850).

105. *Cymothoë egesta.*
Pap. egesta, Cram., Pap. Exot. i, p. 72, t. 46, f. B, C (1775).

106. *Cymothoë beckeri.*
Diademi beckeri, H. S., Aus. Schm. Tagf., f. 81 (1850).

107. *Cymothoë coccinata.*
Harma coccinata, Hew., Exot. Butt. Harma, t. 6, f. 24, 15 (1874).

108. *Euptera sirene.*
E. sirene, Staud., Iris, iv, p. 100, t. 1, f. 6 (1891).

A single specimen of this extremely rare species.

109. *Euxanthe eurinome.*
Pap. eurinome, Cram., Pap. Exot. i, p. 109, t. 70, f. A (1775).

An aberration of the female was obtained, in which the white markings are more extended, and the black ground along median nervure and nervules powdered with white scaling.

110. *Charaxes brutus.*
Pap. brutus, Cram., Pap. Exot. iii, p. 82, t. 241, f. E, F (1779).

111. *Charaxes epijasius.*
C. epijasius, Reiche, in Ferret and Galin. Voy. Abyss. Ent., p. 469, t. 32, f. 1, 2 (1849).

Only one specimen in the collection, a female, and unfortunately in very bad condition.

112. *Charaxes castor.*
Pap. castor, Cram., Pap. Exot. i, p. 61, t. 37, f. C, D (1775).

113. *Charaxes etesipe.*
Nymphalis etesipe, Godt., Enc. Méth. ix, p. 355 (1823).

114. *Charaxes cynthia.*
C. cynthia, Butl., P. Z. S. 1865, p. 626, t. 36, f. 3.

The two males received agree best with examples from Accra, inasmuch as the discal band of hind-wing above is buff yellow, edged with orange rufous, but differs below in the much wider discal silvery band. The female agrees best with a specimen from the Cameroons.

115. *Charaxes protoclea.*
C. protoclea, Feisth, Ann. E. Fr. (2) viii, p. 260 (1850).

116. *Charaxes anticlea.*
Pap. anticlea, Dru., Ill. Exot. Ins. iii, p. 36, t. 27, f. 5, 6 (1782).

Two males only, they belong to the typical form, not that described by Rothschild under the name of *adusta.*

117. *Charaxes etheocles.*
Pap. etheocles, Cram., Pap. Exot. ii, p. 34, t. 119, f. D, E (1777).

118. *Charaxes tiridates.*
Pap. tiridates, Cram., Pap. Exot. ii, p. 100, t. 161, f. A, B (1777).

119. *Charaxes numenes.*
C. numenes, Hew., Exot. Butt. Charaxes, t. 2, f. 9–11 (1859).

120. *Charaxes varanes.*
Pap. varanes, Cram., Pap. Exot. ii, p. 100, t. 160, f. D, E (1777).

121. *Charaxes fulvescens.*
Palla varanes, var. *fulvescens*, Auriv., Ent. Tidskr. xii, p. 216 (1891).

122. *Charaxes laodice.*
Pap. laodice, Dru., Ill. Exot. Ins. iii, p. 34, t. 26, f. 1, 2 (1782).

123. *Charaxes eupale.*
Pap. eupale, Dru., Exot. Ins. iii, p. 7, t. 6, f. 3 (1782).

124. *Monura zingha.*
Pap. zingha, Cram., Pap. Exot. iv, p. 53, t. 315, f. B, C (1780).

125. *Libythea labdaca.*
L. labdaca, Westw., Gen. D. Lep., p. 413 note, t. 68, f. 6 (1851).

126. *Abisara gerontes.*
Pap. gerontes, Fabr., Spec. Ins. ii, p. 117 (1781).

127. *Telipna actinotina*, sp. nov. (Plate VIII, fig. 2.)

Upper-side.—Fore-wing dark brown, basal half brick-red, darker towards base and along costa, and bordered on outer edge by a blackish-brown band; two small red patches beyond cell. Hind-wing semi-transparent brown, veins blackish.

Under-side.—Fore-wing as above, but ground colour paler and with a yellowish band beyond dark border of basal red. Hind-wing yellowish-brown, with veins and lines in interspaces blackish; seven small black spots at base.

Exp. 48 millim.

Only a single specimen of this very distinct species was obtained; its nearest ally appears to be *T. parva*, Kirby, from which it may at once be distinguished by its much greater size. The neuration of hind-wing resembles that of the genus *Mimacræa*, inasmuch as the subcostal nervules are on a long stalk, but the presence of the præcostal nervure serves to separate it from that genus. It is very curious that this species should bear such a strong superficial resemblance to *Actinote*, a South American genus of the Acræinæ.

128. *Pentila pauli.*
P. pauli, Staud., Exot. Schm. i, p. 267 (1888).

129. *Pentila amenaida.*
P. amenaida, Hew., Exot. Butt. Pentila and Liptena, t. 2, f. 8, 9 (1873).

130. *Pentila radiata*, sp. nov. (Plate VIII, fig. 3.)

Upper-side.—Fore-wing fulvous, with broad black margin, the inner edge of which is dentate towards inner margin; costa blackish; two small black spots above and towards end of cell, and a large round black spot at end of cell. Hind-wing fulvous, paler at inner margin and widely bordered with black; a round black spot at end of cell.

Under-side.—Fore-wing fulvous, with black spot as above, outer margin narrowly black, marginal black streaks in interspaces, decreasing in length towards anal angle. Hind-wing fulvous, outer margin narrowly black with marginal streaks as in fore-wing, two very small black spots near base, a large round black spot below costal nervure not far from base, and a similar but somewhat larger spot at end of cell.

Exp. 38 millim.

Nearly allied to *P. pauli*, Stgr., from which it differs in the total absence of discal spots below and in the subcostal spot of the hind-wing below being larger than the cellular spot.

131. *Pentila multipunctata*, sp. nov. (Plate VIII, fig. 4.)

Upper-side.—Fore-wing fulvous, with broad black margin, the inner edge of which is dentate; costa blackish; the following black markings: a small spot above and towards end of cell, and a large round spot at end of cell, three spots near marginal border between upper median nervule and submedian nervure. Hind-wing fulvous, with wide black margin, inner edge of which is dentate; a round black spot at end of cell and a series of seven black spots near marginal border, the three nearest anal angle being further from the border than the others.

Under-side.—Fore-wing fulvous, outer margin narrowly black, with marginal streaks as in the preceding species, and the following black markings: two pairs and one single spot on costa, a large round spot at end of cell and a curved discal series of seven spots. Hind-wing fulvous, outer margin narrowly black, and streaks as in fore-wing, with the following black markings: a large spot above and two spots below cell near base, a large spot at end of cell, a curved discal series of eight spots, of which that next costa is much the largest.

Exp. 42 millim.

Near to *P. pauli*, Stgr., from which it may be distinguished by the conspicuous discal spots.

132. *Pentila abraxas.*
P. abraxas, D. and H., Gen. D. Lep., t. 77, f. 5 (1852).

133. *Mimacræa darwinia.*
M. darwinia, Butl., Lep. Exot., p. 104, t. 38, f. 8 (1872).

One pair of this fine species.

134. *Pseuderesia isca.*
Liptena isca, Hew., Exot. Butt. Pentila and Liptena, t. 2, f. 14–16 (1873).

135. *Pseuderesia gordoni.* (Plate VIII, fig. 5.)
P. gordoni, Druce, Ann. Mag. Nat. Hist. (7) xi (Jan. 1903).

136. *Pseuderesia cellularis.*
P. cellularis, Kirby, Ann. N. H. (6) vi, p. 262 (Sept. 1890).

137. *Citrinophila similis.*
C. similis, Kirby, Ann. N. H. (5) xix, p. 366 (1887).

138. *Liptena submacula*, sp. nov. (Plate VIII, fig. 6.)

Upper-side.—Fore-wing white, costa and outer margin bordered with dark brown. Hind-wing white, outer margin bordered with dark brown.

Under-side.—Both wings as above, with exception of an oval black spot at end of cell of hind-wing.

Exp. 32 millim.

This species may be distinguished from *L. simplicia*, Moschl., its nearest ally, by the black spot at end of cell of hind-wing below.

139. *Liptena undularis.*
L. undularis, Hew., Exot. Butt. Pentila and Liptena, t. 1, f. 7 (1866).

140. *Liptena otlauga.*
L. otlauga, Smith and Kirby, Rhop. Exot. 14, Lycæn. Afr., p. 46, t. 11, f. 9, 10 (1890).

141. *Eresina corynetes.*
E. corynetes, Smith and Kirby, Rhop. Exot., Lycæn. Afr., p. 47, t. 11, f. 7, 8 (1890).

142. *Aslauga marginata.*
Liptena marginata, Plötz, S. E. Z. xli, p. 204 (1880).

143. *Deudorix nomion.*
D. nomion, Stgr., Iris, iv, p. 156, t. 1, f. 11 (1891).

144. *Deudorix eleala.*
Hypolycæna eleala, Hew., Ill. D. Lep., p. 52, t. 23, f. 25–27 (1865).

145. *Deudorix camerona.*
D. camerona, Plötz, S. E. Z. xli, p. 201 (1880).

146. *Deudorix odana.*
D. odana, H. H. Druce, Ent. M. Mag. xxiii, p. 204 (1887).

147. *Deudorix caliginosa*, sp. nov. (Plate VIII, fig. 7.)

Upper-side.—Both wings black, shot with rich purplish-blue. Hind-wing with inner margin clothed with black hair ; a pale shining purplish sex mark above cell ; inner margin pale shining grey.

Under-side.—Fore-wing brownish-grey, with the following white lines inwardly edged with brown : two at end of cell, a double row beyond cell extending from costa to lower median nervule, and a submarginal double row, these being obscure at apex ; a large tuft of black hair from middle of inner margin. Hind-wing brownish-grey, a pale-edged dark-brown spot in bend of subcostal nervure, two whitish lines just beyond cell, and some obscure whitish markings between cell and inner margin, two double rows of whitish lines as in fore-wing ; a black spot inwardly bordered with red near inner margin, between middle and lower median nervules ; anal angle produced into a lobe, black-edged with metallic silvery-blue scales ; lower median nervule produced into a long slender black tail tipped with white.

Exp. 34 millim.

The nearest ally of this species appears to be *D. antalus*, Hopff.; its much darker colour at once serves to distinguish it from that species; the tuft of hair on inner margin of the fore-wing below is much longer in *D. livida* than in *D. antalus*.

148. *Deudorix bimaculata.*
Myrina bimaculata. Hew., Trans. Ent. Soc. 1874, p. 353.

149. *Deudorix lorisona.*
Myrina lorisona, Hew., Ill. D. Lep., p. 37, t. 16, f. 48, 49 (1863).

150. *Deudorix antalus.*
Dipsas antalus, Hopff., Monatsb. Akad. Wiss. Berlin, 1855, p. 641.

151. *Myrina silenus.*
Pap. silenus, Fabr., Syst. Ent., p. 531 (1775).

152. *Myrina subornata*, sp. nov. (Plate VIII, fig. 8.)

Upper-side.—Fore-wing black, a brilliant deep blue patch in cell, and a large area of the same colour below cell. Hind-wing black, cell and area below and beyond brilliant deep blue; a deep crimson spot at anal angle; submedian nervure produced into a moderately long white centred black tail.

Under-side.—Fore-wing dark brownish-grey, with a faint purple tinge, paler towards inner margin. Hind-wing dark brownish-grey, with a faint purple tinge; a black bar at end of cell; a curved discal series of irregular black markings, those next inner margin being inwardly edged with whitish; submarginal whitish powdered black marking extending from inner margin to middle median nervule; anal lobe deep crimson inwardly edged with white.

Exp. 38 millim.

This species may be separated from *M. dermaptera*, Wgr., a South African species, by the discal black markings of hind-wings below.

153. *Oxylides faunus.*
Pap. faunus, Dru., Ill. Exot. Ins. ii, p. 2, t. 1, f. 4, 5 (1773).

154. *Hypolycæna hatita.*
H. hatita, Hew., Ill. D. Lep., p. 51, t. 23, f. 21-24 (1865).

155. *Hypolycæna antifaunus.*
H. antifaunus, D. and H., Gen. D. Lep., t. 75, f. 1 (1852).

156. *Hypolycæna lebona.*
H. lebona, Hew., Ill. D. Lep., p. 51 (1865).

157. *Hypolycæna philippus.*
Hesperia philippus, Fabr., Ent. Syst. iii, 1, p. 283 (1793).

158. *Dapidodigma hymen.*
Pap. hymen, Fabr., Syst. Ent., p. 519 (1775).

159. *Jolaus adamsi,* sp. nov. (Plate VIII, fig. 9.)

Upper-side.—Fore-wing with basal half bright shining blue, apical half black. Hind-wing bright shining blue, costa and apex narrowly black, a black line along outer margin; anal lobe white, a black spot edged with dull crimson placed above it on inner margin, and a black spot beyond it on outer margin, and beyond this a faint whitish mark; three slender black-centred white tails, that at the anal angle being much the longest; cilia whitish.

Under-side.—Fore-wing white, brownish towards outer margin, blackish along inner margin, a faint brown submarginal line; a conspicuous tuft of black hair on inner margin. Hind-wing white, a faint brown discal line extending from subcostal nervure to middle median nervule; a black spot with a red patch above it between middle and lower median nervules, the discal line continuing brokenly from it to inner margin; a short faint submarginal red line from near apex; a black spot on inner margin above anal lobe, edged with a triangular red patch; a little blackish scaling near outer margin between anal tails; a narrow black marginal line.

Exp. 42 millim.

Allied to *J. laon,* Hew., but differs in the absence of dark borders to wings below.

160. *Jolaus eurisus.*
Pap. eurisus, Cram., Pap. Exot. iii, p. 47, t. 221, f. D, E (1779).

161. *Aphnæus orcas.*
Pap. orcas, Dru., Ill. Exot. Ins. iii, p. 46, t. 34, f. 2, 3 (1782).

162. *Aphnæus brahami,* sp. nov. (Plate VIII, fig. 10.)

Upper-side.—Fore-wing dark brownish-grey, cell and area beyond and below densely clothed with purplish-blue scaling; outer margin narrowly blackish. Hind-wing dark brownish-grey, cell and lower discal area densely clothed with purplish-blue scaling, outer margin narrowly blackish, cilia white except at extremities of nervules, where they are blackish; a short black tail at extremity of lower median nervule, and a very long slender black tail at extremity of submedian nervure, the basal third of this tail is dull red and the tip white.

Under-side.—Fore-wing brownish-grey, whitish along inner margin, with the following silver markings all edged with deep dull crimson: a spot at base of cell with one above it on costa, one crossing centre of cell and a large one at end of cell, another on costa beyond cell, and between this and apex two small spots one above the other, a round spot on discoidals not far from outer margin, a figure-of-eight spot on median nervules, and an obliquely-placed oval patch below this, the lower part of this marking being obscure; outer margin narrowly edged with deep dull crimson. Hind-wing brownish-grey, with the following silver markings all edged with deep dull crimson: a spot at base, a small spot in basal half of cell with a large one above it, a large round spot at end of cell, an oval patch between this and inner margin, and a small spot on inner margin; an irregular series of seven discal spots, of which that on the costa is large and almost round, the next three very small, and the remainder long and irregularly shaped; an obscure narrow dark band between this series and outer margin; outer margin narrowly edged with deep dull crimson; anal angle the same colour; tails as above.

Exp. 48 millim.

Very near to *A. argyrocyclus*, Holl., from which it differs in the large circular spot at end of cell in hind-wing below, and the more regular and complete series of silver spots beyond. I have named this species after Mr. Braham the collector.

163. *Spindasis mozambica.*
Aphnæus mozambica, Bertolini, Mem. Acad. Bologna 2, p. 177, sep., p. 13 (1851).

164. *Axiocerses harpax.*
Pap. harpax, Fabr., Synt. Ent., p. 829 (1775).

165. *Lycænesthes sylvanus.*
Pap. sylvanus, Dru., Ill. Exot. Ins. ii, p. 5, t. 3, f. 2, 3 (1773).

166. *Lycænesthes larydas.*
Pap. larydas, Cram., Pap. Exot. iii, p. 160, t. 282, f. H (1780).

167. *Lycænesthes flavomaculata.*
L. flavomaculata, Smith and Kirby, Rhop. Exot. xxvi, Lycæn. Afr., p. 104, t. 23, f. 7, 8 (1893).

168. *Cupido falkensteinii.*
C. falkensteinii, Dewitz, N. Acta Ac. N. Cur. xli, 2, p. 204, t. 25, f. 5 (1879).

169. *Cupido lingeus.*
Pap. lingeus, Cram., Pap. Exot. iv, p. 176, t. 379, f. F, G (1781).

170. *Cupido plinius.*
Hesperia plinius, Fabr., Ent. Syst. iii, 1, p. 284 (1793).

171. *Cupido isis.*
Pap. isis, Dru., Ill. Exot. Ins. ii, p. 6, t. 3, f. 4, 5 (1773).

172. *Cupido mirza.*
C. mirza, Plötz, S. F. Z. xli, p. 203 (1880).

173. *Cupido bæticus.*
Pap. bæticus, L., Syst. Nat. ed. 12, p. 789 (1767).

174. *Cupido malathana.*
Lycæna malathana, Boisd., Faune Madag., p. 25 (1833).

175. *Cupido osiris.*
Lycæna osiris, Hopff., Monatsb. Akad. Wiss. Berlin, 1855, p. 642.

176. *Cupido micyclus.*
Pap. micyclus, Cram., Pap. Exot. iii, p. 160, t. 282, f. F, G (1780).

177. *Cupido punctatus.*
C. punctatus, Dewitz, N. Acta Acad. N. Cur. xli, 2, p. 205, t. 26, f. 15 (1879).

178. *Leptosia medusa.*
Pap. medusa, Cram., Pap. Exot. ii, p. 86, t. 150, f. F (1777).

179. *Leptosia alcesta.*
Pap. alcesta, Cram., Pap. Exot. iv, p. 175, t. 379, f. A (1781).

180. *Mylothris chloris.*
Pap. chloris, Fabr., Syst. Ent., p. 473 (1775).

181. *Mylothris spica.*
M. spica, Möschl., Verh. z. b. Ges. Wien. xxxiii, p. 277 (1883).

182. *Appias rhodope.*
Pap. rhodope, Fabr., Syst. Ent., p. 473 (1775).

183. *Appias phaola.*
Pieris phaola, Doubld., Ann. N. H. (1) xx, p. 63 (1847).

184. *Appias epaphia.*
Pap. epaphia, Cram., Pap. Exot. iii, p. 26, t. 207, f. D, E (1779).

185. *Pieris creona*
Pap. creona, Cram., Pap. Exot. i, p. 148, t. 95, f. C-F (1776).

186. *Pieris calypso.*
Pap. calypso, Dru., Ill. Exot. Ins. ii, p. 30, t. 17, f. 3, 4 (1773).

187. *Pieris cebron.*
P. cebron, Ward, Ent. Mo. Mag. viii, p. 59 (1871).

188. *Teracolus evippe.*
Pap. evippe, L., Syst. Nat. ed. 10, p. 469 (1758).

189. *Catopsilia florella.*
Pap. florella, Fabr., Syst. Ent., p. 479 (1775).

190. *Terias brenda.*
T. brenda, D. and H., Gen. D. Lep., p. 79, t. 9, f. 6 (1847).

191. *Terias senegalensis.*
T. senegalensis, Boisd., Spec. Gén. Lép. i, p. 672 (1836).

192. *Terias desjardinsii.*
Xanthidia desjardinsii, Boisd., Faune Mad., p. 22, t. 2, f. 6 (1833).

193. *Papilio dardanus.*
P. dardanus, Brown, Ill. Zool., p. 52, t. 22 (1776).

Typical female and one example of ♀ *ab. dionysus,* D. and H., were obtained.

194. *Papilio cynorta.*
P. cynorta, Fabr., Ent. Syst. iii, 1, p. 37 (1793).

195. *Papilio nireus.*
P. nireus, L., Syst. Nat. ed. 10, p. 464 (1758).

196. *Papilio demodocus.*
P. demodocus, Esp., Aus. Schm., p. 205, t. 51, f. 1 (1798).

197. *Papilio menestheus.*
P. menestheus, Dru., Ill. Exot. Ins. ii, p. 15, t. 9, f. 1, 2 (1773).

198. *Papilio ridleyanus.*
P. ridleyanus, White, Ann. N. H. xii, p. 262, fig. (1843).

A good series, including an interesting aberration in which area above subcostal nervure is entirely white and without black markings with the exception of marginal border; the nervules and interspaces, excepting those between median nervules, are powdered with white scales; the inner margin is also much whiter than in typical specimens; these remarks apply only to the hind-wing, the fore-wing being normal.

199. *Papilio pylades.*
P. pylades, Fabr., Ent. Syst. iii, 1, p. 34 (1793).

200. *Papilio leonidas.*
P. leonidas, Fabr., Ent. Syst, iii, 1, p. 35 (1793).

A large number of males, but only one female.

201. *Papilio policenes.*
P. policenes, Cram., Pap. Exot. i, p. 61, t. 37, f. A, B (1775).

202. *Sarangesa synestalmenus.*
Antigonus synestalmenus, Karsch, Berl. Ent. Zeit. xxxviii, p. 263, t. 6, f. 8 (1893).

203. *Tagiades flesus.*
Pap. flesus, Fabr., Spec. Ins. ii, p. 135 (1871).

204. *Eagris denuba.*
Antigonus denuba, Plötz, S. E. Z. xl, p. 361 (1869).

205. *Abantis elegantula.*
A. elegantula, Mab., Ann. Soc. Ent. France, 1890, p. 32.

206. *Hesperia ploetzi.*
H. ploetzi, Auriv., Ent. Tidsk., 1891, p. 277.

207. *Gorgyra mocquerysii.*
G. mocquerysii, Holl., P. Z. S., 1896, p. 33, t. 5, f. 10.

208. *Oxypalpus fulvus*, sp. nov. (Plate VIII, fig. 11.)

Upper-side.—Fore-wing deep fulvous, clouded with dark brown at base; apex and outer margin narrowly edged with dark brown; a blackish line along submedian nervure, and an oblong black patch beyond cell. Hind-wing deep fulvous; costa, a narrow outer marginal line, and an oblong patch beyond cell black, inner margin blackish; the veins of both wings black towards extremities, cilia deep fulvous.

Under-side.—Fore-wing deep fulvous, a large black patch on basal third of inner margin; a short black fascia, above submedian nervure, from this patch; a narrow black marginal line. Hind-wing deep fulvous, with a narrow black marginal line. Antennæ beneath fulvous.

Exp. 28 millim.

Allied to *O. ignita*, Mab., but exhibits many points of difference, the chief of which are the smaller area of black on the fore-wing above, the exterior part of inner margin of fore-wing below being fulvous, and the antennæ fulvous beneath.

209. *Oxypalpus annulifer.*
O. annulifer, Holl., Ann. N. H. Oct. 1892, p. 293.

210. *Osmodes distincta.*
O. distincta, Holl., P. Z. S., 1896, p. 43, t. 4, f. 16.

211. *Hypoleucis ophiusa.*
Hesperia ophiusa, Hew., Trans. Ent. Soc. Lond. (3) ii, p. 497 (1866).

212. *Cyclopides abjecta.*
C. abjecta, Snell., Tijd. voor Ent. 1872, p. 52, t. 2, f. 15, 16.

213. *Chapra mathias.*
Hesperia mathias, Fabr., Ent. Syst. Suppl., p. 433 (1798).

214. *Parnara micans.*
P. micans, Holl., P. Z. S., 1896, p. 63, t. 3, f. 19.

215. *Baoris alberti.*
B. alberti, Holl., P. Z. S., 1896, p. 67, t. 2, f. 21.

216. *Baoris ogrugana*, sp. nov. (Plate VIII, fig. 12.)

Upper-side.—Fore-wing dark brown, with the following hyaline markings: two spots at end of cell, three very small subapical spots, a series of four discal spots of which the two centre ones are much the largest, and the upper one is much nearer the outer margin than the others. Hind-wing dark brown, with a hyaline spot in cell, and two very small discal hyaline spots.

Under-side.—Fore-wing dark brown, a short pale submarginal line from apex, hyaline markings as above, the lowest of the discal series being bordered outwardly by an oblong whitish patch. Hind-wing dark brown, with obscure lilac-grey markings on discoidals and near outer margin ; hyaline markings as above.

Exp. 32 millim.

Near *P. unistriga*, Holl., but differs in possessing three subapical spots, the upper spot of the discal series being much nearer the outer margin.

217. *Baoris netopha.*
Hesperia netopha, Hew., Ann. N. H. (5) i, p. 345 (1878).

218. *Platylesches chamæleon.*
Pamphila chamæleon, Mab., C. R. Soc. Ent. Belg. xxxv, p. 179 (1891).

219. *Pardaleodes incerta.*
Pamphila incerta, Snell., Tijd. voor Ent. 1872, p. 29, t. 10, f. 10–12.

220. *Pardaleodes reichenowi.*
Plastingia reichenowi, Plötz, S. E. Z. xl, p. 357 (1879).

221. *Pteroteinon laufella.*
Hesperia laufella, Hew., Exot. Butt. Hesp., t. 2, f. 28–30 (1867).

222. *Ploetzia cerymica.*
Hesperia cerymica, Hew., Exot. Butt. Hesp., t. 2, f. 20, 21 (1867).

223. *Ploetzia nobilior.*
P. nobilior, Holl., P. Z. S. 1896, p. 95, t. 5, f. 2.

224. *Rhopalocampta forestan.*
Pap. forestan, Cram., Pap. Exot. iv, t. 391, f. E, F (1782).

225. *Rhopalocampta chalybe.*
Ismene chalybe, Westw., D. and H. Gen. D. Lep., t. 79, f. 2 (1852).

226. *Rhopalocampta iphis.*
Pap. iphis, Dru., Ill. Exot. Ins. ii, t. 15, f. 3, 4 (1773).

The following is a list of the species not obtained by Mr. Braham, but which are recorded in the two previously-mentioned papers:—

Monotrichtis desolata, Butl.
Ypthima itonia, Hew.
Acræa cæcilia, Fabr.
Atella columbina, Cram.
Precis cebrene, Trim.
Euryphene phranza, Hew.
Charaxes achæmenes, Feld.
Lachnocnema bibulus, Fabr.
Zeritis neriene, Boisd.
Deudorix nomenia, Hew.
Lycænesthes princeps, Butl.*
Cupido hippocrates, Fabr.
„ *lysimon*, Hübn.
Terias brigitta, Cram.
Eronia argia, Fabr.
Celænorrhinus galenus, Fabr.
Parnara borbonica, Boisd.

* It is probable that this species was not correctly identified, the type being from Abyssinia.

Explanation of Plate VIII.

Fig. 1. *Euphædra nigrocilia*, sp. nov.
2. *Telipna actinotina*, sp. nov.
3. *Pentila radiata*, sp. nov.
4. „ *multipunctata*, sp. nov.
5. *Pseuderesia gordoni*, Druce.
6. *Liptena submacula*, sp. nov.
7. *Deudorix caliginosa*, sp. nov.
8. *Myrina subornata*, sp. nov.
9. *Jolaus adamsi*, sp. nov.
10. *Aphnæus brahami*, sp. nov.
11. *Oxypalpus fulvus*, sp. nov.
12. *Baoris ogrugana*, sp. nov.

XII. Hymenoptera aculeata, *collected* by the Rev. Alfred E. Eaton, M.A., *in Madeira and Tenerife*, in the spring of 1902, including notes on species taken by the late T. Vernon Wollaston and F. A. Bellamy. By Edward Saunders, F.R.S., F.L.S., etc.

[Read March 18th, 1903.]

In the little collection enumerated below, made by Mr. Eaton in the above islands, there are several species of interest. I have described four which appear to be new, and besides these two or three will probably prove so when more material comes to hand. A curious variety of *Bombus terrestris*, L., is worthy of special notice, it is quite black with the exception of the apex of the abdomen which is snowy white. Mr. Eaton captured three males and two workers, and remarks that the species is common in Tenerife, and as he sent no ordinarily-coloured specimens, I presume that this is the usual form in the island. Brullé does not mention *terrestris* as a Canary Island species, *soroensis* being the only representative of the genus which he records, and I cannot help having a suspicion that he has mistaken this black var. of *terrestris* for the similarly coloured form of *soroensis* which is well known on the Continent. So little is known of the Hymenoptera of these islands that I thought the present communication might be acceptable to the Society.

Since this paper was read, I have had placed in my hands by Prof. Poulton two collections from the Hope Department of the University of Oxford—one from Madeira made in 1847 and following years by the late T. V. Wollaston, and one made last year at Tenerife by Mr. F. A. Bellamy; as these contain several species not included in my paper, I have, at Prof. Poulton's suggestion, incorporated them.

Wollaston's collection was purchased in 1861 by the Rev. F. W. Hope, and presented to the Oxford University Museum. The specimens are of course old and more or less faded, the smaller ones are often gummed on cards, which renders determination doubtful, and as it would be dangerous to remove specimens of this age I have not attempted to found any new species on them. At the same time there is a bronzy *Halictus* which I think will prove to be new, and also a ♀ *Prosopis* entirely black with the exception of the yellow facial spots; it is larger than the species described here and stands in the collection with a label under it in F. Smith's handwriting—n. sp.? allied to *signata*. It is represented by a single specimen only and is not referable to any species I know.

In spite of the poor condition of Wollaston's specimens it is important to record, as far as possible, the forms which existed over half a century ago in an island so liable to accidental immigration as Madeira.

Professor Forel has kindly examined the ants of the collection and verified those already determined by Mr. F. Smith. I am indebted also to Mons. J. Vachal, who has recently examined Brullé's Canary Island types in the Paris Museum, for confirming, and in some cases correcting my identifications of the *Halicti*.

In Mr. Bellamy's collection is a fine series of the dark form of *terrestris* mentioned above, including six females, all coloured exactly like those met with by Mr. Eaton. As all the specimens of both collections came from Tenerife, it would be interesting to ascertain if the species has the same coloration in the neighbouring islands.

In the following list Mr. Bellamy's captures are indicated by his name, the late T. V. Wollaston's by his initials, while all specimens not specially indicated were taken by Mr. Eaton.

CAMPONOTUS RUFOGLAUCUS, Jerd., r. micans, Nyl.

☿ 7. Orotava, Tenerife. F. A. Bellamy, 31. iii. to 7. iv. 02.

LASIUS NIGER, L.

♂ ♀ ☿. Many of each. Madeira. T. V. W.

TAPINOMA ERRATICUM, Ltr.

♂ ♀ ☿. Several of each. Madeira. T. V. W.

PLAGIOLEPIS PYGMÆA, Ltr.

♀ ☿. Numerous. Madeira. T. V. W.

PONERA CONTRACTA, Ltr.

♀ 2 ☿ 6. Madeira. T. V. W.

TETRAMORIUM SIMILLIMUM, Nyl.

☿ 2. Madeira. T. V. W.

LEPTOTHORAX UNIFASCIATA, Ltr.

☿ 4. Madeira. T. V. W.

MONOMORIUM SALOMONIS, r. subopacum, Smith.

♀ ☿. Numerous. Madeira. T. V. W.

MONOMORIUM CARBONARIUM, Smith.

♂ 2 ♀ 4 ☿ 5. Madeira. T. V. W.

PHEIDOLE MEGACEPHALA, Fab.

♀ ☿. Several. Madeira. T. V. W.

TACHYSPHEX SIMONYI, Kohl.

2 ♂ 1 ♀. Orotava, Tenerife; on the sea-shore, 20 and 21. iii. 02.

MISCOPHUS EATONI, n. sp.

Niger nitidus subæneo-micans, facie punctatissimâ, mandibulis testaceis, apicibus piceis; alis hyalinis, margine apicali late infuscata, propodeo transverse rugoso, medio canaliculato, lateribus oblique striatis, abdomine nigro, punctato et microscopice ruguloso, segmentorum apicibus subpiceis, pedibus nigris.

♀ Black, shining, head and thorax in certain lights with a very slight bronzy tinge, face very slightly convex, so closely punctured as to be almost dull, a very fine smooth line extends from between the antennæ to about halfway between their insertion and the anterior ocellus. Clypeus more shining than the rest of the face, slightly raised down the centre, its anterior margin reflexed and rounded in the centre. Mandibles testaceous darker at the base and apex. 3rd joint of the antennæ slightly longer than the following ones, vertex shining, less closely punctured than the face; ocelli equidistant from each other, cheeks posteriorly with a few short glittering pale golden hairs, thorax shining and punctured like the vertex of the head, wings hyaline, with a well-defined darker apical band, not quite extending to the cell nerves, area of the petiolated cell of much less extent than that of the radial, mesopleuræ distinctly punctured, legs entirely black, propodeum shining transversely and somewhat diagonally rugose, with a well-defined central sulcature, its sides diagonally strigose, and clothed with very short inconspicuous pale golden hairs, abdomen black, finely punctured and microscopically rugose between the punctures, posterior margins of the segments slightly piceous, and with a very insignificant fringe of white hairs at the sides, beneath finely and closely punctured, the posterior margins with a few long exserted hairs.

Long. 5 mm.

Of this very distinct species, one specimen was taken at Orotava, Tenerife, on waste ground near the road beyond the Cemetery gate—21. iii. 02.

AMMOPHILA (*Psammophila*) TYDEI, Guill.

♂ 1. Laguna. Hill-side east of the city, about 2000 feet altitude, 15. iii. 02.

Orotava. "Common, provisions its nest with the larva of a Noctuid moth."

AMMOPHILA (*Psammophila*) HIRSUTA, Scop.

♂ 2 ♀ 2. T. V. W. These were named by F. Smith, "*Maderæ,* Dhb.," but are I think referable to the var. of *hirsuta,* which has pale hairs on the propodeum; I have taken similar specimens in Jersey and at St. Briac in Brittany.

SCELIPHRON TUBIFEX, Latr.

♂ 1 ♀ 3. Madeira. T. V. W. All these have the pedicel of the abdomen black.

OXYBELUS TEGULARIS, sp. n.

Niger, abdomine flavomaculato, propodei mucrone apice dilatato emarginato, tegulis nervisque basalibus alarum læte testaceis, pedibus nigris, testaceo flavoque variegatis.

This species resembles *latro,* Dahlb., in the widened emarginate propodeal spine, but differs widely from it in other characters and is specially recognizable by the bright testaceous tegulæ.

Black, without any bronzy tinge, head and thorax densely, rugosely and closely punctured, mandibles red in the centre, flagellum of the antennæ red towards the apex, clypeus tridentate at the apex in both sexes, with a strong central keel in the ♂ which projects beyond the anterior margin on to the central tooth, and a short angular keel in the ♀ abbreviated before it reaches the anterior margin, which is smooth and shining; face clothed with glittering silvery hairs, vertex rather densely with short greyish-white ones, those on the cheeks behind the eyes short and silvery.* Mesonotum clothed with short greyish hairs with a narrow central keel posteriorly, extending on to the scutellum, tegulæ and bases of wing-nerves bright testaceous, rest of neuration brown—postscutellum longitudinally strigose, lamellæ pale ; legs black, anterior tibiæ and tarsi except the former posteriorly, in both sexes, and all the tarsi in the ♂, testaceous, bases of the intermediate and posterior tibiæ flavous, the pale colour more extensive in the ♂ ; calcaria pale, intermediate and posterior tarsi black in the ♀, posterior metatarsi piceous in the ♂, propodeal spine short, widened and emarginate at the apex, central area shining, more or less diagonally rugose on each side, lateral areas dull, with irregular transverse rugosities, sides shining, transversely strigose ; abdomen more shining in the ♀ than in the ♂, strongly punctured, clothed with grey adpressed pubescence, especially in the ♂, puncturation of the basal segment slightly larger and less close than on the following, ♂ with a narrow transverse yellow spot on each side of the apical margin of the first 5 segments, these become longer and more band-like as the segments approach the apex, in the ♀ the spots are paler and only occur on the first 2 or 3 segments ; in the ♂ the 3rd, 4th, 5th and 6th segments have a short testaceous spine-like tooth at the posterior angle.

Long. 5—7 mm.

Orotava, Tenerife, several ♂ and ♀, 20. iii. 02.

VESPA GERMANICA, Fab.

☿. Monte Funchal, Madeira, above the Church, at about 2000 feet altitude, visiting *Scrophularia*, two or three examples at the same individual plant, 4. iii. 02.

☿ 1. Funchal, altitude 3000 feet (E. S. Goodrich, in Hope Collection), 3. i. 01.

♀ 2 ☿ 2. Madeira. T. V. W.

☿ 6. Orotava, Tenerife, March and April 1902. F. A. Bellamy.

The black on the abdomen of some of Mr. Bellamy's specimens is very extensive, quite as much so as in dark examples of *Vespa vulgaris*.

POLISTES GALLICUS, L.

♀ 3. Madeira. T. V. W.

Odynerus cruentatus, Brullé.

♂ and ♀. Orotava, Tenerife, westward of the port.

Odynerus hæmatodes, Brullé.

♀ 1. La Laguna, Tenerife. Hillside to left of main road to Tejina along a terrace of volcanic rock. Altitude about 2200 feet, 15. iii. 02.
♀ 1. Sauzal. Altitude about 900 feet, 4. iv. 02.
♂ 1 ♀ 2. Madeira. T. V. W.

Prosopis, sp. ?

Madeira. T. V. W.
Carded and marked in collection as n. sp. allied to *signata*.

Prosopis atra, n. sp.

Omnino nigra, facie maris flava, antennarum utroque sexu flagello subtus testaceo exceptis, genis brevissimis, abdominis segmento basali remote punctato, ruguloso, in femina microscopice, apice lineâ laterali pilorum albidorum ornato.

Entirely black in the ♀ ; ♂ with the face and a spot on the anterior side of the front tibiæ yellow, flagellum of the antennæ in both sexes more or less testaceous beneath, wings hyaline, the nervures brownish-black.

♂ Head and thorax and first joint of the antennæ clothed with long pale hairs, face yellow, of the same colour as in *communis*, the colour not or rarely extending above the insertion of the antennæ, clypeus black at the apex, mandibles black, antennæ with the first joint curved but scarcely dilated, cheeks linear, vertex strongly and closely punctured, thorax strongly punctured, but less closely than the head, the intervals microscopically rugose, propodeal area reticulate, abdomen somewhat dull, rugulose, punctured, punctuation of the first segment fine and remote, that of the others, closer and less definite, apex of the 1st segment with a very ill-defined fringe of white hairs at the sides, and 8th ventral segment formed much as in *pictipes*, Nyl., but the apical wings of the 7th are narrower and longer, and are twisted downwards at an angle of about 60 degrees from the horizontal basal plates, and are in this respect quite unlike those of any species I know—armature with the stipites more or less pointed, with very long apical hairs. Sagittæ wide, paler, and slightly longer than the stipites, each gradually narrowing to a rather blunt apex.

♀ punctured and sculptured much as the ♂, but the abdomen more shining, with quite microscopic rugulosities on the basal segment as in *genalis*, face short, cheeks linear, orbital furrows much produced posteriorly, slightly curved at their termination near the base of the posterior ocelli, propodeal area smoother than in the ♂, the reticulations almost obsolete except at the base, basal segment of abdomen with a distinct very narrow line of snowy-white pubescence; calcaria pale.

Long. 5 mm.

Orotava, visiting *Frankenia*, ♂ 3, 21. iii. 02.

Laguna, Tenerife, ♀ 1. 2 or 3 kilom from the city upon the ridge to the left of the Tejina road. Altitude 2100—2500 feet.

Sauzal, ♂ 1. Altitude about 900 feet.

HALICTUS, sp.?

♂ and ♀. Madeira. T. V. W.

This pair is named *quadristrigatus* in the collection, but neither ♂ nor ♀ is I think referable to that species, and in this opinion Mons. Vachal agrees; whether they are ♂ and ♀ of one species is also doubtful; the ♂ has the clypeus entirely black; the ♀ is in such bad condition that it is impossible to be sure of its identity, and I hesitate to describe a new species on a single ♂.

HALICTUS, sp.?

♀ 3. Laguna, 15. iii. 02.

Closely allied to, if not a variety of *H. scabiosæ*, Rossi, but without knowing the other sex, I am afraid to determine it for certain, as there are already several closely allied forms described in the group whose specific value is very doubtful; Brullé (Webb-Berthelot, Hist. Can. ii, p. 87) records *scabiosæ* as occurring in the islands, but remarks that he has only seen one ♂, which differs from *scabiosæ* in having the antennæ beneath entirely yellow; this makes me suspect that Brullé's ♂ and these ♀s may belong to a distinct Canary Island species.

HALICTUS, sp. (?).

♀ Madeira. T. V. W.

In Wollaston's collection there is a single ♀ under the name *zebrus*, Walck., but it is in such a condition as to render identification practically impossible.

HALICTUS VILLOSULUS, Kirb.

♀ 1. Monte Funchal (Madeira). Sheltering on a flower of *Vinca Major*, 27. ii. 02.
♀ 2. Monte Funchal (Madeira). Sheltering on *Crepis* and *Taraxacum officinale*, 4. iii. 02.
♀ 4. Laguna (Tenerife), 15. iii. 02.
♀ 2. Madeira. T. V. W.

These females do not quite agree in all points with British examples of the above species, but I see no distinctive character to rely upon, so without seeing the ♂ I think it is wiser to treat them as belonging to it. Mons. Vachal, to whom I submitted a specimen, returned it to me as *villosulus* ?

HALICTUS ALCEDO, Vachal.

♂ 1. Laguna, Tenerife. Hillside, east of the city, about 2000 feet altitude.

HALICTUS LÆTUS, Brullé.

♀ 1. Orotava, Tenerife, at la Cabezas, 24. iii. 02.

HALICTUS, n. sp.

♀ 1. Monte Funchal, Madeira, on Sonchus oleraceus, 1500 feet altitude, 27. ii. 02.

Allied to *Morio*, F., but more strongly punctured. In the Wollaston collection there are two ♂ and two ♀ of I believe the same species, but they are on cards and therefore no satisfactory description can be made from them; the males are peculiar in having very large heads and unusually ovate bodies.

HALICTUS VIRIDIS, Brullé.

♀ 4. Orotava, Tenerife, on *Oxalis* by the sea-shore, 20 and 23. iii. 02.
♀ 2. Laguna, Tenerife, 25. iii. 21–7. iv. 02. F. A. Bellamy.

I am indebted to Mons. Vachal for the determination of this species, as I had described it as new. I was misled by Brullé's remark: "Elle est revetue d'un duvet blanchatre non seulement sur tout le corp mais aussi sur les pattes"—in the specimens I have seen this rubbed off, but traces of it are left on portions of the abdomen; also he gives the size as that of *subaurata*, Rossi, whereas it is almost as large as *cylindricus*, F., but as Mons. Vachal saw Brullé's types in Paris recently there can be no doubt that his identification is correct.

HALICTUS ARCTIFRONS, n. sp.

Niger, abdominis segmento basali apice, segmentis 2, 3 et basi segmenti 4, testaceis, calcaribus pallidis, 3-spinosis, abdomine crebre punctato.

♀ closely allied to *H. angustifrons*, Vachal (Bull. Soc. Ent. Fr., 1892, p. xxii), to which at first I was inclined to refer it, but on communicating a specimen to the author he very kindly points out that it differs from his species in being stouter and having the posterior calcaria tridentate whereas in *angustifrons* they are 4–5 pectinate, and also in having the 2nd transverse cubital nervure united with the 1st recurrent, whereas in *angustifrons* the 1st recurrent is received into the 2nd cubital cell at about a quarter of the length of the cell from its apex. In colour it seems to agree well with *angustifrons*, the head and thorax are black and the abdomen black at the base and apex and testaceous red from the middle of the basal segment to the middle of the 4th. The eyes converge rather rapidly so as to give the face rather an elongate triangular aspect, the head and thorax are closely punctured and clothed with whitish hairs, and there is a line of dense white pubescence in the anterior depression of the pronotum and also in the depression bordering the mesonotum, postscutellum also densely clothed with whitish pubescence, propodeum with its basal area shallow and semi-circularly bounded, finely clathrate at the base, shining at the apex on the brow ; abdomen closely punctured, the puncturation of the basal segment slightly less close than that of the 2nd, legs black clothed with whitish hairs, apex of posterior metatarsi with a tuft of golden bristly hairs.

Long. 5 mm.

Orotava by the sea-shore, visiting *Frankenia*, 20 and 23. iii. 02.

ANDRENA BIMACULATA, Kirby ? var.

♂ and ♀. Madeira. T. V. W. In too bad condition to determine for certain.

ANDRENA BIPARTITA, Brullé.

♀ 2. Orotava, Tenerife, 21. iii. 02.

Andrena minutula, Kirb.

♂ 2. Monte Funchal, Madeira, 6. iii. 02. At about 1100 feet altitude.
♂ 1 ♀ 2. Madeira. T. V. W.

These are I believe referable to *minutula*, but belong to the form which has the mesonotum rugulose and with very distant, shallow punctures. We have similarly sculptured specimens in England, but those I possess belong to the second brood, whereas the males of this collection have the long-haired face of the first brood.

Osmia latreillei, Spin.

♂ 2 ♀ 1. Laguna, Tenerife, 15—17. iii. 02. At altitudes of 2000—2200 feet.
♂ 4 ♀ 4. Madeira. T. V. W.

Osmia submicans, Mor.

♂ 2. Laguna, Tenerife, 16. iii. 02. "Hill north of the city, at about 2150 feet altitude and under."

Megachile apicalis, Spin.

♂ 2. Orotava, Tenerife, 21. iii. 02.

Megachile, sp.?

♂ 1. Madeira. T. V. W.

In bad condition, but apparently closely allied to *versicolor*, Smith, with similar pale apical joints to the tarsi.

Podalirius quadrifasciatus, Villers.

♂ 6 ♀ 3. Madeira. T. V. W.

Of the usual Madeiran type with fulvous bands = var. *Maderæ*, Sichel.

Podalirius canariensis, n. sp.

Niger clypeo maris triangulariter albosignato, facie albido-hirta in lateribus pilis nigris intermixtis. Thorace albido-hirta fasciâ interalari nigrâ abdominis segmento primo albido-hirta, reliquis nigrohirtis fasciis interruptis apicalibus ornatis. ♂ metatarsis intermediis ciliis nigris postice dense vestitis.

Although so like *atroalba*, Lep., as to be scarcely distinguishable in the ♀, the ♂ is abundantly distinct in coloration and especially in the disposition of the black hairs on the intermediate metatarsi; these are arranged much as in *balcaricus*, Freise, all being on the posterior side of the joint.

♂ and ♀ very similar in coloration; black, the ♂ having a triangular spot on the clypeus, sometimes a more or less extensive spot on the labrum and a line on the front of the scape yellowish-white; in both sexes the hairs of the face are white intermixed with black. The face in the ♀ is very broad, and the cheeks between the eyes and mandibles very short, labrum clothed with silvery hairs. The thorax is clothed with grey and black hairs intermixed above, with nearly black hairs on the sides beneath the wings and with paler hairs round the propodeum, abdomen clothed with greyish-white hairs on the basal segment, with black hairs on the others, the 2nd, 3rd and 4th segments with a band of snowy-white rather long hairs at the apex, slightly narrowed at the sides and broken in the centre, legs clothed with black hairs, the intermediate and posterior tibiæ in both the ♂ and ♀ with bright silvery hairs exteriorly and the metatarsi of the same legs in the ♂ with silvery hairs at the apex, intermediate metatarsi with a dense fan of black hairs on its posterior side, in the ♀ the silvery hairs of the scopæ have a somewhat golden tinge.

Long. 12–13 mm.

La Laguna, Tenerife. Hill-side on left-hand side of main road to Tejuna, nesting in cavities of volcanic rock, altitude about 2200 feet, males only.

The ♀ which I associate with this ♂ is from the collection of Mr. Morice taken in Tenerife, it very closely resembles that sex of *atroalba*, but the face is wider, its hairs are mixed with black, whereas in *atroalba* they are all white. The hairs of the labrum are silvery and not dull grey, and the bands of the abdomen are of much longer hairs.

Bombus hortorum, Linn.

♀ 1. Monte Funchal, Madeira, 17. ii. 02.

"In garden of Belmonte Hotel, visiting *Azalea:* nest subterranean, common between 1450—1700 feet." Differs only from the ordinary type in having the hairs of the apical segments of a brownish tinge, and the hairs of the scopæ more or less reddish.

♂ 2 ♀ 3. Madeira. T. V. W. Similar to the above in coloration.

BOMBUS TERRESTRIS, Linn.

♂ 3 ☿ 2. Laguna, Tenerife, 14—16. iii. 02. Altitude 1900—2200 feet. "A common species."

Numerous ♂ ♀ and ☿ various localities in Tenerife. F. A. Bellamy. March and April 1902.

All the specimens are entirely black, with only the apex of the abdomen white. A very unusual variety of this species; the ♂ armature, however, is like that of normal specimens.

XIII. *Descriptions of Twelve New Genera and Species of* Ichneumonidæ (Heresiarchini and Amblypygi) *and three species of* Ampulex *from the Khasia Hills, India.* By PETER CAMERON, *communicated by* GEORGE ALEXANDER JAMES ROTHNEY, F.E.S.

[Read May 6th, 1903.]

Caspipina, gen. nov.

Mandibles curved, sickle-shaped, unidentate. Apex of clypeus transverse; not separated from the face; the foveæ distinct. Occiput sharply margined. Scutellum flat; its sides on the basal half keeled. Median segment completely areolated; the areola, if anything, broader than long and open at the base. Areolet 5-angled; narrowed at the top, the transverse basal nervure interstitial. Legs stout; the tarsi spinose. Antennæ compressed and somewhat dilated beyond the middle. The apex of the median segment has an oblique, straight, not rounded slope. The inner orbits are sharply margined. The recurrent nervure is roundly curved outwardly and bears the stump of a nervure in the middle.

Caspipina ferruginea, sp. nov.

Ferruginous; the edge of the pronotum, the lower edge of the propleuræ, the tubercles, the mesopleuræ broadly in the middle at the base and the centre of the metapleuræ, yellow; the edges of the mesonotum, the space at the sides of the scutellums, the apex of the median segment—the black projecting upwards along the keels—a band shortly below the middle of the propleuræ, the base, top, and apex of the mesopleuræ, and the base and lower-side of the metapleuræ, black. Legs ferruginous, the fore coxæ yellowish; the tarsi thickly covered with short, stiff hair; the incision on the base of the fore tarsi wide and deep. The basal sixteen joints of the antennæ ferruginous, the rest black. Wings fusco-hyaline, the nervures and stigma black. ♀.

Length, 13 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Head shining, the face and clypeus closely, but not strongly, punctured and sparsely covered with short pale pubescence; the front and vertex closely punctured, the inner and outer orbits obscure yellow. Mandibles with a yellowish tinge at the base, the apex black. Mesonotum closely and finely punctured, as are also the scutellums. Median segment closely, rugosely punctured, the punctures running into striae on the apex and on the spiracular areæ. Propleuræ shagreened, the meso- and metapleuræ closely punctured. Prosternum stoutly keeled in the middle; its apex and the base of the meso- black. The base of the 1st abdominal segment and of the 2nd, black; the 4th and the following segments more or less black; the post-petiole is raised in the middle and separated from the sides; its middle slightly depressed, closely punctured and finely longitudinally striated, except at the apex; the gastrocœli are stoutly striated.

ENCHISIADES, gen. nov.

Mandibles curved, ending in one tooth; the apex gradually narrowed, rounded. Face flat. Labrum projecting. Clypeus not separated from the face, its apex transverse. Scutellum roundly convex, not much raised, its sides distinctly keeled. Post-scutellum bifoveate at the base; its sides not keeled. Median segment with a gradually rounded slope, completely areolated, its areola longer than broad, rounded behind, its apex bulging backwards, and with the keel thin. Areolet 5-angled, narrowed above, the nervures almost touching there. Post-petiole broadly dilated, distinctly separated from the petiole. Legs stout; the tarsi long, spinose. Antennæ long, slender, slightly but distinctly, dilated towards the apex.

The hinder coxæ are larger than usual; the head is only slightly developed behind the eyes; the occiput is broadly rounded inwardly; its lower edge narrowly, but distinctly, keeled.

ENCHISIADES RUFIPES, sp. nov.

Black; the face, clypeus, labrum, mandibles, orbits, the edge of the pronotum narrowly, the line not extending to the apex, the lower edge of the propleuræ slightly more broadly, the scutellar keels, the sides of the scutellum, post-scutellum, the lateral region of the apical slope of the metanotum, the tubercles, a line on the inner-side of the mesopleuræ, commencing above the middle at the base, where it is narrowed along the basal half and more broadly on the lower half, where it is obliquely turned upwards; two marks under the hind-wings and a small mark above the middle of the hinder coxæ, lemon-yellow. Legs rufous; the four front coxæ and trochanters and the four apical joints of the hinder tarsi yellowish-white, the hinder coxæ black; the apex and an oblique line on the middle above, lemon-yellow; the apex of the hinder femora, the base of the hinder tibiæ, their apical third and the metatarsus, black; the tarsi thickly spinose. Abdomen black; an oblique mark on either side of the post-scutellum, a large mark, broader than long, on the sides of the 2nd, 3rd, and 4th segments with their apices narrowly in the middle, lemon-yellow. Wings hyaline, the nervures and stigma black. ♀.

Length, 11–12 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ black, the 10th to 17th joints beneath white; the scape minutely punctured and covered with black down. Face and clypeus closely and uniformly punctured, the vertex closely and minutely punctured, in the centre below closely transversely striated; the front smooth and shining. In the centre of the face is a large bell-shaped black mark, its lower edges uniting with the clypeal foveæ. Mandibles yellow, black at the apex; the palpi pallid yellow. Mesonotum opaque, granular, more distinctly punctured along the sides and covered with a pale down. Scutellum with the basal half indistinctly, the apical closely and distinctly punctured; it is thickly covered with pale hair; the basal keels are stout and extend to shortly beyond the middle. Basal half of post-scutellum punctured; the two foveæ large and deep; the depression at its sides has five stout longitudinal keels. Metonotum closely and distinctly punctured; beyond the basal areæ more or less transversely striated. Pleuræ closely punctured; the pro- at the base closely and finely striated.

Darachosia, sp. nov.

Mandibles with a long, curved apical tooth and a short blunt one in the middle. Antennæ as long as the body, dilated and compressed before the apex. Labrum projecting. Scutellum flat, its sides keeled. Median segment completely areolated, its spiracles linear; the areola twice longer than broad, rounded behind, its apex indented by the posterior median area. Legs long, the tarsi longer than usual; the anterior and hinder twice the length of their tibiæ. Areolet 5-angled, narrowed above. Abdomen with eight dorsal segments; the apex moderately blunt; the last segment short, about one-half the length of the penultimate; the ventral keel is distinct on the 3rd and 4th, indistinct on the 5th segment; the petiole is long and slender; the sheaths of the ovipositor project largely.

The occiput is transverse; the eyes large, sharply margined on the inner-side; the pronotum at the base is broadly raised; the petiole is long and slender; it is not abruptly dilated at the apex.

A distinct genus easily known by the form of the mandibles, by the long antennæ dilated before the apex, and by the very long spined tarsi.

This genus, as also do *Evirchoma*, *Sycaonia*, and *Legnatia*, as regards the mandibles, forms a transition between the *Amblypygi* and the *Heresiarchini*, there being a short subapical tooth, which is indistinct and more widely separated than it is with the former group, while in the latter the mandibles become gradually narrowed.

Darachosia fulvipes, sp. nov.

Black; the face, except for two short black lines in the middle, the clypeus, the eye orbits—the inner on the upper-side narrowly, the outer more broadly—the malar space, a line on the pronotum, two lines on the mesonotum, in the middle, one opposite the tegulæ, the scutellum, except in the middle—the black central mark narrowed and rounded, its apex transverse—the post-scutellum, the sides of the apical slope of the median segment, the yellow extending laterally on to the spiracular area and at the apex on to the pleuræ; the base of the pronotum, a line below the middle of the propleuræ, the mesopleuræ from shortly below the middle, the tubercles and the apex of the mesopleuræ narrowly, pale yellow. Legs fulvous, the four front coxæ and trochanters pallid yellow; the femora lined with black above, the front tarsi infuscated; the hinder coxæ black; the apex and the middle broadly above on the apical half, pale yellow; the trochanters, more than the apical third of the femora, and the apex of the tibiæ, black; the hinder tarsi pale yellowish. Abdomen black; the apices of all the segments lined with yellow, the apical three segments more narrowly than the others. Wings hyaline, their base with a slight fulvous tinge; the stigma testaceous, the apical nervures of a darker testaceous colour, the basal black; the areolet much narrowed above, the nervures almost touching there. ♀.

Length, 15 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ as long as the body, the scape below and joints 11–17 white; the thickened joints brownish beneath; the scape closely punctured and thickly covered with short white hair. Face closely punctured; it and the clypeus are covered with white pubescence. The lower part of the front is smooth and shining, the upper transversely striated, punctured laterally. Mesonotum closely and uniformly punctured; the scutellum is closely and more strongly punctured; its keels yellow. Median segment, except at the base in the middle, closely punctured; the areola closely punctured on the apical half; the basal smooth and shining and furrowed laterally. Pleuræ closely punctured; the pro- striated behind; the meta- more closely and strongly than the meso-. Mesosternum closely punctured; its basal slope stoutly transversely striated in the middle and bearing two transverse yellow marks; on the apex, near the middle coxæ, are two small oblique marks. The petiole closely and somewhat strongly punctured; its sides, on the apical half, striated; the 2nd, 3rd and 4th segments closely and uniformly punctured; the gastrocœli smooth, striated round the edges; the space between them closely, longitudinally striated.

Evirchoma, gen. nov.

Mandibles curved, with one longish apical and a short subapical tooth, not separated behind. Apex of clypeus broad, transverse, above separated from the face by a wide suture, which is deep on the sides, shallow and wider on the top. Labrum projecting. Occiput margined. Scutellum margined laterally at the base, large, convex, gradually rounded at the base and apex. Median segment completely areolated; the areola longer than broad, rounded at the base, of almost equal width throughout; the spiracles linear, curved. Areolet 5-angled, much narrowed at the top, the nervures almost touching these; the transverse basal nervure not interstitial. Abdomen with seven dorsal segments, the last large, not retracted, as long as the preceding, bluntly pointed; the ventral keel is on the 2nd, 3rd and 4th segments; the ovipositor projects, and is as long as the apical two segments united. Tarsi spinose.

Evichoma pallidimaculata, sp. nov.

Scape of antennæ rufous, closely, but not strongly, punctured; the flagellum stout, the 8th to 20th joints white, tinged with rufous, the rest black, more or less brownish. Face and clypeus strongly and closely punctured, the apex and sides of the latter smooth; the face yellow, broadly rufous in the middle; the clypeus broadly rufous in the middle, the sides paler, and there is a darker band between. Orbits yellow, broadly below; the vertex dark rufous, closely punctured; the front blackish, smooth. Apex of labrum fringed with long, fulvous hair. Mandibles rufous, the teeth black. Palpi yellow. Thorax dark rufous, the lower part of the pro-, the lower half of the mesopleuræ, the scutellums and the sides of the median segment at the apex, yellow, suffused with rufous. Mesonotum dark rufous, very closely punctured. Scutellum strongly longitudinally punctured, almost striated in the middle; the base black, the rest yellowish, running into rufous. Post-scutellum yellow, finely longitudinally striated. Median segment with the central three areæ smooth ; the basal central wider than long, narrowed towards the apex ; the basal lateral bear shallow, widely separated punctures ; the posterior median strongly transversely striated ; the spiracular at and behind the spiracles, almost impunctate, the rest obliquely striated, the striæ becoming stronger and more widely separated towards the apex, especially behind the teeth, which are large, keeled on the under-side, and united with the lateral keels. Propleuræ finely punctured above. Mesopleuræ yellow, black above, under the tubercles and halfway down the middle, the lower part of the base behind the keel black; the lower part is strongly longitudinally striated, the upper striæ being much shorter than the lower. Metapleuræ below the keel black, except at the base above, and the apex obliquely on the lower-side ; the yellow part is narrow at the top, becoming wider at the bottom. Legs dark rufous ; the femora darker ; the four front coxæ and trochanters yellowish-white ; the hinder broadly dark rufous at the base in front ; behind yellow, except for a large mark on the base below ; the basal joint of the hinder trochanters dark rufous ; the hinder tarsi thickly spined. Petiole black, its apex yellow ; the 2nd and 3rd segments black, impunctate ; their apices broadly rufous ; the other segments for the greater part dark rufous, their apices yellowish. The ovipositor sheaths pilose, largely projecting, rufous in the middle.

Sycaonia, gen. nov.

Mandibles with one short upper tooth, distinctly projecting beyond the lower, which hardly projects and is bluntly rounded. Face distinctly and broadly projecting in the middle, the projecting part bordered laterally by a shallow furrow, which is wider and more distinct below. Clypeus not separated from the face. Occiput margined. Antennæ stout, thickened beyond the middle. Scutellum flat, only slightly roundly convex ; its sides not margined. Postscutellum with a depression on either side at the base and bordered on the outer-side by a sharp keel. Median segment regularly areolated ; its sides with a blunt tooth ; its spiracles curved, linear ; areola separated by its own length from the base of the segment ; it is longer than broad, slightly narrowed towards the apex. Areolet 5-angled, narrowed above. Legs stout, the tarsi spinose. Abdomen with seven segments ; the last large all round ; if anything longer than the penultimate ; its apex somewhat bluntly pointed.

Sycaonia rufo-facies, sp. nov.

Black ; the orbits all round narrowly, the apex of the petiole and a mark, about three times broader than long and rounded on the inner-side, on the sides of the 2nd abdominal segment at the apex, yellow. Legs rufous, the four front coxæ and trochanters, the tibiæ to beyond the middle—about the basal two-thirds—pale yellow; the hinder coxæ on the sides and beneath, the hinder trochanters, apex of femora, their base more narrowly and the apex of the tibiæ black; the tarsi are covered thickly with stiff spines. The wings have a slight, but distinct, fuscous tinge; the stigma and nervures are fuscous; the 2nd transverse cubital nervure is faint. ♀.

Length, 11 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ with the 10th to 19th joints white except above; the scape rufous beneath. Face and clypeus strongly and closely punctured and thickly covered with white pubescence. Front above and clypeus closely and distinctly punctured. Mesonotum closely punctured and thickly covered with short black hair. Scutellum slightly roundly convex, sparsely punctured and thickly covered with longish pale hair. The base of the post-scutellum is obliquely depressed; its apex has an oblique straight slope. Areola smooth and shining; the posterior median area closely transversely striated; the other areæ closely and distinctly punctured; the spiracular transversely striated beyond the stigma; the striæ on the apical lateral areæ are coarser, more irregular and more widely separated. Pro- and mesopleuræ closely and minutely punctured, the apex and middle of the former closely and the lower half of the latter, more widely and strongly striated. The metapleuræ, if anything, are more strongly punctured and with the apical half obliquely striated. Petiole smooth above, except on the sides of the post-petiole, which are punctured; the gastrocœli shallow, closely striated near the apex, which is testaceous; the sides are closely striated; the apices of the other segments are narrowly testaceous, this being the case also with the 2nd, 3rd and 4th ventral segments.

Legnatia, gen. nov.

Mandibles with one long, curved upper and a short blunt sub-apical tooth. Abdomen with eight dorsal segments; the cerci large; the apical segment blunt, small; the ventral keel on the 2nd and 3rd segments only; the ovipositor largely projecting. Antennæ longish, dilated and compressed beyond the middle. Labrum hidden. Scutellum flat; its sides keeled. Median segment completely areolated; it is longish and has a gradually rounded slope; its areola widely separated from the base of the segment, which is not depressed; it is twice longer than wide: the spiracles linear, curved. Areolet

5-angled, narrowed above. Legs longish; the tarsi long, the hinder almost twice the length of the tibiæ; the apices of the joints spined.

The post-petiole becomes gradually wider from the base to the apex and is not clearly separated; the gastrocœli large and deep; the head is not largely developed behind the eyes, and becomes obliquely wider below before the middle; the eyes are large and are sharply margined on the inner-side.

A genus easily known by the long antennæ dilated beyond the middle, by the curved mandibles with long apical tooth, by the long spined tarsi and by the abdomen having eight segments.

Legnatia fulvipes, sp. nov.

Black; the face, clypeus, the inner orbits, the outer—narrowly above, entirely below—the lower part of the prothorax, the edge of the pronotum, two lines on the basal two-thirds of the mesonotum, the scutellum, except a narrow line down the middle, a squarish mark on either side of the base of the metanotum, its lateral areæ entirely, the lower half of the mesopleuræ, a mark under the hinder-wings, the metapleuræ from shortly behind the middle, where they are obliquely rounded, a small mark at the spiracles, the sides and apex of the post-petiole, the apices of the 2nd and 3rd segments broadly laterally, more narrowly in the centre, a line on the apex of the 4th, interrupted in the middle, a small round spot on either side of the middle of the 5th, the 6th on the apical half of the middle, the whole of the 7th, and the 2nd, 3rd and 4th ventral segments for the greater part, pale yellow. Legs fulvous; the four front coxæ and trochanters and the hinder coxæ, pale yellow; the apex of the latter on the outer-side, the apex of the hinder femora, of the hinder tibiæ and the base of the metatarsus, black. Wings hyaline, the stigma pale, the nervures black. ♀.

Length, 11 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ black, as long as the body, the scape beneath and the 9th to 16th joints white beneath. Face and clypeus closely punctured all over and sparsely covered with pale pubescence; the vertex more sparsely punctured, more closely and distinctly at the ocelli than below; the black band on the vertex and front is contracted on the top of the latter. Mesonotum closely punctured; the scutellum much more sparsely punctured; the post-scutellum smooth. Median segment closely, rugosely punctured; the areola is shagreened and is furrowed round the sides and base; the posterior median area is strongly, if somewhat irregularly, transversely striated, as are also the posterior intermedian. The lower half of the propleuræ longitudinally striated, the upper smooth. Meso- and metapleuræ closely punctured.

Eutanyacra, gen. nov.

♂. Apex of abdomen bluntly pointed, with eight segments, the 8th produced in the middle into a long narrow process, which is three times as long as the basal portion of the segment; the ventral fold is only distinct on the 2nd and 3rd segments. Face flat, not separated from the clypeus. Clypeal foveæ large, deep. Mandibles with one long upper and a blunt lower tooth which is not clearly separated behind. Apex of clypeus transverse, its sides rounded. Labrum hidden. Occiput sharply margined. Scutellum roundly convex. Median segment areolated; the areola about as broad as long, and with its apex rounded. Spiracles elongated. Legs stout, of moderate length; the tarsi spinose. Antennæ serrate, shorter than the body, distinctly tapering towards the body.

The ædigus is much larger than usual; it appears to form one solid piece, united below at the apex and with a broad and deep furrow on the basal two-thirds; at the base of this is a large tubercle, on either side under the base of the projection on the apical segment; the apex, looked at from the sides, is bluntly rounded on the lowerside, which projects more than on the upper. The 8th dorsal segment is small and bears longish cerci. Gastrocœli large, deep.

Belongs, by the bluntly-pointed apex of the abdomen and by the ventral fold being on the 2nd and 3rd segments only, to the *Amblypygi*. In Ashmead's arrangement the genus comes near *Pseudamblyteles*. The ♀ I do not know, but the peculiar structure of the 8th ventral segment, the very large ædigus and the large cerci make the ♂ representatives of the genus easy of recognition.

Eutanyacra pallidicoxis, sp. nov.

Black; the face, clypeus, inner orbits, a small spot on the base of the mandibles, the upper edge of the pronotum, the scutellums, tubercles, tegulæ, the apex of the post-petiole narrowly, its sides more broadly, a large mark on the sides of the 2nd and 3rd segments on the apical half and narrowed on the inner side, the apex of the 6th segment to near the middle and the greater part of the 7th segment, pale yellow. Legs pale yellow, the hinder coxæ, the hinder femora, except at the base and the apical two-thirds of the last joint of the tarsi, black. Wings hyaline, with a slight fulvous tinge ; the cubitus before the areolet and the 2nd transverse cubital nervure are largely bullated. ♀.

Length, 13 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ not much longer than the abdomen, distinctly tapering towards the apex, the flagellum densely pilose, the apical joints serrate ; black, brownish beneath ; the scape beneath, the 2nd and the 7th to 14th joints white. Face and clypeus strongly and closely punctured, and thickly covered with short white pubescence ; in the centre of the face is a line which is irregularly dilated in the middle ; the front and vertex are strongly punctured ; the outer orbits are less strongly and more closely punctured. Palpi pale testaceous. Mesonotum closely punctured and thickly covered with short silvery pubescence ; the scutellum is not so closely punctured as the mesonotum, and is thickly covered with white pubescence ; its apex is distinctly narrowed. Median segment closely rugosely punctured ; the sides at the apex obliquely reticulated, more closely behind than below. Pleuræ closely and distinctly punctured, as is also the breast, which is deeply furrowed down the middle. Post-petiole closely longitudinally striated ; the 2nd to 4th segments closely punctured ; the gastrocœli stoutly striated.

Ancyra, gen. nov.

Areolet large, not much narrowed above, 5-angled. Clypeus not separated from the face, its apex transverse. Labrum projecting. Mandibles bidentate, the upper tooth not much longer than the lower. Scutellum roundly convex, its base and apex with an oblique slope. Median segment regularly areolated ; the areola about twice longer than broad, transverse at the apex, the sides slightly angularly produced in the middle. Metathoracic spiracles linear. Legs longish, not very stout ; the tarsi spinose. Abdomen longish, with seven segments, the last large ; the ventral fold on the 2nd and 3rd segments only. Antennæ short, not much longer than the abdomen, the joints serrate beyond the middle ; the apex distinctly narrowed. Eyes large, parallel, their lower part reaching below the clypeal foveæ.

The stump of a nervure on the outer-side of the recurrent nervure is longer than usual ; there is none on the disco-cubital ; the transverse basal nervure is interstitial. May be known by the large, wide areolet, by the long, slender legs, by the large eyes which reach close to the base of the mandibles, by the pyramidal scutellum and by the long abdomen.

Ancyra flavomaculata, sp. nov.

Pallid yellow; the hollowed lower part of the front, the ocellar region, the vertex behind, an oblique mark behind and united to the eyes near the top, the occiput, the mesonotum, except two yellow lines down the middle, the parts at the sides of the scutellums, the base, apex and central areæ of the metanotum, a line in the centre of the propleuræ on the basal two-thirds, the base, upper part and apex of the mesonotum, and two marks on the sides of the mesonotum—broad at the apex, gradually narrowed behind—and the greater part of the abdomen, black. Legs pallid yellow like the thorax; the four front coxæ above and more or less below, the four front trochanters more or less above, the base of the four anterior femora, the hinder coxæ below at the base, the base of the hinder femora to near the middle; the four anterior and the base and apex of the hinder tarsi, the four front tibiæ at the base behind and the hinder at the base all round, black. Wings smoky-violaceous; the stigma and nervures black. Abdomen black; the apical half of the petiole, the apical half of the 2nd and 3rd segments, except in the middle, and a small mark on the side of the 4th segment, pallid yellow. ♂

Length, 19–20 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ not much longer than the abdomen; the scape pallid yellow, black above; the basal six joints entirely pallid yellow, the 7th to 13th yellow, marked with black above; the others black; serrate, distinctly tapering towards the apex. Face and clypeus shining, punctured all over, but not very closely or strongly and almost glabrous; the vertex is more closely punctured. Mandibles yellow, their teeth black. Mesonotum closely punctured. Median segment rather strongly punctured; the areola roughly aciculated; on the sides are a few, oblique short keels, and on the apex in the middle a central one; except at the base the posterior median area is closely, transversely striated; on the smooth base are two longitudinal keels. Pleuræ closely punctured. Petiole closely punctured at the base, the rest smooth. Gastrocœli deep and bearing three stout keels. The black line on the 2nd abdominal segment is broad at the base, narrowed at the apex; that on the 3rd is much broader and also gradually narrowed towards the apex; the apex of the segment is black.

Losgna, gen. nov.

Antennæ compressed and dilated beyond the middle. Mandibles bidentate, the upper tooth much larger than the lower. Scutellum large, quite flat, its sides sharply keeled. Apex of clypeus broadly transverse. Labrum projecting. Head largely projecting behind the eyes, at the top obliquely narrowed. Eyes distinctly margined on the inner-side. Median segment completely areolated; the areola large, longer than broad, its base roundly dilated; the sides of the segment bluntly toothed; the keel below leaf-like. Legs normal; the tarsi long, spinose. Abdomen with seven segments, the last bluntly pointed, and as long as the penultimate; the ventral keel on the 2nd and 3rd segments only; the ovipositor largely projects.

The head behind is deeply and roundly incised; above it is depressed; the occiput is not distinctly margined. In addition to the longish spines on the tarsi, their joints bear shorter spines, and are also thickly covered with stiff hairs. The ocelli are placed on the edge of the occiput.

Belongs to the *Amblypygi*. May be known from *Amblyteles* by the very flat, keeled scutellum, by the dilated antennæ, by the spined tarsi, and by the abdomen having seven segments.

Losgna forticeps, sp. nov.

Black; the outer orbits broadly below, the inner narrowly above; the face, clypeus, labrum, palpi and mandibles pallid yellow; a line on the hinder half of the pronotum, its base, the sides and apex of the scutellum, the scutellar keels, the sides and apex of the apical slope of the median segment, the lower half of the mesopleuræ and a mark behind the metathoracic spiracles, white. The four anterior legs pale fulvous, the coxæ and trochanters yellow; the hinder coxæ, trochanters and femora pale fulvous, marked with black above, the tibiæ and tarsi black. Abdomen black, the base of the petiole broadly, an oblique mark on the sides at the apex, the sides of the 2nd and 3rd segments on the apical half, an oblique mark on the sides of the 4th and 5th—all extending backwards at the base; the apex of the 6th all round and the 7th entirely, pallid yellow, as is also the whole ventral surface. Wings hyaline, the nervures and stigma black. ♀.

Length, 15 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Antennæ black, the scape and joints 11–20 white beneath. Face broadly dilated in the middle, punctured; the clypeus with scattered punctures. Front smooth and shining, broadly excavated laterally, the ocelli in front surrounded by a semicircular furrow. Mesonotum strongly and closely punctured and with two shallow, wide, longitudinal furrows in the centre. The flat scutellum bears large, deep, clearly separated punctures in the middle. Areola stoutly, closely, mostly transversely, irregularly reticulated; the posterior median area closely transversely rugose. The hinder part of the propleuræ stoutly, closely obliquely striated. Mesopleuræ closely, but not strongly and the meta- closely, strongly, and uniformly punctured.

Pramha, gen. nov.

Metethoracic spiracles small, oval. Antennæ thickened and compressed beyond the middle; annulated with white; the basal joints of the flagellum elongated. Clypeus separated from the face; its apex broadly rounded. Mandibles with a large apical and a small subapical tooth. Labrum hidden. Areolet 5-angled; the transverse basal nervure interstitial. Abdomen with seven distinct segments; its apex blunt; the ventral fold extends to the apex of the 4th segment, the ovipositor large, projecting. Legs moderately stout, the penultimate tarsal joint spinose.

Belongs to the *Amblypygi*. The scutellum is flat and not keeled, the post-scutellum bifoveate; the face flat, clypeal foveæ large and deep; the occiput margined; the temples not much developed; the petiole as in *Ichneumon;* the gastrocœli large, shallow; the transverse basal nervure interstitial; the last ventral segment is large; the cubital nervure at the base is not angled, but broadly rounded. The areola is wider than long, transverse in the middle with the sides rounded at the base; the apex rounded inwardly.

Pramha mandibularis, sp. nov.

Black, a line on the pronotum, broadest behind, the tegulæ, tubercles, scutellums, a band on the base of the propleuræ, yellow; the sides of the petiole broadly, the apex more narrowly, rufous; the 2nd, 3rd and 4th abdominal segments rufous and yellow at the base and apex, the others yellow at the apex. The four front legs fulvous, the coxæ and trochanters yellow, the hinder pair rufous; the coxæ fulvous-yellow behind, the tibiæ of a much darker rufous colour, the tarsi fulvous. Wings hyaline, the nervures fuscous, paler towards the apex; the lower part of the stigma pale testaceous. ♀.

Length, 8 mm.

Hab. Khasia Hills. Coll. Rothney.

The scape and the 10th to 16th joints of the antennæ white, the 2nd and the apices of the 3rd and 4th joints brownish. Face strongly punctured, the clypeus less strongly and closely punctured and covered with short white pubescence. The base of the mandibles broadly and the palpi white. Front and vertex closely, strongly and uniformly punctured and sparsely covered with short pale hair. Mesonotum closely and finely punctured and thickly covered with short fuscous hair. Scutellum with a black mark, rounded above on the apex; the basal depression wide, deep and stoutly keeled laterally. Median segment closely punctured all over and, except at base, thickly covered with long fuscous hair; the basal area is wider than long and has oblique sides; the posterior median area slightly hollowed and not clearly limited, the keels not being very distinct; it is closely transversely striated. The upper part of the propleuræ weakly punctured, the apex below stoutly transversely striated. Mesopleuræ closely and strongly punctured; in the middle above is an oblique shining furrow. Mesosternal furrow wide, deep and with some stout keels in the middle. Metapleuræ closely punctured; the lower half of the basal depression with three stout keels. Apex of petiole aciculated and marked with large, closely separated, punctures; the basal third of the 2nd segment is closely and strongly striated; the gastrocœli are represented by three shallow depressions, the space between them being finely striated.

Benyllus, gen. nov.

Median segment completely areolated, its apex spined; the posterior median area largely projecting into the areola; its spiracles linear, curved. Scutellum convex, rounded, its sides sharply margined. Mandibles unequally toothed, the upper much longer than the lower. Clypeus not separated from the face. Occiput not margined. Wing areolet 5-angled, narrowed above; the transverse basal nervure interstitial. Legs stout, the tarsi long, spinose. Abdomen with seven segments; the apex of the petiole curved; the gastrocœli almost obsolete; the ovipositor largely projecting; the 7th segment is nearly as long as the 6th; the ventral keel stout, extending to the apex of the 5th segment—to the base of the ovipositor. Antennæ stout.

A genus of *Amblypygi* characterized by the stout, unequally-toothed mandibles, the stoutly-keeled scutellums, the spined median segment, and by the posterior median segment area largely projecting into the areola.

Benyllus rufus, sp. nov.

Rufus, nigro maculato, facie, clypeo orbitisque oculorum flavis, mesonoto nigro, alis hyalinis, stigmate fusco. ♀.

Length, 10 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Head black; the face, clypeus, the inner orbits and the outer more broadly, except above, lemon-yellow; the palpi of a paler yellow; the face and clypeus, except at the sides, punctured and covered with pale pubescence; the front smooth and shining, depressed, except at the top, where there is, in the middle, a raised punctured band; the vertex is closely and distinctly punctured; a furrow runs down from the lower ocellus. Mandibles yellowish, black at the apex. Thorax rufous; the mesonotum and the sides of the median segment at the base, black. Mesonotum and scutellum closely punctured; the post-scutellum irregularly punctured and striated. The basal areæ of the median segment are closely punctured; the areola obliquely, stoutly striated on the sides; the posterior median punctured all over, the punctures clearly separated, but not deep; the outer areæ irregularly punctured on the upper half, on the lower transversely striated; the spines are large. Propleuræ smooth and yellowish in tint; the meso-metapleuræ and mesosternum closely and distinctly punctured; the mesosternal furrow striated. Abdomen of a slightly darker rufous colour than the thorax; a mark on the petiole—half on the petiole and half on the base of the post-petiole—and the basal two-thirds of the 2nd and 3rd segments, black; the post-petiole and 2nd segment closely and distinctly, the 3rd less distinctly punctured; the sheath of the ovipositor blackish. Legs coloured like the body; the four front coxæ and trochanters pale yellow.

Buathra, gen. nov.

♂. Antennæ long, stout, distinctly tapering towards the apex; the 1st joint of the flagellum distinctly longer than the 2nd. Eyes prominent, parallel. Front and vertex deeply excavated. Clypeus small, its apex rounded. Mandibles stout, with two stout, blunt, subequal teeth. Parapsidal furrows, deep, distinct. Scutellum not much raised, not keeled. Median segment rugosely punctured, without areæ, but with two transverse keels, bent backwards in the middle; at the sides these are united by a keel which ends in a tooth, which is blunt, but distinct. Areolet almost square, hardly narrowed in front; the disco-cubital nervure has a stump of a nervure; the transverse basal nervure is interstitial. Petiole slender, the spiracles at the base of the post-petiole, which is not much dilated. Gastrocœli indistinct. Metathoracic spiracles large, oblique, linear. Clypeus roundly projecting.

I have only a ♂ of this genus, and am not sure about its exact systematic position. In the distinct parapsidal furrows and in the squarish areolet it agrees with the *Cryptina*, as it does also in the paucity of areæ on the median segment; in the position of the spiracles on the petiole, and in having the stump of a nervure on the disco-cubital nervure, it agrees with the *Ichneumonina.*

Buathra rufiventris, sp. nov.

Black; the abdomen from the apex of the petiole and the legs ferruginous; the antennal scape in the middle below; the inner orbits narrowly above, broadly below—the band becoming broader beyond the middle and narrowed obliquely towards the apex—a mark, rounded at the apex, in the centre below the antennæ, the clypeus, mandibles, except the teeth, the palpi, the outer orbits narrowly, except above, the tegulæ and tubercles, yellow. The four front coxæ and trochanters are yellow in front and at the sides; the middle trochanters are black behind; the hind coxæ and base of trochanters black; the apical four joints of the hinder tarsi spinose. Wings hyaline, the nervures and stigma black. ♂.

Length, 15 mm.

Hab. KHASIA HILLS. Coll. Rothney.

Head densely covered with glistening, silvery-white pubescence. Face strongly punctured. Median segment with a gradually rounded slope to the middle, the apex oblique. Thorax covered with glistening white hair, closely and strongly punctured, the pleuræ more strongly than the mesonotum; the metapleuræ at the apex coarsely obliquely striated. The punctures on the scutellum large and clearly separated; the basal depression large and with some stout striæ. Post-scutellum longitudinally striated in the centre. Petiole strongly aciculated except at the apex, as are also the sides and ventral surface.

AMPULEX KHASIANA, sp. nov.

Length, 16 mm. ♀.

Hab. KHASIA HILLS. Coll. Rothney.

Agrees closely with *A. longicollis,* Cam., but is smaller, the prothorax is not quite so long nor so distinctly narrowed at the base; the apex of the median segment is not reticulated at the end of the transverse striations; the fovea at the apex is neither so deep nor so clearly defined, the narrowed basal part is longer and more distinctly separated, and the bordering nervure on the radial nervure is not so curved at the apex.

Antennæ black, moderately stout, the 3rd joint about twice the length of the 4th. Head dark purple, coarsely punctured above the antennæ, sparsely covered with pale hair. Clypeus smooth, blue above, the middle sharply carinate, the apex with an oblique short tooth on either side; the labrum smooth, glabrous. Front keeled in the centre, the keel bordered by some oblique one. Temples largely developed, roundly narrowed. Prothorax smooth, longer than broad, narrowed at the base, which is raised and distinctly separated; the middle of the pronotum forms almost a triangle. Mesonotum with large, deep, scattered punctures; the furrows are narrow, complete. Scutellum at the apex bordered with large, deep, irregular punctures; there being also a few in the centre; the sides of the post-scutellam with two large punctures. The three central keels on the median segment are distinct and extend to the base of the apical third, where the central keel roundly bifurcates; the central space is stoutly transversely striated; the inner lateral area is finely and closely, the outer more stoutly and widely striated; at the apex are three transverse keels, the apical being more widely separated from the posterior than the latter are from each other; from the hinder keel another projects backwards into the bifurcated apex of the central keel; the projecting apex in the centre is smooth, broader than long, and has the apical third depressed; the lateral teeth are large and somewhat triangular. The apex of the segment has an almost perpendicular slope, is transversely striated, rather irregularly at the base, more closely and regularly in the middle and apex, where it is thickly covered with long white hair. Mesopleuræ stoutly, deeply, irregularly punctured; the tubercles large, smooth and roundly convex; the metapleuræ with two stout longitudinal keels; the space between these is smooth at the base, the rest with stout perpendicular keels; the base in the centre is smooth, its lower part and the apex stoutly, irregularly reticulated. Mesosternum irregularly punctured; the process is long, narrowed at the base, slightly narrower and rounded at the apex; the inner side is slightly raised, the centre hollowed. Legs black, the four hinder coxæ green, the basal half of the hinder femora red; their apex and the hinder tibiæ purple; the tarsi thickly spinose; the tooth on the claws is placed shortly beyond the centre. Wings deep smoky-violaceous; the stigma and nervures black; the apex of the radius is rounded; the appendicular cellule is almost open at the apex, elongate; the basal abscissæ of the radius of equal length; the 1st recurrent nervure is received in the middle, the 2nd near the apex of the basal third of the cellule. Abdomen shining, very smooth, purple; the narrowed basal part of the petiole is as long as the widened apical half; the 2nd segment is slightly longer than all the succeeding segments united. The sides and lower part of the petiole are stoutly striated; the striæ on the sides are oblique.

The pro- and mesonotum are largely tinted with green; the metanotum is deep purple, blue at the base and apex and, to a less extent, on the sides.

Ampulex assamensis, sp. nov.

Length, 13 mm. ♂

Hab. Khasia Hills. Coll. Rothney.

Antennæ black, the apical joints perceptibly curved, the scape thickly covered with pale pubescence; the 3rd joint slightly, but distinctly, longer than the 4th. Head coarsely rugosely punctured, the front transversely striated in the middle, the temples obliquely narrowed; the antennal tubercles stout, longish, narrowed above, slightly curved; the temples narrowed. Clypeus green, thickly covered with long white hair; its apex ends in a triangular tooth, there being no lateral ones. Labrum brownish, thickly covered with long white hair. Mandibles black, the apex rufous, the base punctured. Eyes only very slightly converging above, where they are separated by slightly more than the length of the 2nd and 3rd antennal joints united. The thorax coarsely punctured, the prothorax and sides of the mesonotum blue, the middle of the metanotum indigo-blue; sparsely covered with long black hair. The middle lobe of the median segment is stoutly striated; the striæ distinctly curved, those at the base irregularly curved; the central keel is distinct; the outer areæ are more closely and regularly striated; the projecting apex is deeply hollowed, the hollow being wider than long and bounded behind by three foveæ, there being another fovea behind the outer of these. The apex of the segment is largely, irregularly reticulated, the upper reticulations being the larger, the lower of the two teeth is small and triangular. Pro- and mesopleuræ distinctly punctured, except on the middle of the former and apex of the latter; the metapleuræ strongly reticulated. The mesosternal process large, its sides oblique on the inner, rounded on the outer-side. The four hinder femora are bright red; the anterior femora and tarsi of a duller red; the femora are blue behind; all the tarsi black; the hinder claws are stoutly bifid, the hinder claw the stouter and shorter. The first two abscissæ of the radius are equal in length; the 1st transverse cubital nervure is only indicated slightly below. The narrowed basal part of the petiole is short, the middle triangular and with a curved furrow on the sides at the base; it is sparsely punctured laterally; the apex is more strongly punctured; the 2nd segment is more closely punctured all over; the apical segments are coarsely and deeply punctured below; the punctures on the 2nd segment are more scattered, especially at the base; the other segments are coarsely and closely punctured.

Ampulex carinifrons, sp. nov.

Length, 15 mm.

Hab. Khasia Hills. Coll. Rothney.

Agrees in coloration and closely, in some other respects, with *A. compressa*, but may be known from it by the parapsidal furrows being less clearly defined, by the raised apex of the pronotum being smoother above and deeply furrowed throughout, by the raised apex of the median segment being roundly depressed in the middle, and by the 2nd abdominal segment being much more strongly punctured.

Antennæ black, the scape punctured, metallic green, the 3rd joint not quite the length of the 4th. Head deeply punctured, the face thickly covered with long white hair; the front and vertex with brassy tints; the front in the middle with an enclosed area, its keels enclosing the front ocellus, the basal half of the area being broader than the apical; the keels bounding the latter are curved inwardly; the vertex has a furrow in the centre. Pronotum stoutly transversely striated; the furrows behind the middle are more widely separated; the apex is distinctly raised, smooth and furrowed down the middle. Mesonotum with large, deep punctures which are more widely separated in the middle at the apex; the sides near the apex are deeply hollowed, the inner-side of the hollow being stoutly striated, the outer smooth. Scutellum more closely punctured than the mesonotum; the post-scutellum aciculated; its sides, except at the apex, with large punctures. Median segment transversely striated, the striæ on the middle more widely separated; the middle keel is straight, and reaches close to the apex; the lateral are curved and reach shortly beyond the middle; the inner outer keel originates from the outermost near its base. Tubercles stout, rounded at the top; the keel bounding the apex is depressed in the middle. The apex of the segment is irregularly reticulated all over and thickly covered with long white hair. The upper part of the propleuræ is strongly punctured, the lower smooth, faintly aciculated; the mesopleuræ coarsely punctured except at the apex, where it is aciculated; the upper half striated below, reticulated above. Mesosternum coarsely punctured, the central furrow not widened at the apex as in *A. compressa*. Wings fusco-violaceous, darker along the nervures, of which there are three; the cubital nervure is more rounded upwards on the 2nd cubital cellule than in *A. compressa*, and the 2nd recurrent nervure is received nearer the middle. The base of the abdomen is distinctly narrowed and furrowed down the middle. The base of the petiole is distinctly narrowed and furrowed down the centre; the apex and the 2nd segment are distinctly punctured all over, but not closely, the apical segments are more closely and strongly punctured. The four hinder coxæ are brassy; the four posterior femora bright red, black at the apex; the anterior femora green, dull rufous in front, the tibiæ are black in front, blue or green behind; the tarsi black; hinder claws with a tooth at the base. The eyes at the top are separated by the length of the 4th antennal joint.

As the above concludes the descriptions of the new species of *Ampulex* known to me from the Khasia Hills, it may be useful to give a list of the Khasia species described by me. In the Ann. and Mag. Nat. Hist. July 1899, p. 57, *Ampulex* (*Rhinopsis*) *nigricans; l.c.* 1890, *pilosa*, p. 37; *pulchriceps*, p. 38; *l.c.* 1902, *Rothneyi*, p. 54; *trichiosoma*, p. 55; *ruficoxis*, p. 56; *l.c.* 1903, *montana*, p. 319; *himalayensis*, p. 320; *interstitialis*, p. 321; *longicollis*, The Entomologist, p. 263, 1902; *trigona*, p. 264; *brevicornis*, p. 312. Described here, *khasiana*, *assamensis*, and *carinifrons*. The known species from Khasia are *latifrons*, Kohl, and *compressa*, Fab., in all seventeen species.

Bingham (Fauna of British India, *Hym.*) describes eight Indian species only, but one of these (*Cognata*, Kohl) appears to have been included in error. Cf. Cameron, Ann. and Mag. Nat. Hist. 1900, p. 39.

June 2, 1903.

XIV. *On a Collection of* Lepidoptera *from Arctic America.* By Henry John Elwes, F.R.S., etc.

[Read February 4th, 1903.]

Plate IX.

The collection of which I give a list was made by Mr. David Hanbury, who has appended notes on the localities and habits of the insects, which give an exceptional value to it.

Though small in number of species, it is the most interesting Arctic collection I have yet seen, and most of the specimens are in beautiful condition. The variation in some of the species is extraordinary.

Considering the difficulties under which collecting is carried on in such a region, and that Mr. Hanbury had not previously any experience in collecting, this collection does him the highest credit.

He has been good enough to present the greater part of it to the National Museum.

List of Mr. Hanbury's Arctic Collection.

1. *Erebia fasciata.* (Plate IX, fig. 11 ♂, 12 ♀.)
E. fasciata, Butler, Cat. Sat. B.M., p. 92, Pl. II, fig. 8 (1868).

Several specimens in beautiful condition; from Point Epworth, 11, vii; Cape Barrow, 30, vi; Chapman Island, 27, vi; Gray's Bay, 1, vii. These agree with the type in the British Museum from Cambridge Bay, and vary considerably in the amount of rufous in the fore-wing above, which in the females extends to the base of the wing.

The fringe in quite fresh specimens is grey.

2. *Erebia disa.*
Papilio disa, Thunberg, Diss. Ins. Suec. II, p. 37 (1791).

Three males and a female from Point Epworth, 11, vii. These resemble specimens from Finland much more closely than they do specimens of the var. *mancinus*, Hew., from

Alberta, in having the band of the hind-wing below well marked.

3. *Erebia rossii.*
Hipparchia rossii, Curtis, Ross' 2nd Voy. App. Nat. Hist., p. 67, Pl. A, fig. 7 (1835).

A pair from 140° W., 67° 40 N., 14, vii, and one from Point Epworth, 11, vii, are perfectly fresh, and seem to show that this species is barely separable from the Asiatic form, *ero,* Brem. *Cf.* Trans. Ent. Soc. Lond., 1899, p. 347.

I previously had only bad specimens from Hudson Bay for comparison. Recently I have received a fresh female taken by Mr. Sampson in Frobisher Bay, Baffin's Land, 14, vii, 02.

The fringes of these three are all grey, which is not the case in any of my Altai specimens however fresh, though slightly evident in some from Transbaikalia.

4. *Œneis bore,* var. *taygete.*
Œ. taygete, Hübner, Samml. Ex. Schmett. (1816–1824).

Several pairs in beautiful condition from Barren Grounds, Gray's Bay, and Point Epworth; vary a good deal in the breadth, shape, and distinctness of the bands on hind-wing below. Two show the marginal row of whitish spots on hind-wing very distinctly, these are usually faint or absent in Labrador specimens.

5. *Œneis semidea,* var. *vel crambis,* var. (Plate IX, fig. 9 ♂, 10 ♀.)
Hipparchia semidea, Say, Amer. Ent. III, Pl. 50 (1828).
Chionobas crambis, Freyer, Neuere Beitr. V, Pl. 440, figs. 3–4 (1844).

Five specimens from Barren Grounds and one from Point Epworth, fresh and in good order, must, I think, be referred to one of these species. I might call them *peartiæ,* Edw., or *assimilis,* Butl., but they are intermediate between the types of those two forms in the British Museum, being rather less conspicuously banded on hind-wing below than the former, and rather more so than the latter.

Some of them show more or less trace of the marginal row of grey spots on hind-wing, which at first led me to think that they were *crambis;* but in a fresh state they are much blacker than any of the faded specimens of *crambis* I have before me. Whether that species, which I only know certainly from Labrador, occurs also in Arctic America, and whether when we know it better it will be possible certainly to distinguish it from *semidea*, are points which at present remain obscure.

6. *Cœnonympha tiphon*, var. *mixturata*.
C. tiphon, var. *mixturata*, Alpheraky, Rom. Mem. sur. Lep. IX, p. 326 (1897).

Two males and a female from Dismal Creek, taken 30, vii, are in bad condition, but are sufficient to show that the form found here, like that from Alaska, is nearer to the Kamschatkan variety than to any other.

7. *Argynnis pales.*
Papilio pales, W. V., p. 177 (1776).

Three males and a female from the Barren Grounds, taken 16 and 18, vii, are the first specimens of this species I have yet seen or heard of from America, where I have long expected to hear of its discovery.

The males are quite typical, and could not be distinguished from some Alpine specimens.

The female is like some I have from Northern Siberia.

8. *Argynnis polaris.*
A. polaris, Boisduval, Ind. Meth., p. 15 (1829); *id.* Icones, Pl. XX, figs. 1, 2 (1833).

Specimens were taken in all the localities visited in the first half of July, and are quite typical.

9. *Argynnis chariclea.* (Plate IX, figs. 6, 7, 8.)
Papilio chariclea, Schneider, Neuest. Mag. V, p. 588 (1794).

The most extraordinary variation is shown by the specimens of this species, which occurs in all parts of Arctic America, and was taken by Mr. Hanbury at all the places where he collected.

Among them a male from Chapman Island is almost black. Another from Dismal Creek is very small and pale, but a female from Point Epworth is a wonderful aberration, and I cannot say positively whether it is *polaris* or *chariclea*, though the size and the shape of the wings indicate the latter species.

10. *Argynnis frigga*, var. *improba*.
Papilio frigga, Thunberg, *t. c.*, p. 33.
Argynnis improba, Butler, Ent. Mo. Mag. XIII, p. 206 (1877).

Several from the Barren Grounds and one from Point Epworth are like the type, and show but little variation.

11. *Lycæna orbitulus*, var. *franklinii*.
Papilio orbitulus, Esper, Schmett. I, 2, Pl. CXII, fig. 4 (1800).
Lycæna franklinii, Curtis, *t. c.*, p. 69, Pl. A, figs. 8, 9.

A pair from the Barren Grounds are not so distinct from the Arctic form found in Europe, var. *aquilina*, Stgr., = *aquilo*, Bdv., as those from Labrador, and are perhaps nearer to those I have taken in the Rocky Mountains near Laggan.

12. *Colias hecla*.
C. hecla, Lefebvre, Ann. Soc. Ent. Fr., 1836, p. 383, Pl. IX, B, figs. 3–6.

Four males and three females from the Barren Grounds, 114° W., 67° 40 N., 13–16, vii. Agreeing well with other specimens from Arctic America, some of which were called *glacialis* by McLachlan.

Staudinger now catalogues the Lapland form as var. *sulitelma*, Auriv. The specimens in Mr. Hanbury's collection differ *inter se* to a remarkable extent in the colour of the borders and discal spots of the wings above.

13. *Colias boothii*. (Plate IX, figs. 1–4 ♂, 5 ♀.)
C. boothii, Curtis, *t. c.*, p. 65, Pl. A, figs. 3–5.

This was represented by several fresh specimens, which enable me to confirm the opinion formed on very insufficient previous knowledge, that it is a species perfectly distinct from the last. The variation in this species is so great that I have had to figure five specimens to give a fair idea of it; some of them would be supposed by their markings to be females, but though the abdomens are difficult to examine, owing to their hairy covering and being somewhat compressed in packing, I can find only one undoubted female among them. None of the specimens sent are quite what Curtis figures as *chione*, in which the marginal band is faint or absent.

The species seems to have been fairly common at Point Epworth, Gray's Bay, and on the Barren Grounds.

14. *Colias pelidne.*
C. pelidne, Boisduval, Icones, Pl. VIII, figs. 1–3.

Three pairs from Point Epworth, Barren Grounds, and Dismal Creek, of which the females differ *inter se* a good deal, one being white and two lemon-yellow.

15. *Colias nastes.*
C. nastes, Boisduval, *l.c.*, figs. 4, 5.

Four males and two females from Barren Grounds, all varying. These might be called *rossii*, Guen., or *moina*, Streck., by those who like to try and distinguish local forms, a very uncertain task in the case of Arctic insects.

Heterocera by Sir George F. Hampson, Bart., B.A., F.Z.S.

Noctuidæ.

Hypsophila zetterstedti, Stgr., 114° 67° 40′.

Geometridæ.

Aspilates orciferaria, Wlk., 114° 67° 40′.
Cidaria, sp. 114° 67° 40′.

Tortricidæ.

gen. sp., Point Epworth.

Explanation of Plate IX.

Fig. 1.	*Colias boothii*, Curtis,		♂.	Point Epworth.
2.	,, ,, ,,		♂.	Barren Grounds.
3.	,, ,, ,,		♂.	,, ,,
4.	,, ,, ,,		♂.	Gray's Bay.
5.	,, ,, ,,		♀.	,, ,,
6.	*Argynnis chariclea*, Schn.,	ab.		Point Epworth.
7.	,, ,,	var.	♂.	Bathurst Inlet.
8.	,, ,,	,,	♂.	Dismal Creek.
9.	*Œneis semidea*, Say,	var.	♂.	Barren Grounds.
10.	,, ,,	,,	♀.	Point Epworth.
11.	*Erebia fasciata*, Butl.,		♂.	Cape Barrow.
12.	,, ,,	,,	♀.	Point Epworth.

XV. *A contribution to the life history of* Orina (Chrysochloa) tristis, Fabr., *var.* Smaragdina, Weise. By Thomas Algernon Chapman, M.D., F.Z.S.

[Read April 1st, 1903.]

Plates X and XI.

In our observations on some species of *Orina* presented to the Society by Mr. Champion and myself in December 1900, besides several viviparous species, we noted *Orina tristis* to have a habit that was not viviparous, nor yet strictly oviparous in the ordinary manner. Unfortunately our material of this species consisted of only one female beetle and our observations were accordingly somewhat restricted, so that I was pleased to meet with the beetle in some abundance on May 30th, 1902, near Pino, on Lago Maggiore. The beetles were disporting themselves, often a good number together, in the sunshine on a rather tall upright species of *Centaurea* that looked otherwise very like our *nigra*. I brought a number of beetles home and had them alive throughout the summer. They laid eggs freely, but began to die off about the middle of September. In the first week in October egg-laying seemed to be stopped, but a small batch of seven was laid October 18th, at which date only that number of beetles remained alive. Two males were still living on February 7th, 1903. I noticed in several beetles that died that the posterior tibiæ and tarsi were damaged or wanting and must have been eaten by the other beetles; whether this was a cause of death or only occurred after mortal illness had supervened I do not know. I twice found a beetle so damaged, that was still very decidedly alive.

I may note parenthetically that at the end of June we (Mr. Champion and myself) met with *Orina rugulosa* at San Sebastian. We found both beetles and larvæ, and observed the egg-laying to follow almost precisely the same methods as in *O. smaragdina,* indeed the eggs were almost indistinguishable from each other (I had some of the latter with me). They were on a very *nigra*-like species of *Centaurea;* the impossibility of obtaining

Centaurea at the places we visited in Spain brought to a very early conclusion my attempts to rear the two species side by side.

The account given in 1900 of the egg of *O. tristis* and of the hatching of the larva is correct as far as it goes, but wants much supplementing. When the larva is ready to emerge it shows very visibly through the egg-shell three black patches on either side, just above the spiracular line, on the 2nd and 3rd thoracic and 1st abdominal segments; except the spiracles, eyes, some mouth parts, and finally the cutaneous hairs it is otherwise colourless. These three patches are apparently ordinary portions of the cuticular covering that become hardened and matured at this early period for a special function, just as the 1st spiracular region and some other parts are solidly chitinised with special objects in various Lepidopterous pupæ, whilst the rest of the pupal integument is still soft. These three hard black patches are slightly convex and project centrally, but I cannot make out that they have any sharp or angular point.

Their function is to determine the lines of rupture of the egg-shell. The force used to open the egg-shell is one that is in common use with many insects, especially for emergence from the pupa. Here it is used for emergence from the egg. It is the secretion of air into the interior of the larva; the large air bubbles look as if in the general body cavity of the insect, and I am not positive that they are not, but as some air often escapes by the mouth and anus, when the insect is flattened, I incline to believe it is in the alimentary canal. The effect of this air being so secreted is to enlarge the bulk of the larva and exert a bursting tension in the egg-shell. If this tension became sufficient the shell would burst by explosion in some irregular manner, but the presence of these three hard points on either side of the larva is to increase the tension along a line passing along them, and so, long before the strain is sufficient to produce an explosive rupture, the egg-shell splits along each side over these points. The *modus operandi* is in principle precisely the same as that by which the pupæ of the Lepidopterous genera *Limacodes* and *Eriogaster* open their cocoons; in these a pressure, produced by air secretion within the insect, is localised as to the severest point of strain by a pupal beak, and so a lid splits off at the so-determined line.

When the egg-shell is split, a portion of the larva slightly protrudes through each slit, but the larva soon manages to turn round and escape through one of them head first. Since the larva can emerge through only one of them, why should there be two slits? These do not reach the top of the shell and are still further from reaching the bottom, but now and then they deviate from this symmetrical arrangement, one may be longer than the other, and this deviation may account for one slit only existing and that one reaching to the top of the egg-shell. This is comparatively rare, but still not infrequent, and was the only form I noticed in the few eggs I had in 1900. The two slits are probably useful in affording the larva escape by one, when the other is obstructed by the egg being against one of its neighbours, or possibly even glued to it or some other object, by some accident, either in the disposal of the parental glue that fastens the egg to the surface on which it is laid, or by a neighbouring egg being injured and its contents acting as a cement, as must not infrequently happen to eggs laid naturally on a leaf. The eggs are laid in regular order, in several adjacent rows, and are slightly inclined to the surface of attachment, instead of being perpendicular to it, so that one side of the egg is tolerably free, the other almost or even actually touches its neighbours. The larva could hardly hope to escape, if a solitary slit occurred on this side. I had made many observations of these beetles, of their egg-laying, of their hatching, had fed many of them from hatching to full-fed larvae, and was still of the opinion that this species could not be *O. tristis*, because I had observed *O. tristis* lay eggs quite ready to hatch, whilst my insects from Pino laid eggs quite undeveloped. I was, however, puzzled to find that some eggs hatched in a few days whilst others did not do so for over a week. Some showed the imaginal jaws through the shell very early and so on. Still all the eggs I examined when new laid showed no coloured indications of the young larva.

On August 29th, however, a new experience awaited me. I found several eggs that had been laid since the 26th were already hatched. I determined therefore to more closely scrutinise the periods from laying to hatching of future eggs. Further light was closer at hand than I had expected. At 11 a.m., August 29th, the beetles were fed and as usual placed in a clean jar with fresh food, clean paper.

etc. At 2 p.m. I found three small batches of eggs laid, two presenting the usual clear aspect, but the third, which the beetle was at the moment depositing, consisted of two eggs that were actually hatching and of six others which presented the imaginal eyes well developed, but no jaws, spiracles, or other larval parts visible.

The eggs that I had supposed to be quite undeveloped, usually presented a rather opaque aspect, except at the unattached (head) end, where about one-fourth or one-fifth of the egg was apparently occupied with clear yellow fluid, and it had struck me as curious that the eye-spots, which were the first imaginal parts to be seen, occurred on this transparent area. I now, however, understood that this transparent region had no relationship to a similar one that occurs in the newly-laid eggs of Zygaenids (*Anthrocera*) amongst the Lepidoptera, and that it was really the larval head, after considerable development of the embryo had taken place. Most of the eggs are laid at this stage, when the embryo is well-developed but before the eye-spots appear. I now carefully examined other eggs and found some with a fairly uniform aspect, from end to end. I saw several such eggs actually laid, and examined them immediately, and found I could treat them as transparent objects sufficiently well to see that the greater part of their contents were in small rounded masses, but that at the free end there was within the shell a delicate membrane and inside this several large rounded processes, one nearly half the diameter of the egg across, another smaller, with a clear angular space between them, and smaller ones extending down the egg. I make no doubt these are the early cephalic lobes of the embryo with further segmental divisions.

So far as I have noticed, these are the youngest eggs that are laid, the greater number are rather more advanced, and they may even be so far advanced as to show the eye-spots, and as an exceptional occurrence, they may be just ready to hatch.

I regret that I am ignorant of the methods of examining the younger eggs, and of overcoming the difficulties presented by the tough leathery egg-shell and the very delicate contents, but I feel satisfied that what I have been able to observe justifies the conclusion just stated, that the eggs *have* always undergone some development when laid and sometimes have made a near approach to hatching.

Those of *O. tristis* I watched during August two years ago were well advanced when laid; none were so this year till towards the end of August, so that it may be, that only towards the end of its egg-laying are the ova retained until the larva is well-developed. But it is also certainly the case that the ovum is not fertilised at the moment of deposition, but at some interval previous to that time, notwithstanding that the egg-shell is a solid structure similar to that of eggs that have (as, in fact, these always have) to exist externally for some time before hatching.

They have, in fact, taken the first step towards becoming viviparous, and it is of interest to note that the step is not a definite and constant one, but varies from a habit nearly that of ordinary egg-laying insects, to one that is almost that of viviparity, not in different races of the beetle, or even in different individuals, but apparently in the same individual possibly according to its age. Not certainly according to differences of treatment, as all my beetles were kept together, yet their habits were not always all alike.

It is interesting to notice that Mr. W. M. Wheeler in the Journal of Morphology (Boston), vol. iii., 1889, figures the young larva of *Doryphora decemlineata* as existing within the egg-shell as almost identical in appearance with that of *O. tristis*. The only difference I note in his figure or description is that the hatching spines in *D. decemlineata* have definitely sharp apices, those of *O. tristis* being comparatively flat and blunt. He describes the hatching as taking place by the contained larva moving within the egg-shell so as to cut it with these spines, and says that it cuts the egg on both sides and that these two incisions meet over the apex, making one large opening. I should certainly like to see this process take place; still I see no reason to doubt that it is very possible for similar structures in allied species to exercise the same functions, or at least to attain the same objects in very different ways. A remarkable instance of this I mentioned lately to the Entomological Society in the case of two species of Lepidoptera, *Hybocampa milhauseri* and *H. dryinopa*, in which a similar pupal spine is used in quite a different way in each species for opening the cocoon.

In *O. tristis* it is certainly the case that no movement of the young larva takes place before the opening in the egg is formed, and that it takes place by rupture under tension from within, and merely the place where it shall occur, but not the actual rupture, being determined by the hatching spines.

It is certainly matter of some interest from a classificatory point of view, to find the egg and the embryo within it and the method of hatching (hatching spines, etc.), so very nearly identical in *Doryphora decemlineata* and in *Orina tristis.* Wheeler's observations especially relate to the development of the embryo; and as his observations were made entirely on eggs already laid, and he begins with the egg segmentation preceding the embryo, it is clear that in *Doryphora* there is no quasi-viviparity as in *O. tristis.* There is, in his paper, no suggestion of the possibility of such a thing. He would certainly have noticed and recorded it had there been any trace of it, although it was not strictly the subject of his paper.

I believe *Doryphora* and *Orina* are not classified very closely together. It may be that this method of hatching is common to many species of Chrysomelids; if so, record of it ought certainly to be more frequent than it is.[1]

Immediately after each of its three subsequent moults, the skin of the larva is quite colourless, exhibiting all its interior anatomy, tracheæ, alimentary canal, etc., but it is sufficiently loaded with yellow fat and fluids to make details difficult to observe. It rapidly (in half-an-hour or so) becomes black. At these moults there is no trace of these hatching spines to be noticed. Two circumstances attracted my notice; one was that the larva used inflation to assist the rupture of the effete larva skin. This is not pushed away towards the tail and so stretched in front till it splits as is the method in Lepidoptera, but the whole larva skin is fully on the stretch, and finally slits down the dorsum, the new white larva protruding at once and then creeping out slowly, leaving the empty larval skin slightly contracted, but still looking uncommonly like a living larva, and nowhere with its segments crushed together. It merely takes up the aspect of a younger larva with its subsegmental ridges, when the tension of a full-fed larva within it is withdrawn.

The larva when newly moulted and still colourless is seen to be especially translucent in the thoracic region, and several larger and smaller globules of air are seen to

[1] Mr. Jacobi informs me that the Colorado beetle is not a *Doryphora*, but belongs to a genus very near to *Orina*.

occupy this region; that they are in the alimentary canal seems almost certain, as they escape by the mouth when the larva is subjected to pressure.

The other circumstance connected with moulting that seemed to me curious, is no doubt so, only because my experience in watching the moulting of larvæ has been almost entirely amongst the *Lepidoptera*; in these, the larva always completely voids the alimentary canal at a moult. A newly-moulted larva has no food contents at any stage. In *O. tristis* the anterior part of the alimentary canal contains no food, but the hinder portion, in several loops, in the abdominal segments, is more or less loaded. The effete larval skin appears to be held in place so that the larva may crawl out of it by a more or less half-dried fæcal deposit glueing the anal extremity to the leaf.

The rupture in the larval skin divides the head into two lateral (epicranial ?) pieces, and the clypeus with the mouth parts and slits down the thoracic and two first abdominal segments dorsally as if along a dorsal suture; the third abdominal segment is often slit in the same way, and I have once seen the fourth slit also, but irregularly towards one side, as if any dorsal suture was here certainly absent, as it probably is in the third abdominal segment.

At the moult to pupa the skin collapses, and so far as can be judged by the condition of the cast skin the process of moulting is very similar to that in Lepidopterous larvæ.

The eggs are not absolutely uniform in size and shape. Their length is about two-and-a-quarter times their width; their sides are not quite straight but curved, so that the middle of the egg is the widest part; sometimes the longitudinal section is an ellipse, at others there is some tapering towards one or both ends (as in the small end of an egg).

The actual dimensions of four eggs measured was :—

Long	2·15	2·25	2·25	2·32 mm.
Wide	1·0	0·94	1·01	0·97 mm.

It is to be noted, that as the embryo is always developed with the head to the free end of the egg, and has already advanced in its development so far as to already have its head to that end when laid, the orientation of the embryo in the egg must be determined by its relations to the ovarian tubuli in which it develops, and as these are coiled in all directions, gravity has no share in the determination, but simply which is the end of the egg nearest the top of the tube.

Though a dissected beetle shows the tubules loaded with eggs of all sizes, my observations go no further in this direction; it would be of interest to know whether the eggs attain their full size before they are fertilised and development begins, or whether they grow after development of the embryo is begun. Probably not, but as the embryos of the viviparous species grow considerably whilst still in the tubules, only definite observation can determine what happens in this species.

When hatched the larva of *O. tristis* is colourless, except for the eyes, jaws, spiracles and the six black spots that may be seen through the egg-shell, but it very soon becomes quite black, with the exception of the fine brown hairs which are plentifully scattered all over it. The head and prothorax are at this stage exceptionally large, forming fully two-fifths of the length of the larva. The legs are nearly colourless and the under-surface is pale, the larva is blacker than at later stages, the blackness but encroaching a long way on to the ventral surface.

The intersegmental depression divides the segment deeply, but terminates some way above the spiracle, the anterior and posterior subsegments meeting as a raised ridge, below which the spiracle lies in a depressed triangular area that extends to the front of the segment. Length 2·0 mm., greatest breadth 1·0 m.

At the first moult, *i.e.* in the second instar, the head and prothorax remain dirty yellow for some time after the abdomen has become black, and they remain a little paler throughout the instar. The subsegments still meet in a definite ridge above the spiracle, which is now hardly in a depressed area, but has the diagonal grove separating 1st and 2nd flange below it; the anterior branch of the subsegmental incision exists, but is not at all pronounced or visible in all attitudes of the larva. Length 3·0—4·0 mm., width up to 2·0 mm., when contracted is almost a sphere of 2·5 mm. in diameter.

In the third instar the larva is very similar to the second, the head and prothorax are still a little paler than the abdomen. The branch of the subsegmental incision is very short, but distinct in the 2nd instar, and is very similar in the third. Length 5·0—8·0 mm., width 2·5—3·0 mm.

The full-grown larva has the general aspect and structure of *Orinas*, as described (Ent. Soc. Trans., 1901, p. 18). The thorax is relatively smaller than in some other species, and looks even less than it is, by comparison, being of the same dark colour as the rest of the dorsum, without any kind of paler tinting. The colour of the dorsum is black with a bronzy shade, due either to texture and polish, or also perhaps to a certain amount of the olive or brownish tint that appears laterally and predominates ventrally, declaring itself in the finer depressions of the minute wrinklings. These wrinklings are apparently the same as in the other species described. They are generally in transverse lines, each elevated line being somewhat broken by partial or complete sulci in more or less diagonal directions which are sometimes independent, but are sometimes the transverse sulci anastomosing. So far as it is possible to count them, there are about thirteen or fourteen transverse ridges on each segment. The transverse depressions, which are most marked about the fourth or fifth abdominal segment, and indicate subsegmentation of the segments, and varied somewhat in each species previously described, are well marked, and are probably characteristic. They smooth out nearly completely in some attitudes. Dorsally it is about central, the anterior margin highest. Rather lower than half-way down to the spiracle, it sends back a branch from its anterior margin, that fades out before reaching the dorsum. The spiracle is a minute raised ring surrounded by a small smooth surface; just below this is a very definite diagonal groove, passing backwards and ventrally. In certain attitudes the dorsal subsegmental groove passes down as little more than a fine line in front of the spiracle, and seems continuous with this diagonal groove. This diagonal groove is in fact the demarcation between the spiracular and subspiracular flange. The segmental incision in the subspiracular flange is double, a sulcus from below passing up behind one descending from the dorsum. The marginal (3rd) flange is simple, its upper and lower grooves being longitudinal.

The colour of the lower surface is yellowish-brown, overlaid by a clouding of small blackish spots. The head and prothorax has a tolerable coating of fine brown hairs; these have to be looked for, the surface having at first glance a glabrous aspect. After they are seen, one decides that the abdomen really is glabrous, till a closer search shows that it carries a large number of fine brown hairs, less than half the length of those on head and prothorax.

The legs and incisions are of the same olive-brown already noted.

Length 10–14 mm. Width head 2·3 mm.
,, prothorax 4·0 mm.
.. mesothorax 3·8 mm.
,, 5th abl. 5·0–6·0 mm.

The colour of the larva varies a good deal. Taking it as typically black above and pale luteous olive below, the whole of the mouth region of the head belongs to the pale lower region; the demarcation between the two regions being the lower margin of the subspiracular flange (middle ridge of the triple marginal flange). In many specimens, however, the anterior portion of the larva, especially the prothorax, is dorsally paler, without being pale enough to suggest the yellow colouring this segment has in some other species. The marginal area may also be a little more invaded by the ventral paleness.

The blackness of the dorsum is also variable. In a majority perhaps it is a brownish-olive, approaching black, with a bronzy aspect in some lights, its paler tones being due to lighter colouring (or comparative thinness of pigment) in the bottoms of the minute sulci of the finely-wrinkled surface. In some specimens the blackness is dense and undoubted over the whole dorsum.

The most remarkable fact as to the colouring observed was as to two specimens, differing apparently in no way from any of the others, that formed part of a number turned out in the field: these two were placed on open flowers of the *Centaurea* when going out, and were still there half-an-hour later when returning, but in the sun were now of nearly as bright a metallic green as that of the imago. I have been unable to induce others to exhibit this colouring.

According to its attitude the segmentation of the larva looks rather different. The prothorax is of course always very evident, and when the full-fed larva is active and lively the mesothorax is a good long segment, much like the others, but with the two ridges lower, especially the anterior one. When at rest, however, and especially if the larva be a little sulky and only half-grown, the mesothorax partially or wholly disappears beneath the prothorax, which may even slightly overlap the metathorax. The 2nd thoracic segment is in these circumstances easily overlooked, and owing to the backward direction of the coxæ it is even difficult to believe that the 2nd and 3rd pair of legs do not actually belong to the 3rd thoracic and 1st abdominal segments, taking each of these in fact for the segment in front of it.

The 7th abdominal segment is the last coloured like the others, and has the appearance of a broad anal plate, the 8th is somewhat coloured, but is simple in structure and retractile, the 9th and 10th are colourless and retractile, the 9th forming a foot used in all progression.

The hairs, which seem to disappear as the larva passes to its later instars, do not in fact do so. On the contrary they persist, though the larva grows however, they do not, but maintain almost precisely the same size and distribution they had in the 1st instar. Their length in the 1st instar is tolerably uniform all over the larva, viz. ·25 to ·30 mm. in length. In the 2nd and 3rd instars they are almost precisely the same, but of course make relatively a much less show on these larger larvæ. In the last instar they remain of almost identically the same length on the head, over the dorsum and posteriorly, but laterally they have actually dwindled to a length of only from 0·06 to 0·20 mm.

The hairs on the appendages and many of those on the head appear like the ordinary tactile hairs terminating in a solid sharp point, but the great majority, and nearly all those on the general surface, are expanded at the tips, and appear to be hollow, making the extremity trumpet-shaped, but not so widely expanded perhaps as this suggests.

The arrangement of the hairs may be described as irregular, merely, no doubt, because it is too complex to describe; on the 2nd thoracic and following segments they are placed on the summits of the two subsegmental ridges, on 2nd thoracic almost in one row on each, on 3rd the row on front ridge is a little irregular, on the back one they are better described as in two rows. On the front ridges of the 1st and 2nd abdominal they are in two rows, the hairs in the rows alternating, they are more numerous on the back ridges, whilst on both ridges of 5 and 6 they may be described as in three or four rows, but in all cases without the strict regularity that the idea of rows implies; they are wanting near the incisions, both segmental and subsegmental. The 8th and 9th abdominal segments possess hairs, especially a row of strong ones along their hind margins, and 10 is not without finer hairs. Beneath the abdomen each segment possesses shorter hairs, about ten on each side, placed with some but not absolute bilateral symmetry. The subspiracular flange on each segment has a separate chitinous plate carrying four or five longer and four or five shorter hairs.

The hairs on the prothorax are very numerous, and except a certain regularity round the margin, are equally but irregularly distributed over the whole surface, they number about 110 on either side.

The pupa of *O. tristis* is 10 mm. long and 4·5 deep from back to front across the 3rd abdominal segment, and 6·5 wide from knee-joint to knee-joint of 2nd legs, but this when they are a little set forward, the natural position would give perhaps nearer 5·3 mm. This is from a small specimen, a larger one would probably be 12 mm. long. The colour is pale whitish tending to flesh-colour, and deepening as the beetle matures.

The head is well bent forward, *i. e.* ventral, so that the face is directed ventrally, and the abdomen is also curved forwards, so that the ventral line is nearly straight, running from the frons down the clypeus, labrum, labium, tarsi to the anal point. The dorsum, on the other hand, presents a curve from one of these points to the other, and distant from it (as above noted) 4·5 mm. at the widest point.

The antennæ pass first backwards then down behind the 1st femora, their apices pointing forwards between the 1st and 2nd knee-joints. The wings pass down between the 2nd and 3rd legs, and curving round to the front, hide the greater part of the 3rd femora and tibiæ, and do not meet in front by about 2·6 mm. The first wings (elytra) show several longitudinal ribs or veins of which one on either side is marginal, and three over the centre are more marked than the others. The 2nd wings (wings) are visible dorsally in a narrow slip passing under the 1st wings, and their apices also appear beyond the first over the 3rd tarsi.

The jaws, labrum, labium with palpi, the maxillary palpi of three (?) joints passing straight backwards are very distinct, but these, with the legs and wings, are thickened and fleshy (compared with the imago), but present no spines or other definite armature except a few fine brownish hairs on the upper outer exposed aspects of the femora. The ventral aspect of the abdomen is equally smooth, but dorsally all the segments have a greater or less supply of short pale brown hairs. Over the front of the head and the prothorax these are especially regularly and thickly scattered. The prothorax is a large, somewhat square plate, 5·5 × 4·5 mm., as in the larva and imago. The mesothorax is narrow, 1·3 mm., with a projecting angle at centre of its posterior margin; just in front of this is a small raised boss, which carries a few, the only, hairs on the segment. The metathorax is again rather wide, 1·7 mm. (the projecting point of mesothorax makes these measures unduly favourable to that segment), with a dorsal longitudinal grove, it is very smooth and polished, and possesses only some half-dozen scattered hairs on each side, two on either side near the middle of the hind margin being especially strong.

The first abdominal segment is narrow (about 0·6 mm.), and has a central dorsal grove, which on the second is replaced by an elevation, the remainder having no dorsal peculiarity. The first six abdominal segments are narrow (about 5·0 mm. together), each however rather broader than the one in front. The next is longer (2·0 mm.) and is apically produced to an angle. Each of these (1–7 abdominal) has a spiracle, a small round chitinous ring, about 1·0 mm. across, below which the dorsum of the segment is rounded off, forming a lateral flange. 1–6 carry a fringe of hairs along their posterior margins, which are carried round the margin of the flange, and where more especially they are less a fringe, and more uniformly scattered over the surface. Abdominal 7 has hairs scattered all over it except its extreme anterior margin.

Dorsally 8 and 9 (abdominal) rapidly taper to a fine brown chitinous point with which 9 terminates, 9 has a very few inconspicuous hairs, on 8 they are more numerous and evident but less so than on 7.

Ventrally 8, 9, and 10 are marked by sundry elevations no doubt marking the genitation.

On March 4th, 1903, there still remained alive two males of the beetles taken at Pino on May 30th, 1902. It is not, however, the case that these represent the amount of survival amongst the beetles taken. Comparing these with the numbers that died, and eliminating those that escaped, that were given away, or were otherwise disposed of, these two represent the survivors rather of from eight to ten beetles living in August 1902.

About this date (March 4th, 1903) I examined the pot in which a number of larvæ had gone down in September and October, and was vexed to find that the earth was apparently quite dry, and two larvæ that I unearthed from near the surface were apparently quite dead and dried up, with the ventral and dorsal surfaces almost in contact. Placing these in warm water, after twenty-four hours both were alive and active. Though still looking somewhat starved and contracted, they obviously had a good deal of tissue within their skins.

I was, therefore, encouraged to damp the pot of earth and put it in a warm place. Unfortunately again, I overdid this.

On March 23rd I found a perfect beetle had emerged, and forthwith examined the pot and contents. I found it contained several beetles ready to emerge, one living and one dead pupa, a number of dead larvæ, distended almost to bursting by excess of imbibition but really close on pupation, and others that had died at an earlier stage.

Disappointing as this result was, disappointing also because so much due to my own want of intelligent care, still, it enables me to say that I have reared the beetle from the egg, and also to describe and figure the pupa.

The hibernating chamber of the larva, in which it pupates in the spring, remaining probably as a pupa from two to four weeks, according to temperature, is nearly spherical, and about $\frac{5}{8}$ inch in diameter, with the interior wall pressed smooth.

The following data, giving dates of hatching of batches of eggs laid at the same time, give some indication of the various degrees of maturity of the eggs at the date of laying.

Laid September 22–23		
3 hatched	,,	26
17 ,,	,,	28
22 ,,	,,	29
18 ,,	,,	30
10 ,,	October	1
leaving 14 still to hatch.		

Laid September 12–13		
1 hatched	,,	15
3 ,,	,,	17
14 ,,	,,	18
72 ,, by	,,	21
57 ,, ,,	,,	23
5 mature eggs remaining.		

	Laid September	17
9 hatched	,,	24
60 ,,	,,	26
15 ,,	,,	27
2 ,,	,,	28
2 addled.		

	Laid September	13–15
1 hatched	,,	17
1 ,,	,,	18
12 have died and blackened that were ready to hatch when laid.		
5 hatched	September	21
34 ,,	,,	23
17 ,,	,,	24
4 ,,	,,	26

	Laid August	5–6
1 hatched	,,	8
2 ,,	,,	10
1 ,,	,,	13
12 ,,	,,	14–15
10 left of which the last hatched		17
Larvæ 3 have moulted		
1st on	August	19
All	,,	24
4 have moulted		
2nd on	August	26
All on	,,	29
Many have moulted		
3rd on	September	4
Most	,,	7
All	,,	9
Nearly all full-grown		15

After no eggs laid for 10 days, 7 were laid on October 18th, 1 near hatching and 6 with top end transparent. These show eye-spots on 20th on which date one more egg laid with all spots visible.

The following actual notes show the time taken by the larvæ to feed up.

Batch laid	August	12
4 hatched	,,	17
Many	,,	19
Several 1st moult	,,	24
All ,, ,,	,,	29
Several 2nd moult	,,	31
Most ,,	September	4
Some 3rd moult	,,	4
Nearly all full-grown	,,	15

Hatched	August	3-4
1st moult	,,	12
3 specimens 2nd moult		17
3 specimens 3rd moult		24
Eating little and very fat	,,	31
Had eaten nothing for some time and allowed to go down on September 9.		

Hatched	August	12
Most in 2nd skin	,,	19
Six in 3rd skin	,,	26
Some in 4th skin	,,	29
Nearly all in 4th skin		31
All	September	4
Full-fed	,,	9

Laid	August	7–8
1 hatched	,,	12
2 ,,	,,	13
10 ,,	,,	15
7 in 2nd skin		21 rest removed
2 moulted to 3rd	August	26
All in 3rd skin	,,	29
5 in 4th skin	September	2
All ,, ,,	,,	4
Full-fed	,,	13

Hatched September	18
Full-fed 2nd skin ,,	27
All in 3rd skin October	4
2 in 4th skin ,,	6
All in last skin (4th) ,,	12
Full-fed ,,	15
Going down ,,	18

Hatched September	13
Most in 2nd skin ,,	21
,, 3rd ,, ,,	27
Many in 4th skin ,,	30

Eggs laid August	3–4
Those (11) hatched	9–12 removed
The rest hatched August	13–15
Several in 2nd skin ,,	17
All ,, ,, ,,	19
Some in 3rd ,, ,,	26
Some in 4th ,, ,,	29
Nearly all in 4th skin Sept.	2
All ,, ,, ,,	4
Full-fed ,,	13

It may be useful to summarise the items of the life history of *O. tristis* noticed above. The beetles emerge from the ground in May, and eating freely of the food-plant (*Centaurea* sp.) and pairing frequently, lay eggs abundantly during June, July and August, and even on to November, some specimens living (in confinement) until the following March.

The eggs are rarely laid singly, usually in small batches up to twelve or twenty, or even considerably more. When laid the eggs have already undergone some development, sometimes only to the mulberry stage, usually the larva is already largely developed, and more rarely the eggs may be ready to hatch. This seems to be more frequent later in the season. The eggs hatch by two slits forming, under internal pressure caused by the secretion of air in the alimentary canal of the young larva, their site being determined by the presence of "hatching spines." The larvæ moult three times, the effete skin being similarly split by pressure from "inflation."

They feed up in about a month, rather longer in cool weather, shorter probably in hot, and then bury themselves in the earth to a depth of one to five or six inches, remaining unchanged to the following March or April, when the further changes are rapidly gone through. It seems possible, but I have no evidence whatever to make it at all probable, that the earlier larvæ feed up and may emerge the same year.

Postscript, June 11th, 1903.—As an indication of the date of the appearance of the beetle, on April 27th, 1903, at the habitat of the beetle at Pino, only two specimens of the beetle could be found, these happened to be a male and female; the Centaurea was only some twelve inches high. On May 30th, 1902, it was three to four feet high, but not in flower, and the beetles were plentiful. On May 30th, 1903, two beetles were found at Reigate in my garden, from larvæ turned out last autumn, and one or two a day have appeared since. These are all soft and immature.

The *Orina* taken at Pino April 27th, paired on May 7th and May 8th, but not for long periods. They were placed again in the same jar May 24th, and remained paired for forty-eight hours on May 25th, 26th and 27th. The female again paired with one of the Reigate beetles May 30th and 31st. On June 4th she laid two eggs *ready to hatch*, and two more on the 5th. Of these one failed to hatch, the others hatched on 5th and 6th, and larvæ are now feeding.

These are probably the result of the pairing of May 7th and 8th, but this is by no means certain. The beetles do not seem happy or to feed freely, when kept solitarily.

Explanation of Plates X and XI.

Plate X.

Fig. 1. Egg ready to hatch, showing "hatching spines" and other parts of contained larva × 13.

2. Egg-shell showing slits made at hatching × 13.
3. Larva in 1st stage × 30.
4. ,, 2nd ,, × 14.
5. ,, 3rd ,, × 10.
6. ,, 4th ,, × 6.
7. ,, ,, ,, × dorsal view 6.
8. Pupa lateral view × 6.
9. ,, ventral ,, × 6.

Plate XI.

Fig. 1. Newly-hatched larva squeezed flat, showing hatching spines and air bubble in gullet, etc.

2. Another specimen, air bubble pressed out, now entangled with legs.

XVI. *The Butterflies of Chile.* By Henry John Elwes, F.R.S., F.L.S., etc.

[Read June 4th, 1902.]

Plates XII, XIII, XIV, and XV.

Our present knowledge of the butterflies of Chile consists almost entirely of bare descriptions published by authors who had little knowledge of the country or of the climatic conditions which have tended to make the fauna of this country so interesting and peculiar.

Guérin in the 'Voyage de la Coquille,' published in 1832, was the first entomologist who seems to have received any butterflies from Chile, except a few of the very commonest, which Molina, Drury, and Hübner had already described.

Blanchard in Gay's 'Fauna Chilena,' published in 1852, has described and figured more of the commoner ones.

Philippi has described others in 'Linnæa Entomologica' in 1860, but though an excellent botanist he has paid little attention to the Lepidoptera of his adopted country.

Reed, an English naturalist long resident in Chile, published in 1877 a small work in Spanish, 'Mariposas Chilenas,' with indifferent figures and descriptions of several of the rarer ones, but gives little information as to their habits and distribution.

Wallengren in the 'Wiener Ent. Monatschrift,' and 'Eugenie's Resa,' and *Felder* in the 'Reise der Novara,' add a few more to the list, but the first serious attempt at a Catalogue of the Lepidoptera of Chile was that by *Butler* in this Society's Transactions for 1881.

This paper was based on a collection made in Chile by Mr. Thomas Edmonds, and describes a good many new or supposed new species, giving a full synonymy of those already described, with some useful but rather fragmentary notes by Mr. Edmonds on the localities in which they were found.

A translation of this paper into Spanish, with a list of the Microlepidoptera of Chile described by Ragonot and Zeller, was published by Mr. Bartlett Calvert, a member of our Society, in the 'Anales de la Universidad de Chile' in 1895.

None of these writers, however, have told us much of the nature of the country which produces these insects, or described the very peculiar geographical and physical conditions which have influenced their variation and distribution, and no one has realized the great amount of variation which is found in many of the species. Therefore in attempting to give a better idea of the Butterflies of Chile, I have had to rely mainly on my own observations.

I left England in November 1901, and arrived at Buenos Ayres on December 2nd. Here I endeavoured to find a companion who knew the language, and who had travelled in the Southern Andes, which until quite recently have been unvisited and undescribed by naturalists. I arranged with Mr. Arneberg, a Swedish engineer, naturalized in Argentina, to accompany and assist me, but when I reached Santiago de Chile, I found that the strained political relations between Chile and Argentina, which very nearly led to war, and which delayed my start for over a month, made it undesirable to carry out this plan, and I eventually secured the companionship and assistance of Mr. Bartlett Calvert of Quillota, who speaks Spanish like a native, and who is a well-known entomologist and an accomplished photographer.

I arrived at Puente del Inca, to which point the Transandine railway is now open, on December 10th, and stayed two nights in the excellent hotel which belongs to Dr. Cotton, and which stands close to the celebrated Natural Bridge and warm baths, at an elevation of over 9000 feet. Here I was able to gain some idea of the flora and butterflies of the high Andes, though the weather was extremely dry, and the high wind from the west, which is a daily feature of this locality after nine a.m., makes collecting difficult.

I found at the entrance to the valley called Horcones, and round the Laguna de Horcones, a few very interesting species, including *Scolitantides andina*, a *Colias* which I thought at the time was near *euxanthe*, Feld., *Argynnis lathonioides*, and *Phulia nymphula*, all of which are peculiar to the high Andes of Chile and Bolivia.

I was unfortunate enough to lose the bag which contained most of these specimens when starting in the dark the next morning to cross the pass into Chile, but I saw enough to convince me that the environs of Puente del Inca are well worth a week's stay in January by a passing entomologist, and that a few of the species described by Staudinger, in Iris Vol. vii, from the Bolivian Andes would probably be found here. The pass between Puente del Inca and Chile is over 12,000 feet, but very easy to cross on mule-back except for three or four months in winter, and the vegetation of the Chilean side from 10,000 down to about 6000 feet is much richer than that of the eastern valleys. Juncal, where there is a comfortable inn kept by a Frenchman, would also be a desirable halting-place for any one who wished to collect on the western side of the pass. I was obliged, however, to hurry on, and could do little in the way of collecting on this occasion. When I returned at the end of February the season was far advanced, and I was again unable to stop as I had to catch the steamer at Buenos Ayres. From Juncal a good carriage road leads down to Salto de Soldado, whence there is a railway connecting at Los Andes with the Chilean state railway to Valparaiso and Santiago, making it possible to go in one day as I did from Puente del Inca to Santiago.

In this beautiful city I met with the greatest hospitality and civility from many men of science and distinction, among whom I should especially mention Prof. Federigo Philippi, the director of the Museum, a most distinguished botanist, whose father, the describer of so many Chilean plants, still enjoys life at the age of ninety; Dr. Barros the Rector of the University, who was kind enough to give me an introduction to a family from whom I afterwards received the greatest possible kindness and help; and Señor Dr. Vicente Isquierdo, who has the most complete collection of Lepidoptera in Chile, and who has been good enough to send some of them to the British Museum for identification. The brother of the latter, Señor Salvador Isquierdo of Santa Ines, has a large and most interesting collection of trees, and is developing the rising fruit-growing industry in Chile in a manner worthy of the best European horticulturists. Señora Ana de Jordan, the hostess of Miss North, was kindness itself, and, like many of the members of the old Chilean families, gave me a charming idea of the state to which progress and civilization have reached in her delightful and to most Europeans little-known country.

Whilst waiting until the question of peace or war should be settled I visited the Baños de Cauquenes, a well-known watering-place in a valley three hours south of Santiago by rail, which has been described by Miss North, by Mr. Ball, and by Darwin. Here I stayed four days and collected all the species which were then out, but failed in an attempt to reach the highest part of the valley, where there is said to be good collecting ground at 5000 to 6000 feet. This valley, however, is well known in comparison with the mountains I afterwards visited farther south, and has been visited by Reed and others. The country around was dried up, hot and windy, and the variety of insects not great, though I got one species which seems to be undescribed.

I then went by rail to Concepcion on the coast, three hundred miles south of Santiago, and visited the beautiful park and gardens of the late Señora Cousinho at Lota, where Mr. O'Reilly, the superintendent of the gardens and plantations, was good enough to show me everything he could. I found few butterflies, however, in this neighbourhood though there is some very good-looking collecting ground near Coronel, and some trees and shrubs characteristic of Southern Chile, which do not occur much farther north, are found on this part of the coast.

On December 21st I left Concepcion by train, and got to Chillan by 11 o'clock. From here there is a carriage road to the celebrated Baths of Chillan situated in a wooded valley of the Andes about sixty miles distant. Starting in the afternoon in a carriage, I reached the second stage of the journey at dark, and slept in a fair roadside inn. From here the road to the Baths passes through a country which was once covered with forest, and is still in many parts most beautifully wooded, the last stage from Las Trancas to the Baths being specially fine, through splendid forests of beech, of which three or four different species constitute the principal forest trees in this latitude.

At the Baths I found excellent accommodation and a rich flora. This was Mr. Edmonds' best collecting ground, and during January and February most of the peculiar Chilean forest species may be found in the woods below the Baths, and many of the Alpine species on the bare mountains above them. I spent four days here, and got the greater part of the species found by Edmonds, though I was too early for two or three of the rarest. The snow still lay at an elevation of 6000 to 7000 feet in shady places near the Baths, and the weather, which had been wet previously, was fine and hot, though, as usual in the Andes at this season, very windy in the afternoon.

On December 28th I returned to Santiago to make arrangements for my journey to the south, and as our Minister, Sir B. Cusack Smith, advised me not to take an Argentine subject as my companion, I went to Quillota, where I arranged with Mr. Calvert to meet me as soon as he could get away on January 9th. Quillota has been so well described by Darwin* that I need say nothing of it. There is no good collecting ground within four or five hours' ride, but I got a few specimens here and at Llai-llai, the junction between the lines to Santiago and Valparaiso. Mr. Paulsen, who lives at Quillota, and Mr. Calvert have both collected here, especially Coleoptera, and the latter showed me a very nice collection mainly of Coleoptera.

Leaving Santiago on January 3rd, I slept at San Rosendo, where the line to what is called "la Frontera" diverges from the line to Concepcion and Lota. Here I had only a morning in which to sample the environs, and next day reached Victoria, a large new town to which most of the live stock raised in the frontier districts of Argentina comes over the Lonquimay Pass to market. Most of the country round here has been cleared of forest near the railway, but at Temuco further south, and at Tolten which was then the terminus of the line now being extended to Valdivia, I found the virgin forest which covers the greater part of Chile south of the Biobio river, and soon became convinced that, though the moths might afford a rich harvest to a resident collector, the south of Chile, like the centre, is, away from the mountains, very poor in diurnal Lepidoptera. Returning to Victoria I engaged a German and a Chilean as servants for my Andean journey, and went on by a branch line to Mulchen, whence I drove twenty miles east through a country recently cleared of forest to the hacienda of San Ignacio, the property of Señora Bussey, who received me with the greatest hospitality, and to whose husband, George Bussey, Esq., I am indebted for invaluable assistance in engaging reliable men and mules for my journey. Whilst these were being brought in I collected in the neighbourhood, but found that though the valley of the Renaico river, near which the hacienda is situated, is mostly virgin forest with the rich evergreen

* Darwin's 'Journal,' New Edition, Murray, 1890, pp. 269–286.

vegetation peculiar to Southern Chile, very few butterflies, and those the same as I had previously taken, were to be found. Moths, however, are abundant at light, and a good many were collected. San Ignacio lies some little way from the foot of the Pemehue Mountains, which constitute an outlying group on the west of the Biobio Valley, and the country round the hacienda is now mainly under wheat cultivation.

I was here delayed more than a week by a sudden and severe attack of illness, from which I was fortunate enough to be cured by the medical skill of Señora Bussey's brother, Dr. Puelma, and was nursed with as much care and attention as if I had been at home. I cannot speak too gratefully of the kindness and hospitality of this charming family, who, like many of the upper-class Chileans, are, though living in a country only recently conquered from the Indians, as civilized and well educated as any people in Europe.

I was at last able to make a start on January 22nd, a month later than I had hoped to do, and rode in two days up the valley of the Renaico river through a beautiful country mostly covered with virgin forest, and then over the Sierra de Pemehue to Lolco, a hacienda belonging to Señor Manuel Puelma, another brother of Señora Bussey's. This is a beautiful place near the Biobio river, and near it I got some of the best insects I found on my journey. No one except Mr. Calvert had ever collected Lepidoptera on this road before, and if I had not been so pressed for time I should have stayed longer.

On January 27th we started early from Lolco on a very cold morning, and rode first through grassy valleys which reminded one of Mongolia, and splendid araucaria and beech forests, over a very striking pass about 8000 feet high, to Lonquimay, which is the Chilean outpost and custom-house, on the main road from Victoria to Argentina, and from here in one and a half days up the head-waters of the Biobio we reached the Argentine frontier, which is an open bare ridge about 5000 feet high, and not the least like the northern passes over the Andes, the higher mountains in this latitude being isolated volcanoes, which lie well to the westward of the watershed. Close to the pass is an outpost of Argentine cavalry at Los Arcos, where I was civilly received by the lieutenant in command, and from here we turned more to the southward, and reached the beautiful Lake of Aluminé, one of the long line of lakes which are found mostly on the east side of the watershed, and which form the head-waters of many rivers, some of which run to the Pacific and some to the Rio Negro, and which are in the frontier region, of which parts were in dispute. This country has been described by Señor Moreno.* From here my route southwards for three weeks lay through Argentine territory, but I soon realized that there is no well-marked natural boundary between Chile and Argentina in this latitude, and that the influence of the rainfall, which rapidly becomes less when the watershed is crossed, is the real factor in determining the boundary between the wet sub-evergreen forest which clothes the western slopes of the mountains, and the dry grassy hills and valleys on the east, which gradually fall away into the great arid pampas of Patagonia that now form part of the Argentine territory of Neuquen.

It also became evident that nearly all the mountain and forest species of butterflies which hitherto have been considered peculiar to Chile occur in Argentine territory as well, and that there are few species peculiar to the pampas in the country which I passed through.

On reaching Lake Quillen in lat. 41° S. I made an attempt to re-cross into Chile by a track which formerly existed through the forest to Villarica, but it had become so much blocked by fallen trees that we could not get through, and after two days in the forest I turned south from Lake Quillen, crossing a pass over a lateral ridge about 6000 feet high to Junin de Los Andes, where an attempt has been made to found a frontier town in a very sparsely inhabited but fine cattle-ranching country. Up till now the weather had been splendid, too hot for comfort in the middle of the day, when high wind from the south usually prevailed, but now we had a spell of bad weather which very much hindered my collecting. At San Martin on Lake Lacar we found a military settlement commanded by Col. Perez, from whom, as well as from the other officers of the 3rd Argentine Cavalry, we had a most hospitable reception. This would be a good collecting station, as, though the elevation is under 3000 feet, there is a heavy snowfall in winter and a rich forest vegetation on the shores of the lake, whilst a range of mountains about 7500 feet high,

* Notes préliminaires sur une excursion aux territoires du Neuquen Rio Negro, etc., de Francisco P. Moreno. Musée de la Plata, 1898.

and wooded up to about 6000 feet, which is the approximate timber-line in this latitude, is within a ride of the town. Here I got a good Indian guide, and left on February 8th, intending to reach the great Lake Nahuelhuapi, which is the largest of all the lakes on this part of the frontier.

Our route through the mountains was extremely interesting and picturesque on account of the extraordinary volcanic rock formations which occur in these valleys, but the heavy rain which came on soon after leaving San Martin swelled the numerous mountain streams to an extent which made some of them difficult and dangerous to ford with loaded mules.

From San Martin to Nahuelhuapi I was able to do but little insect collecting, having long marches and broken weather, but the few butterflies which I saw showed that there was not much change in the fauna, and the country began to assume an autumnal appearance. At the point where the great river Limay runs out of Lake Nahuelhuapi, I found a ranch and store kept by a Scotchman named Neil, who is in partnership with Mr. Jones, one of the earliest and principal ranch owners of the district; here I sold my mules and horses, and had intended to take a boat and follow the river Limay down to its confluence with the Rio Negro, about five days' journey by river and then by rail to Buenos Ayres. But I heard such good accounts of the pass into Chile which is called the pass of Perez Rosales that I gave up the idea of returning by this route, and went on to a settlement called San Carlos, founded by the German firm of Hube and Achelis, which is on the south shore of Lake Nahuelhuapi. From here there is a regular route to Puerto Montt by small steamers on the lakes of Nahuelhuapi, Todos Santos, and Llanquihue, which are connected by good mule-roads, and where lodgings can be got in new houses built and managed by this enterprising and obliging firm. Anything more beautiful, interesting, or novel than this route, which can be traversed in about three days, cannot be imagined, and it must some day be the favourite tourist resort of South America.

Though very profitable from a botanical point of view, I was too much pressed for time to be able to add much to my entomological collections on this part of the trip, and after being delayed a day on Lake Llanquihue, only arrived at Puerto Montt just in time to catch the steamer to Concepcion, whence I had to hurry back to Santiago, and after packing and drying my botanical collection, part of which had been left at the museum in charge of Dr. Philippi, I re-crossed the Andes by the Mendoza Pass, and reached Buenos Ayres in time to catch the mail steamer on March 1st.

Before giving a list of the butterflies I collected, which include almost all the species hitherto described from Chile, I must say a few words as to the climate of different parts of the country. From a naturalist's point of view Chile may be divided into three regions.

First, Northern Chile, which consists of the long strip of country comprising the provinces of Tacna, Tarapaca, Autofagasta, Atacama and Coquimbo, from 18° to 32° S., between the sea and the Andes, about which I know nothing personally. It includes the nitrate districts which are absolutely arid, and most of the best mining districts; and from a zoologist's point of view is poor, on account of the very slight rainfall and absence of vegetation, except in the valleys of the few perennial streams and tracts which are cultivated solely by means of irrigation. It includes a great tract of high mountains in the district of Autofagasta and Tarapaca, which are, as far as I can learn, almost if not entirely destitute of trees, and which have therefore afforded no route by which tropical forms could extend from the north, as they might have been expected to do if the country had not been too dry.

Secondly, the coast region and valleys of Central Chile from about lat. 32° down to about the latitude of Concepcion and the river Biobio. This part of Chile has a climate much like that of Southern Spain, damper on the coast and drier in the great central valley between the coast range and the Andes, and is the most populous and richest part of Chile from an agricultural point of view, being fertilized by the deposit from numerous mountain streams which are made to irrigate large tracts of highly fertile country. Forest is now found in Central Chile only at and above elevations of 3000 to 6000 feet, and in the upper parts of the Andean valleys; and I doubt whether there was ever much true forest in the neighbourhood of Santiago, where the hills are covered with shrubs and thorny bushes, and where rain usually falls only during twenty to thirty days in winter.

In the latitude of Chillan heavy forest is found, or rather was found until it was destroyed by fire, along the foot and on the outer valleys of the Andes, but on the coast there is much brushwood, and in narrow gorges and valleys some timber, though the plains are still very dry. South of the Biobio the climate changes very suddenly, and when Valdivia is reached the rainfall is so great that the country is covered with a forest so dense that one can hardly penetrate it; where ferns grow twelve feet high, and a bamboo-like grass climbs the trees to a height of forty feet.* Inland, however, there is some open savannah and marshy country at the foot of the volcanoes, south of Lake Llanquihue.

This region has a few peculiar Satyridæ and Hesperidæ, but is extremely poor in diurnal Lepidoptera, though very little collecting has been done except about Valdivia and La Union.

Lastly, I take the region south of lat. 42 down to the Straits of Magellan, which is familiar to us from the writings of Darwin, Cunningham, and other naturalists, and which includes a great number of forest-clad islands and unexplored mountains, of which our zoological knowledge at present is very limited. Some parts of the coast are fairly well known to naturalists, and the district lying south of Lake Nahuelhuapi and east of the watershed, which has been described by Moreno and more recently by Prichard,† is beginning to attract colonists, especially at the head-waters of the Chubut river, where there is some good ranching country now occupied by Welsh settlers from the east coast. This region will probably be found to contain many of the species which I found farther north, but the west coast and Straits of Magellan have such a very wet and inclement climate that there can be but few butterflies, and those few nearly allied to or identical with those of Chile and Argentina.

The list of butterflies which follows is based on what is by far the most complete collection of Chilean butterflies ever brought together in Europe, comprising my own collection, that of Mr. Edmonds, which was contained in the British Museum, and Mr. Godman's collection, and the specimens taken by our fellow, Mr. J. J. Walker, R.N., when serving on the coast at Coquimbo, Valparaiso and Concepcion. I have also been able to examine the types of

* See Darwin's 'Journal,' New Edition, Murray, 1890, pp. 318–322.

† Prichard, 'Through the Heart of Patagonia,' London, 1902.

several species described by Mabille, Felder, and Reed, and have added some specimens from the late Mr. Crowley's collection now in the British Museum, where the whole of this material is now placed.

There are, no doubt, in the collections of Mr. Paulsen and Dr. Isquierdo many specimens which would have been invaluable in studying the variation of Chilean butterflies, and perhaps some new species, but as they have had no means of identifying their specimens with the types, which are all in Europe, and I was too ignorant of the Chilean species to make notes of them when I saw them, this list must not be taken as more than an attempt to improve the foundation of what is still very fragmentary and incomplete knowledge.

What is wanted are resident collectors, especially in the south, who will observe the seasonal and local variations, and bring together much larger series than now exist; by which means alone my conclusions as to specific values can be proved or disproved.

It will be seen from this list:—

First, that the number of species is extremely small, being, if the diverse conditions of climate are considered, the smallest found in any country in the world of equal length from north to south.

Secondly, that the number of butterflies which are not endemic in Chile, if the Argentine as well as the Chilean slopes of the Andes are included, is very small.

Thirdly, that the scarcity of Nymphalidæ and Lycœnidæ is extreme; only six species of the former and seven of the latter occurring in this immense tract of country, a smaller number than could be taken in a single day in almost any part of North America, Europe, or the temperate region of Asia. Not a single Lycœnid and only one or two Nymphalid butterflies seem to have been taken south of Valdivia; a case quite unparalleled in other parts of the world.

The Chilean butterflies consist almost entirely of Satyridæ and Hesperiidæ, many of which are confined to the forest region of the centre and south, and there is a marked absence of alpine species; only

2 Pierids
2 Nymphalids
1 Lycœnid, and
2 or 3 Satyrids

can be considered as strictly alpine butterflies, though several of the common species of the valleys and forest are found up to, and even above, timber-line. Many of the forest insects seem to be found only where *Chusquea*, a bamboo-like grass, is abundant, but some others, such as *Argyrophorus argenteus, Cosmosatyrus leptoneuroides*, and *Neomaenas simplex*, are found on grassy downs and hills, and never enter the forest so far as I observed.

In the arrangement of the Hesperiidæ I have availed myself of Watson's 'Classification' of that group (P. Z. S. 1893, pp. 3–132).

I have not studied the generic characters, as it seemed to me that this could not profitably be done without undertaking a study of the allied species from other parts of S. America.

SATYRIDÆ.

1. *Elina lefebvrei.*
   Satyrus lefebvrei, Guérin, Voy. de la Coquille, p. 281 (1829).
   S. montrolii, Feisthamel, Mag. Zool., Ms., Pl. 20 (1839).
   Lasiommata montrolii, Westwood, Gen. Diurn. Lep., p. 387 (1851).
   ♀ *Elina montrolii*, Blanchard, in Gay's Fauna Chilena, vii, p. 29, Pl. V, fig. 7 (1852).

A well-known and very distinct species, the largest of the Chilean Satyridæ. I found it common at the Baños de Cauquenes, where it flies in shady woods and settles on the trunks of trees. It was also common at Temuco and near San Ignacio, but I did not see it in the mountains. The southern form is darker than that found at Valparaiso and Quillota.

2. *Elina vanessoides.*
   Elina vanessoides, Blanchard, *t. c.*, p. 28, Pl. V, figs. 5, 6.

Also a very distinct species which I did not take myself, but which is common in the neighbourhood of Valdivia.

3. *Elina neomyrioides.* (Plate XIV, fig. 5 ♂.)
   ♀ *Satyrus neomyrioides*, Blanchard, *t. c.*, p. 33, Pl. II, figs. 6, 7.

I doubt whether this species belongs to the same genus as the last. I took it at San Ignacio in January, and at

Port Blest on Lake Nahuelhuapi in February. I have figured a male of this species as it appears to be undescribed.

4. *Elina calvertii*, n. sp. (Plate XIV, figs. 3 ♂, 4 ♀.)

This species was not uncommon in the forest below the Baños de Chillan in December, when I took five males and one female in fair condition. I also found a single female in the thick forest on Lake Quillen in Argentina on February 3rd; and there is in the British Museum a female taken by Edmonds below the Baths of Chillan, which Butler has mistaken for the female of *neomyrioides* and marked as such. There is a distinct patch of velvety androconia on the fore-wing in this species and the last which is not found in the species of Elina, and they are probably not congeneric. The base of the fore-wing below in *E. calvertii* is, like that of *E. edmondsii*, fulvous, which distinguishes it at once from *neomyrioides*, and the lower part of the band on the hind-wing below is also much less defined and does not form a conspicuous white patch on the costa. On the upper-side the band is also much less distinct forward.

5. *Pedaliodes flora.*

♀ *Satyrus flora*, Philippi, Linnæa Entomologica, xiv, p. 267 (1860).

Hipparchia ? flora, Butler, Cat. Sat., p. 58 (1868).

Pedaliodes oaxes, *id.*, Cist. Ent., i, p. 25 (1870).

Stibomorpha tristis, *id.* (*nec* Guérin), Lep. Exot., p. 180, Pl. LXII, fig. 3 (1874).

Satyrus tristis, Reed, Mon. Marip. Chil., Pl. III, fig. 4 (1877).

Stibomorpha reedi, Reed (*nec* Butler), *t.c.* explic. de las laminas, lam. iii, fig. 4 (1877).

Neither in its appearance, habits, nor flight has this species any affinity with *Elina lefebvrei* or with any other species of Elina that I observed. I found it abundant in marshes overgrown with reeds, bushes, and great tufts of Gunnera scabra on the east shore of Lake Llanquihue, where it was fresh in February. It has a slow flight amongst the rushes and bushes, and is very easy to take. The females differ but little from the males. Edmonds found it common in marshes at Valdivia.

6. *Epinephele edmondsii.*
E. edmondsii, Butler, Trans. Ent. Soc. Lond., 1881, p. 451, Pl. XXI, fig. 2.

This seems to be a distinct species, which was described from one specimen only, taken near the Baths of Chillan in March by Edmonds. This specimen is in the British Museum, and agrees very closely with two in that collection from Cordoba and two from Uruguay sent by Berg to Zeller.

7. *Epinephele janirioides.*
E. janirioides, Blanchard, *t. c.*, p. 34, Pl. II, fig. 8 ♀.
Satyrus limonias, Philippi, *t. c.*, p. 268 ♂; Reed, *t. c.*, Pl. II, fig. 7.
Var. *Epinephele dryas*, Felder, Reise der Nov. Lep., iii, p. 492 (1867).

This was common at the Baños de Cauquenes on dry hill-sides covered with bushes from the 18th to 21st of December, and at San Ignacio in January. It is common at Valparaiso in November and December, and has been taken at Talcahuano and at Valdivia. The specimens in the British Museum from this locality are smaller than mine but not otherwise different. As I think Blanchard's figure of this species is unmistakable I adopt his name.

8. *Epinephele monachus.*
Satyrus monachus, Blanchard, *t. c.*, p. 35.
Epinephele valdiviæ, Felder, *t. c.*, p. 493.
Pedaliodes lugubris, Butler, Cist. Ent., i, p. 25 (1870).
Stibomorpha monachus, *id.*, Lep. Exot., p. 179, Pl. XIII, fig. 2 (1874); Reed, *t. c.*, Pl. II, fig. 5, and explic. de las laminas, lam. ii, figs. 5, 6.
Satyrus luctuosus, Reed, *t. c.*, Pl. II, fig. 6 ♀.

This species was very abundant in the heavy virgin forest south of Temuco, where it was fresh out on January 10th. It was also very abundant amongst the dense bamboo undergrowth in the Upper Renaico Valley at 3500 feet at the end of January, and was common in similar forest on Lake Quillen and at Port Blest in the middle of February, when it seemed to be nearly over. I cannot distinguish the insect which Reed figures badly under the name of *luctuosus*. I have compared the type of *valdiviæ*, Feld., with my specimens from Temuco, and believe it to be identical.

9. *Epinephele tristis.*
   ? *Satyrus tristis*, Guérin, Voy. Coq., p. 281.
   ? *Argynnis tristis*, *id.*, *t. c.*, Atlas. Ins., Pl. XVI, fig. 5 (1832).
   ? *Epinephele coctei*, Reed, *t. c.*, expl. de las laminas, lam. iii, fig. 3 ♀.
   ? *S. pales*, Philippi, *t. c.*, p. 268.

Guérin's figure being, like his description, very bad, there is much confusion as to the synonymy of this species, which being a common insect in all the low country varies a good deal in size and in the markings on both sides. I recognize two allied species only, of which this is the larger. It was common amongst bushes at Baños de Cauquenes on December 15th and up to about 3000 feet; also amongst bushes at San Rosendo on the lower Biobio on January 5th. I found it nearly over at Llai-llai on January 1st, and took a single female at over 4000 feet in the Chillan Valley on December 22nd.

10. *Epinephele coctei.*
   E. coctei, Guérin, *t. c.*, *id.*, Mag. de Zool. Ins., Pl. XI (1839).
   Erebia coctei, Westwood, *t. c.*, p. 380.
   ? *Epinephele coctei*, Butler, Cat. Sat., p. 68 (1868);
   ? *Satyrus tragiscus*, Reed, *t. c.*, Pl. III, fig. 3.

Guérin's figure of this species is I think unmistakable. It is a smaller species than the last, and probably distinct, though it may be only a mountain form of it. I did not find it anywhere in the low country, but first saw it abundantly flying among the scrubby bushes and grass tufts in the Upper Biobio Valley above Lonquimay on January 28th. From here as far south as the Rio Limay it was common on suitable ground from 2000 up to about 4000 feet. The males are always, when fresh, darker than the last, and the under-side is less variegated, but I can find no distinction that I could consider specific between the two. The only specimen I find in the British Museum marked *coctei* is a female from Talcahuano sent by Edmonds; Butler says he thinks this is only a dwarfed form of *tristis.*

11. *Neomœnas cœnonymphina.*
   N. cœnonymphina, Butler, Trans. Ent. Soc. Lond., 1881, p. 454, Pl. XXI, fig. 4.

This is a species somewhat like the last above, but perfectly distinct by the broad pale band on the hind-wing below, and on both wings in the female above, which Butler's figure does not well show. According to Edmonds it is local at Valparaiso. I did not take it myself.

12. *Neomænas fractifascia.*
N. fractifascia, Butler, *t. c.*, p. 455, Pl. XXI, fig. 3.

A very distinct species which I found scarce at San Martin, near Lake Quillen, and in the forest at Port Blest in February. It frequents open places in the forest, and was also taken by Edmonds near the Baths of Chillan in March. The female has much more red on both wings above, but both sexes vary in this respect.

13. *Neomænas servilia.*
N. servilia, Wallengren, Kon. Vet. Akad. Förh., p. 78 (1858); *id.*, Wien, Ent. Mon., iv, p. 36 (1860); *id.*, Eug. Resa, p. 354, Pl. VI, fig. 1 ♂ (1861).
Stibomorpha decorata, Butler, Ent. Mo. Mag., x, p. 205 (1874); *id.*, Lep. Exot., p. 179, Pl. LXII, fig. 3 ♀ (1874).

I took one only at Cauquenes. It is not uncommon at Valparaiso and elsewhere, and frequents bushy uncultivated ground, but is not, I think, found in the forest region.

14. *Neomænas wallengrenii.*
N. wallengrenii, Butler, Trans. Ent. Soc. Lond., 1881, p. 456, Pl. XXI, fig. 5.

A rare species, which seems distinct from the last, and is represented in the British Museum by two bad specimens taken by Edmonds in the woods below the Baths of Chillan in March. I did not find it myself.

15. *Neomænas ? inornata*, n. sp. (Plate XIV, figs. 1 ♂, 2 ♀.)

This species seems to be most nearly allied to *servilia*, Wall., with which it agrees in size and shape, but it is darker in colour above and has the under-side of the fore-wing in both sexes of a deeper rufous colour. The hind-wing below is perfectly plain olive-grey with a darker marginal line. The female has on the fore-wing above an indistinct black ocellus, and both sexes have on the fore-wing below an ocellus like that of *servilia.* As in that species there is no sexual patch on the fore-wing of the male. It is also somewhat like *Argyrophenga simplex*, Butler, but larger and much more rufous above, and has the hind-wings of a different shape. I can find no described species to which it can be referred in any collection. I took two males and one female at the Baños de Cauquenes on December 15th, flying on a bushy hillside above the Baths and settling on low trees.

16. *Neomœnas ? edmondsii.*
    Argyrophenga edmondsii, Butl., *t. c.*, p. 457, Pl. XXI, fig. 6.

I know this only from the very bad specimen in the British Museum which Edmonds took in March 1880 in woods below the Baths of Chillan.

17. *Neomœnas ? humilis.*
    Stygnus humilis, Felder, *t. c.*, p. 489.

Butler identifies as above a distinct species with the same markings as *ambiorix*, but the ocelli much smaller and fainter. It can be distinguished, however, I think from *ambiorix*, certainly by the absence of any chocolate colour in the fore-wing below, and by the rounder and less pointed fore-wings. Edmonds found it common in woods near Valdivia. I only took two or three males in forest at Quillen and near Lake Aluminé at about 3000 feet; these agree with Edmonds' specimens, which I have compared with Felder's type and find identical.

18. *Cosmosatyrus leptoneuroides.* (Plate XV, figs. 3 ♂, 4 ♀, 6 ♀.)
    Cosmosatyrus leptoneuroides, Felder, *t. c.* p. 495, ♀.
    Satyrus antarctica, Reed, *t. c.*, Pl. II, fig. 4.
    Tetraphlebia germainii, *id.*, *t. c.*, explic. de las laminas, lam. ii, fig. 4.
    ? = *T. plumbeola*, Butler, Cat. Sat., p. 95, Pl. II, fig. 11 (1868).

I first took this species in the Renaico Valley at Maitenes, a farm of Mr. Bussey's, about 2500 feet elevation, when it was fresh out on January 24th, and common in grassy openings in the woods. Afterwards it became abundant everywhere, and was generally distributed at elevations of 3000 to 5000 feet in all suitable situations. I have figured three specimens to show the great variation which exists in the species. The type of *leptoneuroides* is a very large male, and agrees well with my largest. Though at first I thought that the androconia on the male fore-wing of some specimens would distinguish them, yet on careful comparison of my very large series I am unable to separate what Butler calls *plumbeola*, which he thinks the mountain form of *leptoneuroides*. This, which is often smaller, was found by Edmonds at 6000 feet in January, but was not out when I left Chillan at the end of December. The species does not seem to occur in the low country or on the coast of Chile, as Reed says he has never seen it. It is probable that what he figures as *S. antarctica* is the same as *plumbeola* Butler, described from the Straits of Magellan, which however he does not allude to in his paper on Edmonds' collection. This is also found at Port Famine, and was placed with *plumbeola* in the British Museum by Butler. Staudinger also figures as *Erebia plumbeola*, var. *Duseni*, a variety of the same form from the Rio Aysen in S. Chile, showing that the species has a continuous distribution from about the latitude of 38° to the far south of Chile. From the figure of *Duseni* I do not see much to distinguish it, and it is to be hoped that the practice of giving varietal names to specimens of whose distribution and variation so little is known will not be adopted as largely by authors as it has been in the Holarctic Butterfly Fauna.

19. *Cosmosatyrus chiliensis*. (Plate XV, figs. 9 ♂, 10 ♀.)
   Satyrus chiliensis, Guérin, *t. c.*, p. 280; Atlas, Ins., Pl. XVI, figs. 4, 5 (1832).
   Stibomorpha reedii, Butler, Lep. Exot., p. 180 (1874).

This is one of the common species of Chile which I first took in the Chillan Valley at about 3000 feet in December, when it was just coming out. Afterwards I found it on the coast near Coronel rather worn, and later it was common in the Renaico Valley at 2000 feet, and was found almost everywhere up to about 3000 to 4000 feet and as far south as Nahuelhuapi, where, however, the specimens show differences which might enable those from Argentina to be separated from those taken in Chile. In order to show these differences clearly, and also how *chiliensis* can be separated from the next species, I have figured a male and female from the east side of Lake Nahuelhuapi, the farthest point south which I visited. These were flying on grassy pampas where the rainfall is very much less than in Chile and the snowfall and cold of winter much greater, and their markings show a good deal more resemblance to those of *monticolens*. It is possible that this form may prove distinct from *chiliensis*.

20. *Cosmosatyrus monticolens*. (Plate XV, figs. 7 ♂, 8 ♀.)
Satyrus monticolens Butler, Trans. Ent. Soc. Lond., 1881, p. 484, Pl. XXI, fig. 1.

I first found this at the head of the Lolco Valley on the road to Lonquimay, at about 5000 feet, and was at once certain from its flight that it was a species new to me. Instead of a slow short flight among bushes like that of *chiliensis*, it has a rapid straight flight of 20 to 50 yards backwards and forwards over wet subalpine meadows always amongst grass and stones, and was in consequence much harder to catch. It was afterwards found between the Aluminé Lake and Pulmari on similar ground at about 4500 feet, and also near San Martin on a mountain side at 6000 feet. It varies considerably, and I have figured a pair from Pulmari to show the differences between it and *chiliensis*. These agree fairly well with Butler's type, which came from the mountains above the Baths of Chillan, where it had not yet appeared at the end of December.

Cosmosatyrus williamsianus.
Arge williamsianus, Butler, Cat. Sat., p. 159, Pl. IV, fig. 1 (1868).
Œneis antarcticus, Mabille, Nouv. Arch. Mus. (3), i, p. 142, Pl. X, figs. 5, 6.

The type of *williamsianus* in the British Museum is a female in bad condition from Port Famine, Patagonia, and has been compared with the type of *Œneis antarcticus*, which appears to be identical. I believe that it is very nearly allied to, if not identical with, *monticolens*; the shape of the wings and the white veins on the hind-wing below being similar, and the difference not more than one might expect in the species when starved and dwarfed by an ungenial climate.

21. *Argyrophorus argenteus.*
A. argenteus, Blanchard, Fauna Chil., vii, p. 30.
Chionobas argenteus, id., t. c., Pl. II, figs. 9–11.

This is one of the most beautiful and unique butterflies in Chile, or I may say in the world, and as its habits are undescribed I will give an account of them, as I had ample opportunities of observing it. Though found at various places in the mountains it seems local. Mr. Calvert has taken it on the Campana Mountain near Quillota, and Edmonds says he took it near La Union in the province of Valdivia, but at what elevation he does not mention. I first found it in the Villacura Valley east of the Pemehue range at the end of January, where it was abundant at about 3000 feet on grassy hillsides and flats covered with long tufted herbage. In the morning when it first begins to move, and before the wind has become strong, it may be taken without much difficulty, though even then it is very shy. Later it flies in the sun with such rapidity that it is only by waiting in the line of flight that you can take them. The brilliance of the shining silvery wings of this butterfly make it a most beautiful and striking object when fresh, but they soon become worn and broken, and a very large proportion of those I took were not worth keeping. All along the upper valley of the Biobio and on the Argentine side of the frontier about Lake Aluminé I found it common up to about 4000 feet, always on the grassy hill-sides but never in the forest. It settles on the ground amongst tufts of grass, and the larva is no doubt a grass-feeder. It was common about San Martin and as far south as the valley of the Limay, and when I re-crossed the Andes at the end of February I saw one or two in the Aconcagua Valley at about 6000 feet elevation.

22. *Faunula stelligera.* (Plate XV, figs. 1 ♂, 2 ♀.)
F. stelligera, Butler, Trans. Ent. Soc. Lond., 1881, p. 460, Pl. XXI, fig. 10.

I found this species common on the grassy hill-sides and ridges above timber-line near the Baños de Chillan at 6000 to 7000 feet in December, when many specimens were already worn. The flight and habits are essentially like those of the Alpine grass Erebias, and as it never occurs far from the dwarfed form of "colihue" (a bamboo-grass very like the Arundinarias of the Himalayas) which covers large areas of these mountain-sides, I have little doubt that the larvæ feed on this plant. The specimens taken here average much larger than those which I afterwards found abundant in January and February above Lolco and near Pulmari, Quillen, and San Martin in Argentina, always at elevations of 4000 to 6000 feet. They vary a great deal, and some do not show as plainly as others the toothed band on the hind-wing below which is characteristic of the species, though Butler's figure does not show it. I have figured a pair from Lolco.

23. *Faunula leucoglene.* (Plate XIV, fig. 6 ♂.)
F. leucoglene, Felder, *t. c.,* p. 488.

This is essentially a high Alpine species, which I only took myself on the top of the pass from Lolco to Lonquimay on January 27th at 8000 feet. Here it flew among stones in a very exposed situation among a rich variety of Alpine plants, sheltering itself from the high wind behind stones, and so difficult to approach that in an hour's work I only took one pair. It also occurs in the Cordillera near Santiago at Condes, at 6000 feet according to Calvert, at 7000 to 10,000 according to Edmonds.

This species is curiously similar in appearance to *Erebiola butleri,* an Alpine species from New Zealand.

I saw a butterfly which looked like this on the Argentine side of the Mendoza Pass near Las Cuevas, at about 10,000 feet, but failed to catch it.

24. *Neosatyrus ambiorix.*
N. ambiorix, Wallengren, Wien. Ent. Mon., iv, p. 36 (1860); *id.,* Eug. Resa, Pl. VI, fig. 2 (1861).
? *N. minimus,* Butler, Trans. Ent. Soc. Lond., 1881, p. 461, Pl. XXI, fig. 7.

This is a common forest insect wherever dense growth of bamboos is found, and usually occurs in great numbers, though hard to get in really fresh condition. I found it at Baños de Cauquenes and Baños de Chillan up to 6000 feet in December, in the Pemehue Mountains at the head of the Renaico Valley in January, and all along the Argentine frontier at 3000 to 4000 feet in February. Both sexes vary a good deal in the ocelli of the under-side, and those taken at Cauquenes may belong to a different form from those taken in Argentina and Pemehue, the males when fresh having a distinct fulvous tinge at the base of the wings above which is not seen in those from Pemehue and Argentina. The females also of the Cauquenes form are brighter-coloured above, much more yellow below, and with larger ocelli. *N. minimus* appears to be a small starved variety of doubtful origin, and impossible to describe from the specimen which is in the British Museum collection.

25. *Neosatyrus ? simplex.*
Argyrophenga simplex, Butler, Trans. Ent. Soc. Lond., 1881, p. 458.

Specimens of this agree with Butler's type in the British Museum taken by Edmonds above the Baths of Chillan in March. I found it only in one place in a grassy valley at about 5000 feet on the road from Lolco to Lonquimay on January 27th. I took six or seven males all in the same place which vary a good deal, most of them being without the white dash on the hind-wing below which exists in the type. It flies among the low bushes like an Epinephele, and should be placed, I think, near *Neosatyrus ambiorix*, which it resembles in form and flight.

26. *Neosatyrus vesagus.* (Plate XIV, figs. 9 ♂, 10 ♀.)
Erebia vesagus, Doubleday and Hewitson, Gen. Diurn. Lep., Pl. XLIV, fig. 2 (1851).
Homœonympha pusilla, Felder, *t. c.*, p. 487.
Neosatyrus ochreivittatus, Butler, Trans. Ent. Soc. Lond., 1881, p. 462.
N. violaceus, *id.*, *t. c.*, p. 463, Plate XXI, fig. 8.
? *N. hahni*, Mabille, Miss. Cap. Horn. Lep., p. 3, Pl. I, fig. 3.
? *Erebia boisduvalii*, Blanchard, *t. c.*, p. 32.

I am by no means sure of the above synonymy, as the specimens before me vary a good deal and may belong to two species.

First I have the type of *vesagus* in the Hewitson collection from South America, which is undoubtedly the same as *violaceus* and *ochreivittatus*, of which the types from Chillan and Chile are in the British Museum. Also a pair of the same from Valparaiso (Walker) in Mr. Godman's collection; and a pair which I took at Coronel on December 19th, in which the bands of the hind-wing below are less distinct. Then I have a pair which I took near the Baths of Chillan where Edmonds got the type of *violaceus*; these, though otherwise very like *vesagus*, have a distinct marginal band of spots on hind-wing below, and seem to agree very nearly with Felder's type of *pusilla*. I have figured these as none of the figures cited are satisfactory.

Then I have what seems a smaller species which has the bands less distinct and the spots more so, which Butler calls *boisduvalii*, and of which two males and a female are in Mr. Godman's collection from Concepcion (Walker) close to Coronel, where I took the larger form above-mentioned.* Then I have a single male from some part of Chile which comes very near the figure of Hahnii from Punta Arenas, which looks like, and probably is, a starved southern form of the same. Until we get much more ample material from intermediate localities in the south the specific identity of these forms must remain undecided.

27. *Neosatyrus nycteropus*. (Plate XIV, figs. 7 ♂, 8 ♀.)
Neosatyrus nycteropus, Reed, *t. c.*, Plate III, fig. 2.

I can find no other name for or description of this species. What Reed speaks of in the explanation of the plates as *Hipparchia boisduvalii* is the same, but that name cannot be identified certainly, and the figure Reed gives of the under-side cannot I think be mistaken for that of any other species. I can distinguish this from all others in Chile known to me, by the distinct scalloped band on the hind-wing below outwardly edged with white, in which *Neosatyrus hahnii*, which I have referred to *vesagus*, resembles it more than any other. On the upper-side both sexes usually (but not always the male) have a fulvous submarginal band on the hind-wing above not reaching either the costa or inner margin of the wing.

I know this insect from two pairs taken at Coquimbo by Walker in Collection Godman, a male and female given me by Mr. Paulsen of Quillota, and three males which I took on the scrubby hill-sides near Llai-llai on January 1st. It seems, therefore, to be confined to the coast region of Central Chile.

28. *Neosatyrus reedii*.
N. reedii, Butler, Trans. Ent. Soc. Lond., 1881, p. 463, Pl. XXI, fig. 9, var. *fuscescens*, *id.*, *t. c.*, p. 485.

This is a distinct species, which I did not take. It was

* What Blanchard called Boisduvalii came from the Straits of Magellan and is probably same as Hahnii, but I cannot recognize it by the description.

described by Butler from Reed's collection without definite locality, and is distinguished by the broad pale band on hind-wing below. The figure of *Janiroides* in Gay's plate (Fauna Chilena, Pl. III, fig 2), which Butler gives as a synonym, is I think impossible to identify.

29. *Tetraphlebia germainii.* (Plate XV, fig. 5 ♂.)
T. germainii, Felder, *t. c.,* p. 488.
Satyrus promaucana, Reed, *t. c.,* Plate III, fig. 5.

I took the male of this in the woods below Chillan at about 4000 feet at the end of December, and a single worn female in the Villacura Valley at 3000 feet on January 25th. It is a very distinct species. Reed says that it is not scarce in the central provinces, but specimens are rare in collections.

NYMPHALIDÆ.

30. *Euptoieta hortensia.*
Argynnis hortensia, Blanchard, *t. c.,* p. 24.

This species does not seem common anywhere, but I took specimens at Quillota, San Rosendo, and San Ignacio in January.

31. *Argynnis cytheris.*
Papilio cytheris, Drury, Ill. Exot. Ent., ii, Pl. IV, figs. 3, 4 (1773).
Argynnis siga, Hübner, Zutr. Exot. Schmett, figs. 677, 678 (1832).

One of the commonest butterflies all over the country, and found from the sea-level up to at least 7000 to 8000 feet near the Baths of Chillan. It extends from about Copiapo in the north to as far south as the Straits of Magellan; and though it has several synonyms I cannot distinguish any marked local varieties, except perhaps the one found in the Falkland Islands. The largest and palest I have is a female from 7000 feet elevation taken above timber-line at Chillan, though probably it was bred in the valley below. The smallest are those from the low forest country near Mulchen and Tolten, though Edmonds says the contrary is the case. It occurred in Argentina as far south as Nahuelhuapi.

32. *Argynnis lathonioides.*
A. lathonioides, Blanchard, *t. c.,* p. 22, Pl. II, figs. 1, 2.

? *A. anna, id., t. c.*, p. 23.
? *A. dexamene*, Boisduval, Bull. Ent. Soc. Fr., 1859, p. 157.

The only place where I took this species was in the Horcones Valley near Puente del Inca in Argentine territory at about 10,000 feet, on December 12th, 1901, where it was not uncommon. Most of my specimens were lost, but Fitzgerald took one probably in the same locality, now in the British Museum, and Edmonds found it in the mountains above the Baths of Cauquenes at 6000 feet in January. It is very rare in collections, and the females might easily be mistaken for pale examples of the same sex of *cytheris*. The male, however, is very unlike the male of that species and very similar to its own female. It seems to be a true mountain species confined to the northern parts of the country, and perfectly distinct from either *cytheris* or *modesta*.

33. *Argynnis modesta*.
A. modesta, Blanchard, *t. c.*, p. 24, Pl. II, figs. 3, 4.

I found this first above the Baños de Chillan at 7000 to 8000 feet on bare stony ridges above timber-line. Here it was very hard to take, as it flew very fast and quite close to the ground, and was also very shy. I spent at least an hour in securing two specimens, though they kept returning to the same spots on little bare sandy places close to the peaks but a little sheltered from the high wind. I did not take the female, but have one from Edmonds, who found it in the same place as the last but 2000 to 4000 feet higher up. I also saw it and caught one specimen in Argentine territory near Lake Aluminé at about 5000 feet on January 30th. It froze hard the previous night in our camp but was very hot in the afternoon.

34. *Pyrameis carye*.
Hamadryas decora carye, Hübner, Samml. Exot. Schmett, i, Pl. XLV (1806).

Common in the low country, but not found by me in the mountains.

35. *Pyrameis terpsichore*.
Vanessa terpsichore, Philippi, Lin. Ent., xiv, p. 266 (1860).

Taken at San Rosendo, San Ignacio, Lolco, and on Lake Llanquihue in December, January, and February, and at San Martin in Argentina up to about 3000 feet.

LYCÆNIDÆ.

36. *Scolitantides collina.*
    Lycæna collina, Philippi, *t. c.*, p. 270.
    L. lyrnessa, Hewitson, Ent. Mo. Mag., xi, p. 107 (1874).
    ? *Scolitantides plumbea*, Butler, Trans. Ent. Soc. Lond., 1881, p. 486.

This belongs to a group which is represented in the Andes of Bolivia by *S. speciosa*, Stgr., in Peru by *vapa*, Stgr., and in Ecuador by an unnamed species of which there are specimens in the British Museum. I am uncertain whether *plumbea*, Butler, is identical; Edmonds thought it was only a variety, and though the type is larger and duller in tint, I find no character in it to enable me to say decisively. I took a single specimen exactly like the type of *plumbea*, but am uncertain of the locality. I found the species very abundant at 5000 to 6000 feet near the Baths of Chillan in December, and also took it in the Sierra de Pemehue in January. It frequents bushy ground and also the bare ridges above timber-line. Philippi says he took it on the hills near Santiago.

37. *Scolitantides andina.*
    S. andina, Calvert, An. Univ. Chile, xxxiv, p. 832 (1894).
    ? *Lycæna endymion*, Blanchard, *t. c.*, p. 37, Pl. III, fig. 3 *a*, *b*.

I cannot identify this species with certainty, as, if Blanchard's plate is correct, the under-side is different from that of Calvert's species which I know from two females sent by him to the British Museum, where they stood without name. I found the same species common near Puente del Inca on December 11th, flying on bare ground among grass tufts at about 9500 feet near the entrance to the Horcones Valley. It differs from *collina* in the colour above, which is more greenish in the male and grey in the female. Beneath the markings are very like those of *collina*, but the female has no red on the under or upper surface of the wings. Calvert's species was taken near Condes above Santiago at 3000 metres elevation.

Endymion is said by Blanchard to come from Coquimbo. It appears that Kirby in Cat. Diur. Lep., p. 377, gave the name of *Sibylla* to Blanchard's figure, because the name *endymion* was pre-occupied. I prefer to use the name of *andina*.

38. *Scolitantides chilensis.*
   Lycæna chilensis, Blanchard, *t. c.*, p. 37, Pl. III, fig. 4 *a*, *b*.
   ? *Polyommatus atahualpa*, Wallengren, Wien. Ent. Mon., iv, p. 37 (1860).

I found this species common at Baños de Cauquenes in December. It is also found, according to Edmonds, at Valparaiso and Copiapo.

39. *Lampides trigemmatus.*
   L. trigemmatus, Butler, Trans. Ent. Soc. Lond., 1881, p. 468.

This species seems to be peculiar to the north of Chile. Besides the types in the British Museum there are four specimens from Tarapaca. It is nearly allied to *L. telicanus* of Europe.

40. *Thecla bicolor.*
   Lycæna ? *bicolor*, Philippi, *t. c.*, p. 269.
   ♀ *Thecla quadrimaculata* ♂, Hewitson, Ent. Mo. Mag., xi, p. 106 (1874).

I am not convinced of the specific distinction of this species from the next; it may be a mountain form of it. The only specimen I have is labelled Puente del Inca, but I am inclined to think that this label has been misplaced. The specimen is smaller, and on the under-side somewhat different from *quadrimaculata*. The males of both forms have a large sexual patch in the fore-wing, which has led Butler to put them in the genus *Callipsyche*, Scudd. The type was taken near Santiago.

41. *Thecla quadrimaculata.*
   ♀ *T. quadrimaculata*, Hewitson, *l. c.*

Hewitson appears also to have doubted the distinctness of this from the last, as he has put the female type as the male of *bicolor*. I took two males of what Butler calls *quadrimaculata* at Coronel and one at Baños de Cauquenes, both at low elevations.

42. *Strymon americensis.*
Thecla americensis, Blanchard, *t. c.*, p. 38.

I took a pair on the road up to the Baths of Chillan at about 2000 feet on December 20th, and found it also near Temuco and at San Ignacio in January. Edmonds took it at Valparaiso, Valdivia and Cauquenes. The male has the same sexual patch as *bicolor*, with which I think it is congeneric.

PIERIDÆ.

43. *Heliochroma leucothea.*
Papilio (*D.*) *leucothea*, Molina, Saggio sulla Storia Naturale del Chili, libr. iv, p. 347 (1782).
Pieris gayi, Blanchard, *t. c.*, p. 10, Pl. I, fig. 4.

Though Edmonds says this is common in the Cordillera of the Cauquenes hacienda in January, I was informed by M. Germain, the veteran entomologist of the Museum at Santiago, who knows the insects of Chile very well though he has never written on the Lepidoptera, that the species was confined to the coast, where it comes out early in spring. I only saw it near Coronel in December flying among bushes where I was unable to take it.

44. *Terias chilensis.*
T. chilensis, Blanchard, *t. c.*, p. 17, Pl. I, fig. 5 *a*, *b*.

I only saw it near Llai-llai on January 1st in irrigated fields. It seems to be common at low elevations.

45. *Callidryas drya.*
Papilio drya, Fabricius, Syst. Ent., p. 478 (1775).
Callidryas drya, Butler, Lep. Exot., p. 61, Pl. XXIII, figs. 5–8 (1871).
C. amphitrite, Blanchard, *t. c.*, p. 20, Pl. V, figs. 1, 2.

A few were seen in the lower part of the Aconcagua Valley. Edmonds says it is common at Valparaiso and is found at Copiapo, and occurs almost throughout the year. He found the larva on Cassia.

46. *Colias lesbia.*
   Papilio lesbia, Fabricius, *t. c.*, p. 477.

This was abundant and very variable at Buenos Ayres, and was found as high as 9000 feet near Puente del Inca. I also took a single albino female on the Chilean side of the pass at about 9000 feet on December 18th. I cannot find that the species has been recorded previously west of the Andes, and I did not find it anywhere in Argentina along the frontier.

47. *Colias vauthieri.*
   C. vauthieri, Guérin, Voy. de la Coquille, Pl. XV, fig. 2 (1829).
   ♂ *C. rutilans*, Boisduval, Sp. Gen. Lep., p. 642, Pl. XIX, fig. 3 (1836).
   C. minuscula, Butler, Trans. Ent. Soc. Lond., 1881, p. 470, Pl. XXI, fig. 11.
   C. cunninghami, *id.*, *t. c.*, p. 471.

Very abundant everywhere in Chile and in Argentina along the frontier from sea-level up to 8000 feet and probably higher. Extremely variable in size and in the colour and markings of the female; of which, however, I have never seen an orange form. I could not see that climate had any influence on the species, those from the cold and windy plains about Lake Nahuelhuapi being as large and bright as those from the damp warm forest near Temuco.

The spring brood, however (*minuscula*, Butl.), which I did not find, is small, and has a narrower black border on both wings, and *Cunninghami*, Butl., is a narrow-winged southern form from Sandy Point.

48. ? *Colias euxanthe.*
   Colias euxanthe, Feld., Reise Nov. Lep., ii, p. 196 (1865).

I took what I believe to be this species in the Horcones Valley near Puente del Inca at about 10,000 feet on December 12th, but the specimens were unfortunately lost on the road when starting for Chile, and I have never been able to recover the bag which contained them. As it is a native of the mountains of Bolivia and Peru, there is nothing improbable in its extending southwards.

49. *Phulia nymphula.*

Pieris nymphula, Blanchard, *t. c.*, p. 14, Pl. I, fig. 3 *a*, *b*.

? *Phulia nymphea*, Staudinger, Iris, vii, p. 49 (1894).

Taken near Puente del Inca in the Horcones Valley at 10,000 feet on December 11th, and on the pass in February at 11,000 feet. Chilean specimens are somewhat larger than those in the British Museum taken in Bolivia by Sir M. Conway, and what Staudinger describes as *nymphea* seems inseparable.

50. *Tatochila autodice.* (Plate XII, figs. 1—4.)

♂ ♀ *Synchloe autodice*, Hübner, Samml. Ex. Schmett, ii, Pl. CXXVII, 1—4 (1816).

♀ *Pontia mercedis*, Eschscholtz, Kotzebue's Reise, iii, p. 215, Pl. IX, figs. 22 *a*, *b*—36 (1821).

var. ? *Pieris microdice*, Blanchard, *t. c.*, p. 14. (Plate XII, figs. 5, 6.)

I have had great difficulty in naming the Tatochilas I found in Chile on account of their variation, and because Blanchard has described three forms without figures which I cannot identify certainly.

The first is a well-known species which occurs all over Argentina and Chile, and is known as *autodice*, Hübn. This I took near Buenos Ayres. When I crossed the pass into Chile, I saw flying on the head of the valley at about 9000 feet a small silvery form, of which I have figured a ♂ on Plate XII, fig. 5. This had a rapid flight and appears to be distinct, and to be what Blanchard called *microdice*. I could not find the female here, but two months later found what I think is the same species fairly common at 4000 feet and upwards on the Argentine frontier near Lake Aluminé, and as far south as Lake Nahuelhuapi. Of these I have figured a female from Lake Quillen, fig. 2, one from Nahuelhuapi, fig. 6, and one from the Sierra de Pemehue, in Chile, fig. 1. A male from Pulmari is like the figure which Mabille calls *theodice* in Miss. Cap. Horn Lep., xi, fig. 2.

51. *Tatochila demodice.* (Plate XII, figs. 7 ♂, 8 ♀.)

? *Pieris demodice*, Blanchard, *t. c.*, p. 13.

Tatochila argyrodice, Staudinger, Hamb. Magal. Sammelreise Lep., p. 14, fig. 11 (1899).

? *Pieris theodice*, Boisduval, Voy. Astr. Lep., p. 51 (1832), ♀ dimorph. apud Staudinger, *l. c.*

This species was common at Baños de Cauquenes in December, in the Pemehue range in January, and down south as far as Nahuelhuapi in February, practically at all the localities where I found the last species. I have figured a pair from San Martin, Pl. XII, figs. 7 ♂, 8 ♀. What I take to be a form of the same species is found as far south as the Straits of Magellan, where it is known as *argyrodice*, Stgr. Of this I have figured a pair (Pl. XII, figs. 9 ♂, 10 ♀) taken by Walker at Punta Arenas. These are probably if not certainly the same as what Staudinger calls *theodice*, Bdv., of which he makes *demodice*, Blanch., a synonym, but a large series are necessary to understand the variation of this species.

52. *Tatochila theodice.*

Pieris theodice, Blanchard, *t. c.*, p. 12, Pl. I, fig. 1 *a*, *b*.
Tatochila blanchardii, Butler, Trans. Ent. Soc. Lond., 1881, p. 472, Pl. XXI, fig. 15.

Lastly we have a species which is perhaps a second brood of one or the other species usually identified with *theodice*, Blanch. (*nec* Bdv.) = *Blanchardii*, Butl.

This is easily distinguished by the double bar at the end of the cell, and extends from as far north as Islay in Peru to about lat. 38°, where I took it at San Ignacio in January. It seems to be common at Valparaiso, and is in Mr. Godman's collection from Valdivia. *Xanthodice*, Lucas, is another mountain species which is common in Ecuador and Bolivia, but has not been found in Chile, though Mabille figures under this name in the Miss. du Cap. Horn. Lep., Pl. I, fig. 1, a species which appears to me very near *argyrodice*, Stgr.

PAPILIONIDÆ.

53. *Papilio bias.*

P. bias, Roger, Bull. Soc. Linn. Bord., i (1826).

I saw this in the Botanical Gardens at Santiago, but not elsewhere, though Edmonds records it as common at Valparaiso in successive broods from October to June.

HESPERIIDÆ.

54. *Hesperia fusca.* (Plate XIII, figs. 1 ♂, 2 ♀.)

H. fusca, Reed, Mon. Marip. Chil., p. 81 (1877).

This was common near Lolco in one place at the confluence of the Lolco with the Biobio river at about 2500 feet. It seems a rare species, but I have a pair from Copiapo, and Reed says it occurs in the province of Valdivia. The male figured is from Lolco and the female from Copiapo.

55. *Hesperia americanus.*
Syrichthus americanus, Blanchard, *t. c.*, p. 44, Pl. III, fig. 10.

I took this at the Baths of Cauquenes and at Coronel, but it does not seem common anywhere.

56. *Hesperia fulvovittatus.*
Pyrgus fulvovittatus, Butler, Trans. Ent. Soc. Lond., 1881, p. 475.

This was described from a single specimen in Edmonds' collection, locality unknown. There are some from Callao collected by Walker in the British Museum collection which seem very close, and it may not be a Chilean species.

57. *Hesperia trisignatus.* (Plate XIII, figs. 3 ♂, 4 ♀.)
Scelothrix trisignatus, Mabille, Bull. Ent. Soc. Fr., 1875, p. ccxiv.
? *Hesperia notata*, var. *valdiviana*, Reed, *l. c.*, p. 81.

I took a single female at Quillota and another near Llai-llai on January 1st. Afterwards I found it abundant on a dry bushy plain below the Quillen lake in Argentina on February 2nd at about 3000 feet. Here it was flying about small bushes close to the ground. The male figured is from Quillen and the female from Quillota. There are specimens in the British Museum collection from Callao and Coquimbo taken by Walker.

A co-type of *valdiviana* in coll. British Museum looks like a variety of the same species but may be distinct.

58. *Hylephila fasciolata.* (Pl. XIII, fig 7 ♂.)
♂ *Hesperia fasciolata*, Blanchard, *t. c.*, p. 42, Pl. III, fig. 7.
♀ *H. signata*, id., *l. c.*

I am not sure that I took this myself, though I found a pair in one of my boxes without locality. It seems rarer than the next species, though Edmonds took it at Copiapo, Cauquenes, Valparaiso and Valdivia.

59. *Hylephila fulva.* (Plate XIII, figs. 5 ♂, 6 ♀, 8 ♀, var.)
Hesperia fulva, Blanchard, *t. c.*, p. 43, Pl. III, fig. 8.

I found this common in many places and have specimens from Coronel, Cauquenes, Llai-llai, San Ignacio and Lolco. The female from the Renaico Valley (fig. 8) belongs to the form mentioned by Butler as being larger and with more markings than the other. The originals of figs. 5 and 6 are from Lolco.

The species comes near *phylæus*, Drury, which has a very wide range in America and extends as far south as Buenos Ayres. A specimen from thence in the British Museum seems very near *fulva*. Both these species frequent grassy places in the open.

60. *Argopteron aureipennis.*
Syrichthus aureipennis, Blanchard, *t. c.*, p. 40, Pl. III, figs. 5 *a*, 5 *b* and 6.

I took this in the dense forest on the shores of Lake Lacar near San Martin on February 8th, where it settles on the bamboo and has exactly the same habits as the next species. On the under-side the male is like *puelmæ*, but the female has the fore-wing below much more like *fruticolens*. The white spots on the under-side shown in Gay's fig. 5 *b* are not in my specimens, and as Gay says, "sin mancha alguna," I presume this is an error of the artist. I think I also saw this species at Puerto Blest on Nahuel-huapi, and Edmonds found it at Valdivia.

61. *Argopteron puelmæ.* (Plate XIII, figs. 11 ♂, 12 ♀.)
Cyclopides puelmæ, Calvert, Ent. Mo. Mag., xxv, p. 34 (1888).

I found this beautiful species very abundant among the bamboo in the dense forest on the Pemehue range at 3000 to 4000 feet between Maitenes and Chilpa on January 26th. The flight is quite peculiar, and the insect settles on bamboo leaves and also the orange flowers of *Alstrœmeria aurantiaca* in the sunny openings of the forest. It seems to represent *aureipennis* in the north, but has a limited range.*

62. *Butleria fruticolens.* (Plate XIII, figs. 9 ♂, 10 ♀.)
Cyclopides fruticolens, Butler, Trans. Ent. Soc. Lond., 1881, p. 477, Pl. XXI, fig. 12.

* It seems impossible to reproduce by chromo-lithography the shining gold of the under-side which makes this such a conspicuous insect when flying.

Sterops tripunctatus, Mabille, C. R. Ent. Belg., xxxv, p. lxiv (1891).

I found this along the frontier at 3000 to 4000 feet in forest from the Pemehue range as far south as Puerto Blest. The female figured is from the latter locality and the male from Chilpa. It does not seem to vary in the mountains so much as on the coast, where Edmonds found it at Corral in March. Butler has described three varieties as *tractipennis*, *quadrinotatus* and *pulcher*, which differ in the number of spots on the upper-side and in other minor characters. In Mr. Godman's collection is a male from Chile marked "*tripunctatus* = type, Mab." This is described as coming from high mountains.

63. *Butleria philippii.*

Cyclopides philippii, Butler, *l. c.*, p. 479, Pl. XXI, fig. 13.

Very near the last but has an additional silver stripe on the hind-wings below which I have never found in *fruticolens*. I did not take this species, which occurs at Las Zonas in Valdivia.

64. ? *Butleria sotoi.*

Cyclopides sotoi, Reed, Mon. Mar. Chil., p. 86 (1877).

The only specimen of this in British Museum marked "type" seems distinct from either of the last by the yellowish colour at base of both wings below, and the presence of a spot on the hind-wing below. Reed took it in the hacienda of Cauquenes, but does not say at what elevation. I found a single worn specimen, which I believe is identical, in thick forest by the waterfall at Las Trancas, the last station below the Baths of Chillan, at about 4000 feet, on December 24th, but neither this nor the type are in good enough condition to figure.

65. *Butleria flavomaculatus.*

? *Syrichthus flavomaculatus*, Blanchard, *t. c.*, p. 44, Pl. III, fig. 9 *a*, *b*.

? *Butleria vicina*, Reed, *t. c.*, p. 88.

The next three or four species are nearly allied to each other, but I have not sufficient material to define them accurately, and their synonymy is doubtful.

What seems to agree best with Blanchard's plate is a small species which I took on the edge of the forest at Lake Quillen, and which is distinguished from the others by the spots of the under-side being yellow and not white or silvery. This is in Mr. Godman's collection from Staudinger as *paniscoides*, Blanch. The description of this is not sufficient in my opinion to identify it by, or to separate it from *flavomaculatus* on the material before me.

66. *Butleria valdivianus.* (Plate XIII, figs. 15 ♂, 16 ♀, 17 ♂.)
Syrichthus valdivianus, Philippi, Linn. Ent., xiv, p. 272 (1860).
? *Carterocephalus exornatus*, Felder, Reise Nov. Lep., p. 521, Pl. LXXIV, figs. 18, 19 (1867).
? *Butleria paniscoides*, Reed, *t. c.*, p. 82.

I found this species common both in the Pemehue range at about 3000 feet, and in the marshy places on the edge of the forest at Quillen, from which locality I figure a pair (figs. 15 and 16). The original of fig. 17 is from Lolco. It varies extremely in the spots of the hind-wing below, which, however, seem to me to distinguish it from the last species by their silvery white colour, and from the next by the irregularity of the marginal series, which are sometimes faint or absent. On the inner and costal margins of the hind-wing below, these spots often coalesce into a streak; as is also sometimes the case in the next species. *Exornatus* is described as from Valparaiso.

67. *Butleria polyspilus.* (Plate XIII, fig. 18 ♀.)
? *Carterocephalus polyspilus*, Felder, Verh. Z. B. Wien., xii, p. 495 (1862).

I identify this with great doubt. In Mr. Godman's collection there are three specimens named *C. exornatus*, Feld. I am not certain whether it is distinct from the last, but have found it in much more open grassy places, and took it in the valley of the Traful river in Argentine territory as well as at Quillen. The specimen figured is from the Traful Valley.

68. *Butleria bissexguttatus.* (Plate XIII, figs. 13 ♂, 14 ♀.)
? *Steropes* (sic) *bissexguttatus*, Philippi, Linn. Ent., xiv, p. 272 (1860).

I found this first in the forest at Temuco on January 3rd, and afterwards at several places in the Pemehue range and Argentina always in or close to the heavy forest. It is easily distinguished by the colour of the under-side from the allied species above. The specimens figured are from Chilpa.

69. *Thanaos funeralis.*
Nisoniades funeralis, Scudder and Burgess, Proc. Bost. Nat. Hist. Soc., xiii, p. 293, fig. 7 (1870).

Butler includes this on Edmonds' authority, but no locality is given for it, and I think the identification highly dubious. In the forest on the Pemehue range I am certain that I saw a Hesperiid belonging to this group, but did not succeed in taking it.

List of Chilean Butterflies showing their distribution and range.

		North.	Central.	South.	Elsewhere.
	Satyridæ.				
1	*Elina lefebvrei*, Guér.	...	× low	...	...
2	,, *vanessoides*, Blanch.	...	× low	...	...
3	,, *neomyrioides*, Blanch.	...	× middle	...	...
4	,, *calvertii*, n. s.	...	× middle	...	...
5	*Pedaliodes flora*, Phil.	...	× low	...	...
6	*Epinephele edmondsii*, Butl.	...	× middle	...	Argentina
7	,, *janirioides*, Blanch.	...	× low	...	...
8	,, *monachus*, Blanch.	...	× low and middle	...	...
9	,, *tristis*, Guér.	×	× low and middle	...	...
10	,, *coctei*, Guér.	...	× low and middle	...	...
11	*Neomœnas cœnonymphina*, Butl.	...	× low	...	...
12	,, *fractifascia*, Butl.	...	× middle	...	...
13	,, *servilia*, Wall.	...	× low	...	...
14	,, *wallengrenii*, Butl.	...	× middle	...	...
15	,, *inornata*, n. s.	...	× low	...	...
16	,, *edmondsii*, Butl.	...	× middle	...	...
17	,, *humilis*, Feld.	...	× low and middle	×	...
18	*Cosmosatyrus leptoneuroides*, Feld.	...	× middle	...	...
	,, var. *plumbeolus*, Butl.	...	× middle	...	...
19	,, *chiliensis*, Guér.	...	× low and middle	×	...
20	,, *monticolens*, Butl.	...	× middle	...	...
	,, var. *williamsianus*, Butl.	...	...	×	...
21	*Argyrophorus argenteus*, Blanch.	× ?	× middle	...	..
22	*Faunula stelligera*, Butl.	...	× middle	...	...
23	,, *leucoglene*, Feld.	...	× high	...	...
24	*Neosatyrus ambiorix*, Wall.	...	× low and middle	...	...
25	,, *simplex*, Butl.	...	× middle	...	...
26	,, *vesagus*, Doubl.	...	× low	×	...
27	,, *nycteropus*, Reed.	...	× low	...	...
28	,, *reedii*, Butl.	...	× low	...	...
29	*Tetraphlebia germainii*, Feld.	...	× middle	...	...

		North.	Central.	South.	Else-where.
	NYMPHALIDÆ.				
30	*Euptoieta hortensia*, Blanch.	...	× low	...	...
31	*Argynnis cytheris*, Drury	×	× low and middle	×	Falklands and Magellan
32	,, *lathonioides*, Blanch.	...	× middle and high	...	...
33	,, *modesta*, Blanch.	...	× high	...	...
34	*Pyrameis carye*, Hübn.	×	× low	...	...
35	,, *terpsichore*, Phil.	...	× low and middle	...	...
	LYCÆNIDÆ.				
36	*Scolitantides collina*, Phil.	...	× middle and high	...	...
37	,, *andina*, Calv.	...	× high	...	...
38	,, *chilensis*, Blanch.	...	× low	...	...
39	*Lampides trigemmatus*, Butl.	×	...	...	...
40	*Thecla bicolor*, Phil.	...	× middle ? high ?	...	...
41	,, *quadrimaculata*, Hew.	...	× low	...	...
42	*Strymon americensis*, Blanch.	...	× low	...	...
	PIERIDÆ.				
43	*Heliochroma leucothea*, Mol.	...	× low	...	...
44	*Terias chilensis*, Blanch.	...	× low	...	...
45	*Callidryas drya*, Fabr.	×	× low	...	...
46	*Colias lesbia*, Fabr.	...	× high ?	...	...
47	,, *vauthieri*, Guér.	×	× low and middle	×	...
48	,, ? *euxanthe*, Feld.	× ?	× high	...	Bolivia
49	*Phulia nymphula*, Blanch.	...	× high	...	do.
50	*Tatochila autodice*, Hübn.	...	× low and middle	...	Argentina
	,, var. ? *microdice*, Blanch.	...	× high	×	...
51	,, *demodice*, Blanch.	...	× low and middle	×	...
52	,, *theodice*, Blanch. (*nec* Bdv.)	×	× low	...	...
	PAPILIONIDÆ.				
53	*Papilio bias*, Roger	...	× low	...	...
	HESPERIIDÆ.				
54	*Hesperia fusca*, Reed.	×	× low and middle	...	...
55	,, *americanus*, Blanch.	...	× low	...	...
56	,, *fulvovittatus*, Butl.	× ?	× ?	...	...
57	,, *trisignatus*, Mab.	...	× low and middle	...	...
58	*Hylephila fasciolata*, Blanch.	...	× low	...	...
59	,, *fulva*, Blanch.	× ?	× low and middle	...	...
60	*Argopteron aureipennis*, Blanch.	...	× middle	...	...
61	,, *puelmæ*, Calv.	...	× middle	...	...
62	*Butleria fruticolens*, Butl.	...	× middle	...	...
63	,, *philippii*, Butl.	...	× low	...	...
64	,, *sotoi*, Reed.	...	× middle	...	...
65	,, *flavomaculatus*, Blanch.	...	× middle	...	...
66	,, *valdivianus*, Phil.	...	× low and middle	...	...
67	,, ? *polyspilus*, Feld.	...	× low and middle	...	...
68	,, *bissexguttatus*, Phil.	...	× low and middle	...	...
69	? *Thanaos funeralis*, Scudd.	...	× ?	...	...

Explanation of Plates XII—XV.

Plate XII.

Fig. 1.	*Tatochila autodice*,	♀,	Pemehue.
2.	,, ,,	♀,	Quillen.
3.	,, ,,	♂,	Cauquenes.
4.	,, ,,	♀,	,,
5.	,, *microdice*,	♂,	Above Juncal.
6.	,, ,,	♀,	Nahuelhuapi.
7.	,, *demodice*,	♂,	San Martin.
8.	,, ,,	♀,	,, ,,
9.	,, *argyrodice*,	♂,	Punta Arenas (Walker).
10.	,, ,,	♀,	,, ,,

Plate XIII.

Fig. 1.	*Hesperia fusca*,	♂,	Lolco.
2.	,, ,,	♀,	Copiapo.
3.	,, *trisignatus*,	♂,	Quillen.
4.	,, ,,	♀,	Quillota.
5.	*Hylephila fulva*,	♂,	Lolco.
6.	,, ,,	♀,	,,
7.	,, *fasciolata*,	♂,	Quillota or Cauquenes.
8.	,, *fulva*, var.?	♀,	Renaico.
9.	*Butleria fruticolens*,	♀,	Port Blest.
10.	,, ,,	♂,	Chilpa.
11.	*Argopteron puelmæ*,	♂,	,,
12.	,, ,,	♀,	,,
13.	*Butleria ? bissexguttatus*,	♂,	Quillen.
14.	,, ,,	♀,	,,
15.	,, *valdivianus*,	♂,	,,
16.	,, ,,	♀,	,,
17. ?	,, ,,	♂,	Lolco.
18.	,, *? polyspilus*,	♀,	Traful.

Plate XIV.

Fig. 1.	*Neomœnas ? inornata*, n. sp.,	♂,	Baños de Cauquenes.
2.	,, ,, ,,	♀,	,, ,, ,,
3.	*Elina calvertii*, n. sp.,	♂,	Baños de Chillan.
4.	,, ,, ,,	♀,	,, ,, ,,
5.	,, *neomyrioides*,	♂,	Chile Mus. Crowley.
6.	*Faunula leucoglene*,	♂,	Lolco Pass.
7.	*Neosatyrus nycteropus*,	♂,	Llai-llai.
8.	,, ,,	♀,	,,
9.	,, *vesagus*,	♂,	Baños de Chillan.
10.	,, ,,	♀,	,, ,, ,,

Plate XV.

Fig. 1.	*Faunula stelligera*,	♂,	Lolco.
2.	,, ,,	♀,	,,
3.	*Cosmosatyrus leptoneuroides*,	♂,	,,
4.	,, ,,	♀,	Aluminé.
6.	,, ,,	♀,	Villacura Valley.
5.	*Tetraphlebia germainii*,	♂,	Chillan Valley.
7.	*Cosmosatyrus monticolens*,	♂,	Pulmari.
8.	,, ,,	♀,	,,
9.	,, *chiliensis*, ? var.	♂,	Lake Nahuelhuapi.
10.	,, ,,	♀,	,, ,,

XVII. *On the genus* Theodosia *and other Eastern* Goliathides, *with descriptions of some new species.* By Oliver E. Janson, F.E.S.

[Read June 3rd, 1903.]

Theodosia, Thoms.

Westwoodia, Cast., *Helionica*, Thoms., *Atopocerus*, Kz.

This genus was established by Castelnau in 1873 under the name of *Westwoodia*, with *howitti*, Cast., as its type. His generic name being preoccupied, Thomson in 1880 substituted that of *Theodosia* and at the same time erected what he considered a distinct genus, *Helionica*, for the reception of the species *westwoodi*, Thoms.; the characters, however, that he relied upon to separate it from *Theodosia* are certainly not of generic value, and the two genera must therefore be merged into one. In 1888 Kraatz, evidently ignorant of the fact that Thomson had already eight years previously re-named the genus, published the name *Atopocerus* as a substitute for the preoccupied one of *Westwoodia*, his name therefore must also be sunk as a synonym.

The genus is very closely allied to *Phædimus*, Waterh., of which the type is *cumingi*, Waterh., and Bates has regarded them as generically inseparable, but this view has not been adopted by subsequent authors, and I certainly think they are sufficiently distinct to warrant separation; besides a very different general facies and some minor characters, in the male of all the *Theodosia* species the head is flat with the horn arising from the extreme front margin of the clypeus, the thorax has no distinct lateral margin on the anterior part to separate the upper and under surfaces, and the horn is formed as a prolongation of the exceedingly convex disk, the anterior tarsi are also slender and longer than the tibiæ, whereas in *Phædimus* the head is excavated and has the clypeus projecting beyond the base of the horn, the thorax is strongly and completely margined at the sides and with the horn arising from close to the anterior margin, and the anterior tarsi are stout and distinctly shorter than the tibiæ.

Considerable trouble has been experienced in the identification of the species of this genus largely owing to the confusion occasioned by Dr. Kraatz in using the preoccupied name *westwoodi*, and in giving distinctive names to slight variations and degrees of development. After a careful study of the rather large material I have had an opportunity of examining and the various descriptions, I am only able to adopt five out of the nine names that have been published, as representing distinct species, and these only, with the two new species now added, are included in the following tabulation which I have drawn up of their most prominent male characters. Female specimens are rarely received, and it is very difficult, or almost impossible, to decide with any amount of certainty to which species they pertain.

1. Cephalic horn acute at apex.		
A. Anterior tibiæ bare.		
a. Angles of clypeus strongly produced, spiniform . . .	*howitti*, Cast.	S. Borneo.
b. Angles of clypeus only slightly produced, obtuse.		
aa. Thoracic horn without prominences near apex.	*westwoodi*, Thoms.	N. Borneo.
bb. Thoracic horn with a small prominence on each side near apex . .	*magnifica*, Roths.	N. Borneo.
B. Anterior tibiæ densely pilose on inner side	*perakensis*, Moser.	Perak.
2. Cephalic horn bifid at apex.		
A. Anterior tibiæ densely pilose on inner side	*rothschildi*, Jans.	N. Borneo.
B. Anterior tibiæ bare.		
a. Thorax green, sub-opaque .	*telifer*, Bates.	N. Borneo.
b. Thorax brassy, very polished	*aurata*, Jans.	N. Borneo.

The other names that have been given in the genus are:—

T. westwoodi, Kz. This is evidently identical with *magnifica*, Roths., the latter name having priority. I think this species may perhaps prove to be merely a variety of *westwoodi*, Thoms., when we have an opportunity of examining a larger series.

H. waterstradti, Kz. This is the larger highly developed male form of *westwoodi*, Thoms., and should not bear a separate name.

H. denticornis, Kz. This is a slight variety of the same, and unworthy of a distinctive name.

H. viridicollis, Kz. This is described as a variety of *westwoodi*, Thoms., but is stated to have the angles of the clypeus acutely produced and to come from South Borneo, in which respects it agrees with *howitti*, Cast., and I think it is probably a small and lesser developed form of the male of this species.

Theodosia rothschildi, n. sp.

♂. Viridis, subnitida, elytris flavescentibus; capite cornu sat brevi, apice profunde bifido, supra igneo-cupreo; thorace cornu robusto, apice bifido, dilatato, igneo-cupreo; tibiis anterioribus intus dense flavo pilosis.

Long. (cornu excepto) 25 mm.

Mount Kina-balu, N. Borneo.

This species most nearly resembles *T. telifer*, Bates, but is to be at once distinguished from all the other known members of the genus, except *perakensis*, Moser, in having the inner-side of the anterior tibiæ densely clothed with fine pale yellow pubescence. The horn on the head is a little broader than in *telifer* and the thoracic horn is less flattened and more dilated at its apex, the sides of the thorax are a little more prominent in the middle, the scutellum is much broader at the base, as in *magnifica*, Roths., the elytra are broader and more rounded at the sides before the middle, and the mesosternal process is broader and more rounded at its apex. The sculpture is very similar to that of *telifer* except that the punctuation of the scutellum is very dense and confluent. The legs are deep green with the upper-side of the femora flavescent, otherwise the colour is similar to that of *telifer*. The length of the prothorax including the horn is 17 mm., the cephalic horn is 6 mm. in length.

T. perakensis, Moser (Berl. Ent. Zeit., 1902, p. 379), is the only other described species having pubescent anterior tibiæ, but in that species the cephalic horn is acute at the apex, not bifid as in *rothschildi*.

Theodosia aurata, n. sp.

♂. Aureo-viridi-flavescens, micans; capite igneo-cupreo, cornu brevi, apice bifido; thorace dorso subtilissime punctato, nitidissimo, cornu brevi, apice paullo emarginato, igneo-cupreo; scutellum magnum, basi latiusculum.

Long. (cornu excepto) 20 mm.

Mount Kina-balu, N. Borneo.

Most nearly allied to *T. telifer*, Bates, but differs in having the thorax shorter and much broader, especially across the middle, and more abruptly narrowed in front, the dorsal surface is very shining, being much less closely and more finely punctured, the horn is short, flattened and with a slight notch, but not dilated, at its apex, the scutellum is much broader at its base than in *telifer* and less strongly punctured, the elytra are also more feebly punctured and have the apical sutural angles strongly rounded. The colour is a rather golden yellow with a slight metallic greenish tint, the thorax is of a more brassy tint and very polished on the dorsal part, with the horn and median anterior part fiery coppery, whilst in *telifer* it is green and the entire surface sub-opaque by reason of the dense granulose punctuation. The head is coppery with the sides of the clypeus green and the horn greenish brassy and darker at its apex. The under-side is more strongly tinged with green and the legs are of the same colour as the elytra. The second and third abdominal segments are deeply impressed in the centre. The length of the cephalic horn is 4 mm., and of the prothorax, including the horn, 10 mm.

Mycteristes inermis, n. sp.

♂. Gracilis, fusco-olivaceus, opacus, parcius flavo-squamulosis; capite sub-nitido, inermi, clypeo apice medio anguste reflexo, rotundato; elytris planiusculis, sub-carinatis; subtus nitidus, viriditinctus, griseo-squamulosis. Long. 14 mm.

Mount Kina-balu, N. Borneo.

Narrow, elongate, above dull olivaceous brown with sparse appressed, yellowish, coarse, squamiform setæ. Under-side and legs red-brown, shining, and with a greenish or brassy tinge in places, more thickly clothed than the upper-side with finer and longer grey setæ, tibiæ coppery.

Head shining, coarsely punctured, a small slightly elevated smooth spot near the base, clypeus convex in the centre, the side margins elevated in front of the eyes, the apical margin narrowly reflexed and rounded in the centre. Thorax much narrower than the elytra, the basal two-thirds parallel-sided, then obliquely narrowed to the front, strongly but rather narrowly lobed behind, the basal angles right angles, the front margin slightly raised in the centre and green, the disk with a slight curved carina on each side, convergent in front, the elevated parts almost impunctate, the other parts with rather close coarse irregular semi-circular punctures. Scutellum large, depressed and smooth in the centre, a small group of coarse setiferous punctures near the apex and on each side at the base, the apex acute. Elytra depressed, narrowed behind, the apex slightly rounded with the sutural angles a little produced, a sinuous dorsal carina on each from the base to the apical tubercle, and a short outer one from the humeral tubercle to about the middle, these carinæ almost impunctate, the depressed portion between the dorsal carina and the suture, behind the middle, longitudinally strigose, the other parts with rather close coarse semi-circular punctures. Pygidium strongly and somewhat concentrically strigose. Under-side and legs coarsely punctured and strigose. Mesosternal process conoid, the apex rather acute. Abdomen with a strongly punctured central impression. Anterior tibiæ with two equidistant lateral teeth, posterior tibiæ strongly channelled, the inner-side fringed with long grey hair, the outer-side with a strong spinose tooth below the middle.

The absence of any form of cephalic or thoracic horn in the male at once separates this interesting species from all others hitherto described. It is most nearly allied to *khasiana*, Jordan, and *microphyllus*, Wood-Mason, but besides the absence of horns it differs from both species in many other points that I have given in the description. The female is unknown to me.

Cephalocosmus moewisi, Kraatz (Deuts. Ent. Zeit., 1895, p. 107), from the description, is evidently identical with *M. microphyllus*, Wood-Mason, this latter name having fourteen years' priority.

INGRISMA, Fairm.

Ann. Soc. Ent. Belge, 1893, p. 292.

This genus established only in a note, and omitted in the Zool. Record (though included in the recent 'Index Zoologicus'), has been generally overlooked; *rasuta*, Fairm., is the type and *cupreola*, Fairm., from the description would appear to be merely a colour variety of the female of the same species. *T. whiteheadi*, Waterh., has been since added, and besides the two additions I now make, the *Heterarrhina euryrrhina*, Gestro, and *Coryphocera* *tonkinensis*, Moser (Berl. Ent. Zeit., 1901, p. 525), must also be referred to this genus, but judging from the description the latter is apparently identical with *rasuta*, Fairm., in which case the genus would now comprise five species, all of which are known to me.

Ingrisma binghami, n. sp.

Cyanea vel viridis, nitida, coxis posticis marginibus pedibusque rufis, tarsis rufo-piceis, elytris striato-punctatis.

♂. clypeo elongato, medio constricto, apice valde dilatato, margine antico medio late reflexo ; tibiis anticis tenuoribus, lateribus inermibus. Long. 30 mm.

♀. clypeo piceo, apice leviter dilatato, rotundato ; tibiis anticis brevioribus, latioribus, lateribus apiceque valde dentatis. Long. 26 mm.

Tenasserim.

Deep purple blue, or green with a reddish-golden tint in certain lights, the sides of the head and thorax, the base of the pygidium and the abdomen slightly rufescent, the hind margin and exposed upper-side of the meta-coxæ, sides of the abdomen and the legs red, the femora tinged with blue or green, the knees, extreme apex of the tibiæ and the tarsi reddish piceous ; in the female the anterior part of the clypeus is also piceous. The whole of the upper surface and the abdomen have a very fine and dense punctuation, which is only discernible under a lens.

Head rugosely punctured, the base smooth, clypeus strongly constricted about the middle and very much dilated in front, the side margins strongly elevated and acute, strigose on the outer side, the apex broadly reflexed with the entire apical margin strongly and uniformly rounded. Thorax a little rounded at the sides and narrowed from the base, the basal margin distinctly emarginate above the scutellum and with the lateral angles rounded, finely and sparsely punctured on the disk and at the base, more strongly punctured towards the sides. Scutellum broad and triangular, remotely punctured. Elytra broader than the thorax at the base, the disk obsoletely bicostate and with rows of coarse semi-circular punctures, five of which are regular and continuate, the others being irregular, the sides more finely and irregularly punctured, and strigose towards the apex, the sutural angles almost right angles. Pygidium very finely and closely strigose, slightly impressed on each side near the apex. Beneath coarsely strigose at the sides : mesosternal process long, broad and flattened, obliquely divergent and slightly curved, its apex rounded ; anterior tibiæ slender and strigose, the outer edge without any indication of teeth, intermediate and posterior tibiæ fringed with golden hair, the latter with a slight sub-median tooth.

The female is smaller than the male, and altogether more strongly punctured, the clypeus is scarcely constricted and very much less dilated, with the side margins less elevated, the apex much less produced and more narrowly reflexed, the legs are shorter, the anterior tibiæ are very broad with a large obtuse sub-apical tooth and a strongly produced apex.

Allied to *euryrrhina*, Gestro, but larger than that species, and with the mesosternal process broader and more strongly divergent, the clypeus in both sexes is longer, more rugosely punctured, and with the side margins more strongly raised, in the male it is also much more dilated and broadly reflexed at the apex.

A pair of this fine species have been given to me by Col. C. T. Bingham, who took them on the flowers of *Ficus religiosa* in the Thaungyin Valley, Tenasserim, in August 1894. The male is of a beautiful purple blue colour and the female is green, but this difference is without doubt an individual variation, such as is seen in nearly all the green *Heterorrhinæ* and in other genera of this family.

Ingrisma femorata, n. sp.

♂. Elongata, convexa, viridis, nitida, coxis posticis extus tibiisque rufis, tarsis piceis; clypeo antice abrupte dilatato et medio profunde bi-foveolato, margine antico arcuato, reflexo, angulis lateralibus sub-acutis; elytris fere lævibus, lateribus transverse plicatis; pedibus anticis longioribus, femoribus dentatis, tibiis curvatis, intus tenuiter serratis. Long. 28 mm.

Korat, Siam.

Bright bluish, green, very shining, the exposed margin of the meta-coxæ and the tibiæ red, femora green changing to reddish on the upper parts in certain lights, knees, extreme apex of the tibiæ and the tarsi reddish piceous.

Head slightly convex in the centre between the eyes, the entire surface, except at the base, rather closely covered with minute black tubercles which become rather larger, and elongate in form, towards the front, clypeus nearly straight at the sides with the margin scarcely elevated, strongly and abruptly dilated just before the apex, and with two large deep foveæ in front separated by a slightly raised carina, the apical margin broadly reflexed and regularly arcuate with the lateral angles sub-acute and elevated. Thorax very convex, the sides regularly rounded and narrowed almost from the base, basal margin almost straight with a slight emargination above the scutellum and the lateral angles obtuse, the disk extremely finely and sparsely punctured, more coarsely so towards the sides. Scutellum large elongate-triangular, almost impunctate. Elytra without any trace of costæ, the surface a little uneven but impunctate with the exception of an almost obsolete sutural row on the basal part, the inclined lateral part transversely wrinkled in the middle and coarsely strigose behind, the sutural angles distinctly produced and obtuse. Pygidium coarsely and irregularly, but not closely, strigose. Beneath remotely strigose at the sides, the mesosternum punctured, and with some fine pale pubescence in front; mesosternal process long, obliquely divergent, narrow and slightly curved inwards towards the apex, which is obtuse. Anterior legs long, the femora very stout and furnished with two closely approximate teeth on the under-side about one-third from the apex, the tibiæ slender, curved and finely rugulose, slightly dilated and finely serrate on the inner-side from a little below the base, the outer side without any indication of teeth and the apex but slightly produced; intermediate and posterior tibiæ fringed with light brown hair, the latter with a very slight tooth a little below the middle.

The form of the clypeus, the very convex thorax strongly deflexed in front, the almost impunctate elytra and remarkable anterior legs are sufficient to at once distinguish this species from *T. binghami*, to which it is most nearly allied.

XVIII. *Experiments in* 1893, 1894, *and* 1896 *upon the colour-relation between lepidopterous larvæ and their surroundings, and especially the effect of lichen-covered bark upon* Odontopera bidentata, Gastropacha quercifolia, etc.

By EDWARD B. POULTON, D.Sc., M.A., LL.D. (Princeton), F.R.S., etc., Hope Professor of Zoology in the University of Oxford, Fellow of Jesus College, Oxford.

[Read June 3rd, 1903.]

PLATES XVI, XVII, AND XVIII.

THE circumstances under which the experiments recorded in the present memoir were undertaken, afford a good example of the stimulus and encouragement to work rendered possible by that mutual intercourse and exchange of experience and ideas which are promoted by meetings of scientific societies.

In the year 1892 I conducted an extensive series of experiments upon the adjustment of the colours of the larvæ of *Amphidasis betularia* to those of their environment (Trans. Ent. Soc. Lond., 1892, pp. 337–369). Living examples of the chief results obtained were shown at the meeting of Section D of the British Association at Edinburgh, on August 9th (Report of the 1892 Meeting, p. 786, where however the word "pupæ" is erroneously printed instead of "larvæ"). After the larvæ had been exhibited, Dr. Stacey Wilson, of Birmingham, asked if I had tried the effect of lichen-covered bark. Dr. Wilson stated that he had once beaten the larva from a food-plant with twigs covered by lichen, and that its appearance was entirely different from that usually borne by *betularia*. He looked upon it, in fact, as the larva of some other species, and was only convinced by breeding the moth (Trans. Ent. Soc. Lond., 1892, p. 360). The idea of making use of an environment of lichen-covered bark had not occurred to me, and I determined to try the experiment on this and other suitable larvæ on the first opportunity.

I propose to state the results of these experiments forthwith, referring to the plates which accompany the paper. Hence it will be possible to gather the conclusions by looking at the few first pages, while those who desire to study the evidence in detail will find it recorded in the later part of the memoir.

The first larva which appeared suitable for the purpose was *Odontopera bidentata*, and Mr. G. T. Porritt very kindly consented to look out for eggs. Mr. Porritt had himself suggested to me that the larva would probably prove to be especially suitable for the purpose of this enquiry, and he wrote on May 9th, "the larva varies so very much in a wild state according to its food, that I fancy it will form an interesting subject for your experiments." * On May 9th, 1893, he kindly sent me from Huddersfield a batch laid by a single female, and, on June 13th, a second consignment laid by two females, from Sledmere on the Yorkshire Wolds. The first set afforded the material of Experiments I to IX (including VA) described in this paper. The second mixed set formed the subject of Experiments X to XVIII. The chief results of both experiments will be gathered by a glance at Plate XVI, in which figs. 1 to 5 represent larvæ from the first set of eggs, figs. 6 to 11 larvæ from the second set. At the same time results like those shown in the former figures were produced in larvæ of the second set and like those in the latter figures, in larvæ of the first set.

The detailed account of the experiments shows the number of days which elapsed before the influence of each environment became visible, and the time which was necessary in order to produce the full effect. A very large number of records proves that the larvæ, in the great majority of cases, rested by day upon the object which

* Dr. T. A. Chapman wrote to me (June 14, 1903), concerning the forms and habits of *bidentata*:—"About forty years ago, I took three or four beautifully green latticed larvæ off the lichen-covered trunk of an old alder-tree in Glen Messen (Argyleshire). They were quite new to me, and though very like (of course) *bidentata*, I thought they must be something else, a lichen-feeder. When they produced *bidentata*, I got no further than wondering whether *bidentata* was sometimes a lichen-feeder. I remember well their resting-place was near the ground, many feet from any leaves,—as long a journey for feeding as the larva of *Aprilina* makes."

they afterwards came to resemble. This, however, is probably not the case in the earliest stages, when the larvæ doubtless rest on the leaves and stalks.

The extreme sensitiveness of this larva is clearly shown by a glance at Plate XVI. The four first figures indicate a power of adjustment about equal to that of the most sensitive larva hitherto known, *Amphidasis betularia* (compare Trans. Ent. Soc. Lond., 1892, Plate XIV). The effect of green leaves and shoots, shown in fig. 5, is however very inferior to that produced upon *betularia*, which becomes bright green in this environment. The effect of green leaves alone upon *bidentata* is the same as that observed in many other larvæ, Noctuæ as well as Geometræ, viz. the reduction of the brown ground-colour to a very pale tint which would be far less conspicuous than the more ordinary appearance. The contrast between the results of an effective environment of green, and nothing but green, as shown in fig. 5, and of green scattered over a brown background of bark, as shown in figs. 6 to 11, is very striking, and suggests renewed experiments with an artificial arrangement of combined colours. Another interesting fact, suggesting the restriction of larval susceptibility to the *immediate* surface upon which the resting periods are passed, is the entire absence of any effects traceable to the green leaves of the food-plant when present with the other forms of environment employed in these experiments. The complex nature of the result produced is well seen in the oblique white lateral marks which are found in larvæ with the green lichen-like patches (figs. 6, 9), and probably assist in the general effect by breaking up the larval surface. The green markings are developed in the vicinity of and include the projecting ridges, etc.—a fact which is of obvious significance in promoting the resemblance to small scattered masses of lichen. The various kinds of lichen made use of did not produce corresponding effects.* Thus the green dorsal patches shown on the larvæ which had been exposed to orange lichen (figs. 8, 9) did not differ in any marked degree from those in which a green lichen had been chosen. It is by no means

* My friend Professor S. H. Vines, F.R.S., has very kindly given me the probable names of the lichens made use of. They will be found in the detailed account of the experiments, and in the description of Plates XVI to XVIII. The names could not be given with certainty because the specimens themselves had been lost.

unlikely, however, that under entirely normal conditions special detailed adjustments of this kind may be brought about. With regard to the sensitiveness to lichen, *bidentata* appears to be as superior to *betularia*, as it is inferior to the latter larva in sensitiveness to green leaves, so that the two species may be considered about equal in the power of colour adjustment. It is interesting to observe that dark purplish-brown twigs with white spots, although producing lighter larvæ than those upon unspotted but otherwise similar twigs (compare figs. 4 and 3), did not lead to the appearance of white marks upon the larvæ (fig. 4).

Dr. Stacey Wilson's experience led me to try the same experiments with an environment of lichen in the case of *A. betularia*. My friend Mr. Arthur Sidgwick kindly gave me a small batch of eggs in the summer of 1893, and the fourteen young larvæ which hatched from them were subjected, together with *bidentata*, to this form of environment, in Experiments XII to XV. It will be seen however that eleven of the resulting larvæ were yellowish-green, two brownish-green, and one grey mottled with brown.

The same experiments produced the larvæ of *bidentata* of which typical examples are represented in Plate XVI, figs. 6—11. So far as any conclusion can be drawn from these four small experiments, *betularia* does not seem to be nearly so sensitive or so specialized to this form of environment as *bidentata*. At the same time lichen must have been the cause of the *betularia* larvæ, with one exception, becoming green; for ordinary bark tends strongly to the production of dark forms of this species, even in the presence of a great preponderance of green leaves (Trans. Ent. Soc. Lond., 1892, pp. 331, 332). It will be of interest to repeat these experiments upon a much larger scale, and to introduce the larvæ immediately after hatching; but it does not appear to be probable that this species often exhibits the kind of susceptibility to lichen observed by Dr. Wilson; for (1) it is remarkably sensitive to other surroundings almost throughout its life-history (see pp. 318—320), and (2) the four small experiments, conducted in 1893, do prove considerable sensitiveness to lichen although they did not lead to the production of lichen-like larvæ.

The fortunate discovery of a company of young larvæ of *Gastropacha quercifolia* by Mr. W. Holland, on July 22nd, 1893, enabled me to experiment on this interesting species, which is well known to present grey and lichen-like forms. The company, evidently the product of a single batch of eggs, was so numerous that I was able to start four experiments with fifteen larvæ in each, on July 28th. All were fed on hawthorn, the food-plant on which the larvæ had been found. This in three cases was intermixed with environments more or less harmonizing with known varieties of the larva—the rough black-barked twigs of the Turkish oak, bramble-stems of a rich reddish-brown colour, and sticks bearing an abundant growth of lichen (probably *Ramalina farinacea* in all cases). In the fourth case the larvæ were as far as possible restricted to the green leaves and youngest shoots of their food-plant. It was, however, impossible altogether to exclude shoots of greyish and reddish-brown shades, and these probably produced some effect.

At first the young larvæ rested chiefly on the food-plant, but soon preferred the bark of the older wood. The change took place simultaneously in each of the three sets containing dark bark and lichen, as will be seen by a glance at the following summary of Mr. Holland's careful notes:—

Dates.	I.		II.		III.	
	Food-plant.	Black bark.	Food-plant.	Lichen-covered bark.	Food-plant.	Reddish-brown bark.
Aug. 1.	12	3	14	1	14	1
Aug. 5.	4	11	3	12	5	7 *
Aug. 9.	3	12	1	14	1	13 †

* 3 on muslin roof. † 1 missing.

There is no reason to suppose that these effects were due to any gradual recovery from disturbance. The recently hatched larvæ were found at the tip of a young shoot on July 22nd, and it is probable that by August 5th the period had been reached when they begin to seek the older wood for the diurnal rest. After August 9th only single larvæ were found except upon the environments which had been provided, and it is probable that, under entirely natural conditions, larvæ of the same age would never be found upon the leaves or green shoots.

It is of interest to note that the larvæ never rested upon the lichen itself, but upon the bark of the sticks between the masses of lichen. This position is consistent with the larval appearance, which is that of bark partially grown over with lichen.

There can be little doubt that the larva is influenced by the colours of the environment from the time at which it first seeks the older wood, but a certain period is required before the effects become visible. A very obvious adjustment to the three forms of environment was recorded on August 14th—so obvious indeed that the first trace of a visible result might probably have been detected some few days earlier. The adjustment continued to become more complete right up to the beginning of hybernation. On Aug. 31st it was noted that the effects of the three environments had greatly increased. On Sept. 21st a careful comparison of all the larvæ was made upon a white paper background. It was then thought that the adjustment was as complete as it was likely to be before hybernation, and for many larvæ this conclusion was justified. In others however the effects continued to deepen right on into October, as will be seen in the complete account of the experiments. The latest changes probably took place after the larvæ had ceased to feed; indeed they had eaten very little for some time previous to October 3rd. The degree of cryptic adjustment to the three environments which had been reached by the beginning of hybernation can be seen by a glance at the upper part of Plate XVII, where examples of all the types of colouring are represented.

In arranging the larvæ for hybernation many of the environments were shifted, in order to test the existence of any larval susceptibility during this period; and, as no effects were visible when the larvæ were compared after the winter, these same surroundings were continued in each case, right up to the time when the nearly mature larvæ were sent to Lord Walsingham for preservation, in May. The results of various comparisons point to the conclusion that the larvæ of *G. quercifolia* are not susceptible to the colours of the environment after the beginning of hybernation. Thus Plate XVIII, fig. 1 represents a nearly mature larva, of which the appearance before hybernation is shown in either fig. 4 or fig. 9 on Plate XVII. The latter appearance was a response to an environment of lichen-covered sticks; but after October 16th these were replaced by black-barked twigs, which it is seen produced no effect at all. Again, Plate XVIII, fig. 2 represents a later stage of Plate XVII, fig. 6. Here too the resemblance between older and younger larvæ is very close, although the former had been subjected to the same black environment after October 16th. The negative result of a transfer experiment in the opposite direction is seen in Plate XVII, fig. 14, the representation of a larva which had been exposed to lichen-covered sticks after October 3rd. All the larvæ did not remain as uniform throughout their life-history as these three. Thus Plate XVIII, fig. 3 represents a nearly mature larva of which the appearance before hybernation is seen in Plate XVII, figs. 4 or 9. In this case the larva darkened considerably after the winter, although its environment had not been shifted, but consisted of lichen-covered sticks throughout.

It is probable that the power of adjustment to environment possessed in so marked a degree by this species is specially directed to protection during hybernation, when the food-plants are leafless, and when enemies are often pressed by hunger. But it is doubtless also of importance later on when the larva becomes so much larger and would on this account be far more conspicuous. It is probable, however, that the caterpillar does not wander from its food-plant, and that complete adjustment to the old wood before hybernation is an adequate defence in the following spring and summer. If this be correct there would be no advantage in a prolonged larval susceptibility.

The same relationship between susceptibility and the particular needs of each species is seen in the effect of an environment of green leaves and shoots upon *G. quercifolia*, *O. bidentata*, and *A. betularia*. The first-named probably invariably rests by day, except for a brief period after leaving the egg, upon the older wood, and the power of adjustment to leaves and young shoots, being altogether useless to it, has never been acquired. The last-named, with its remarkable range of food-plants, including many, such as broom or rose, in which green shoots are a prominent feature, is frequently in a position in which a green colour would best conceal its nearly smooth and cylindrical form; and we find that, as a matter of fact, it always responds in this way to an environment of the kind described above. *Bidentata* doubtless occupies an intermediate position between the other two species in this respect. The occasions are probably rare, but not altogether wanting, in which it is compelled to develop in a green environment. We find that it has the power of making some considerable approach towards such surroundings, but not of attaining any high degree of resemblance to them. It is probably the case, however, that the tint which it produces on green leaves and shoots is of great value on a pale yellowish-brown bark, which may often form its environment; and it may well be that it is something in common between the light reflected from this and from green leaves which explains the similarity in the effects produced upon the larvæ.

Typical examples of all the forms of *quercifolia* larvæ produced in these experiments were shown alive at the meeting of the Entomological Society of London on May 2nd, 1894, and also at the Soirée of the Royal Society in the same month. A brief account of the exhibit is printed in the Proc. Ent. Soc. Lond., 1894, p. xvi. It is also referred to in Mr. C. G. Barrett's "Lepidoptera of the British Islands" (Lond., 1896, vol. iii, p. 45).

The nearly mature larvæ of *quercifolia*, forming the subject of the experiments described in this memoir, were in almost every case sent to Lord Walsingham, and, with the exception of one which was spoilt, were kindly preserved by him. The specimens are now to be seen in the Hope Department, Oxford University Museum, and in the British Museum of Natural History.

The last series of experiments described in this paper grew out of the surprising restriction of susceptibility to the younger stages of *G. quercifolia.* The results naturally suggested further experiments upon other species well known to be highly sensitive, and I immediately fixed upon *Amphidasis betularia* as the most suitable for the purpose. The investigation was carried out entirely by the present writer, in the laboratory at Wykeham House, Oxford. The results are clearly shown in the accompanying diagram and summary. The Roman figures represent the corresponding stages of larval life. The shaded squares indicate stages passed in a black environment, the unshaded, stages passed in the green surroundings.

Experiment.	I.	II.	III.	IV.	V.	VI.	Colour of mature larvæ.
B							5 green, 1 intermediate.
B^3							1 dark smoky-black. 1 greenish-brown (intermediate). 1 greyish smoky-black.
B^2							9 black (1 dark brownish, 3 with dull greyish patches). 1 grey.
B^1							4 black.
C^1							5 black (overspread with grey). 1 brownish-black.
C							6 dark (with grey patches). 3 intermediate.
A							3 dark (respectively overspread with grey, greenish on sides, and with pale yellowish spots). 1 green (with brown dorsal line and lateral patches).
A^2							2 black. 2 dark overspread with grey. 1 bright green.
A^1							2 green, sprinkled with grey, 1 greenish intermediate. 1 whitish, 2 blackish with grey markings. 1 distinct but dull green with brown broad dorsal line and slight lateral traces.

A glance at the diagram and results proves conclusively that there is no restriction of susceptibility to the younger stages of this species. Experiment B^3 shows the strong influence of a black environment applied only to the two latest stages, while A^1 shows considerable effects traceable to black which was present in the 2nd stage only. When we furthermore take into account the more intense effects which were produced as additional stages were exposed to a dark environment, we may feel confident that every stage except the 1st and the 5th *or* 6th, is sensitive. These require further experimental testing.

A very interesting and unlooked-for effect was produced in many of the transferred larvæ, viz. an overspreading greyness or the appearance of grey patches. Thus, although the effect of the earlier surroundings appeared at first sight to be entirely obliterated, the larvæ were nevertheless unable to develop their full and characteristic response to the later environment. Details will be found in the account of the experiments. It only remains to point out that experiment A^1 probably indicates that these larvæ are susceptible to the colours of the branches at a period when they are at any rate chiefly to be found upon the leaves and leaf-stalks, and that there was some evidence to show that the influence of environment may be largely a question of time, so that of several larvæ passing the same stages in given surroundings, those which grow most slowly are, on the whole, the most affected.

First Experiments with Larvæ of O. bidentata (1893).

The larvæ from the first set of eggs sent by Mr. Porritt from Yorkshire hatched at about the same time, so that nearly all the experiments recorded on pages 322—325 in a tabular form were started on the same day, May 22nd. The observations were in part conducted by Mr. Holland and in part by me, as is indicated by the initials or name under the dates in the left-hand column of the table. Hence in the account of each experiment there is the opportunity of comparing two independent sets of observations.

The food-plant made use of in all these experiments was the black poplar (*Populus nigra*).

A careful comparison of the results of the 10 sets of experiments (viz. I to IX, including VA) was made by the present writer on July 6th, 1893, all the larvæ being placed on a background of white. At this time all except one were in the last stages, and many in all the cylinders were approaching maturity. Of the forms of environment made use of, 7 had produced dark larvæ, and 3 light.

A. DARK LARVÆ OF BIDENTATA ON JULY 6TH.

I. *Black sticks.*—Fourteen out of the 15 larvæ were very black, the exception being quite small and probably in the 3rd stage. These larvæ were the darkest of all the sets.

II. *Deep blue paper spills.*—These 12 larvæ were very dark, coming next to those upon the black twigs in this respect. The dark purplish-black colour was also very uniform over the whole larval surface corresponding to the unvarying tints of the environment.

III. *Purplish-brown twigs.*—These 15 larvæ were *slightly* more variegated than II, in correspondence with the less uniform darkness of their environment. Except for this slight introduction of rather lighter shades these larvæ were as dark as II.

IV. *White spotted purplish-brown twigs.*—These 16 larvæ were dark, but distinctly lighter than those of the three previous sets. They also varied a little, whereas the groups first described were more uniform. Although the relative lightness and the darkness of these larvæ, as compared with III, corresponded to the *general* effect of their respective environments, there was no marked resemblance to the special details of the twigs which had been carefully selected for Experiment IV.

V. *Brown twigs.*—The 17 larvæ were distinctly brown and not nearly so black or purplish as the preceding sets. The shade of brown varied, being much lighter in the smaller larvæ. The brown larval surface was also somewhat variegated with different shades of the same colour.

VA. *Bark overspread with a bright yellowish-green powdery lichen.*—The 18 larvæ varied very greatly, some being as dark as the blackest of set I; many were variegated with shades of brown, harmonizing well with the environment; for the lichen soon lost its green tint and became various shades of brown. This is the only note relating to this experiment which has been found. There is no doubt that the young larvæ were introduced on May 22nd or 23rd.

VI. *Lichen-covered sticks.*—The lichen was probably dead and had become much paler. These larvæ too were much lighter than any of the previous sets, although a few were quite dark. Nearly all were light brown and much variegated with shades of brown, harmonizing well with the environment.

Of the 7 sets of larvæ described above, the degrees of

Dates in 1893.	I. Black twigs of Turkish oak.	II. Deep blue paper spills.	III. Dark purplish-brown glossy twigs probably of birch.	IV. White-spotted purplish-brown twigs of birch.
May 22. (E. B. P.)	15 Young larvæ introduced.	(May 23.) 15 young larvæ introduced.	15 larvæ introduced (just hatched).	16 young larvæ introduced.
June 11. (E. B. P.)	(June 9.) Re-fed.	12 larvæ counted; becoming very dark.	(June 16). All 15 dark like the twigs, but not markedly purplish.	15 counted.
June 19. (E. B. P.)	(June 17.) All 15 very black like the twigs.	All 12 very dark.	All 15 on twigs, very dark and purplish.	12 larvæ on twigs, 4 on green. All dark, but greyer than those in III, and not so dark as latter.
June 25. (E. B. P.)	(June 22.) As before. All at rest on twigs.	As before. All on spills.		
July 1. (E. B. P.)	As before: all on twigs.		(June 27.) All 15 dark brown.	(June 27.) Re-fed.
July 6. Careful comparison on white paper. (E. B. P.)	2 at rest on green, 13 on twigs. All very black.	9 on spills, 1 on green, 2 not noted. All 12 of a uniform dark purplish-black.	All 15 on twigs. All very dark.	13 on twigs, 3 on green. Dark, but much lighter and less constant than III.
July 10. (W. Holland.)	2 at rest on green, 13 on twigs. All very black.	8 on spills, 4 on green. All very dark.	14 on twigs, 1 on green. All dark purplish-brown.	15 on twigs, 1 on green. The larvæ remain lighter in tint than III.
July 12. (W. Holland.)	15 on twigs.	9 on spills, 3 on green.	13 on twigs, 2 on green.	13 on twigs, 3 on leaves.

V. Reddish-brown twigs.	VI. Lichen-covered sticks.	VII. Weathered pale grey barkless twigs.	VIII. Green leaves and shoots of food-plant (*Populus nigra*).	IX. Orange paper spills.
17 young larvæ introduced.	14 young larvæ introduced.	(June 3.) 15 young larvæ introduced.	15 young larvæ introduced.	15 young larvæ introduced.
All 17 evidently becoming brown like the twigs.	(June 9.) Re-fed.	Apparently becoming light brownish and approaching colour of twigs.	All 15 *very* pale brown	
Brown like the twigs.	14 larvæ; variable, with no marked resemblance to lichen.	(June 18.) 13 on twigs, 1 on muslin roof, 1 on green. All closely resemble twigs.	(June 17.) All 15 very pale brown, some faintly greenish.	6 on spills, 1 on muslin roof, 8 on green. All very light brown.
As before. 14 on twigs, 2 on green, 1 uncertain.	10 on sticks, 4 on green. Some distinctly variegated light and dark brown, but no green marks yet.	(June 22.) 10 on twigs, 1 on muslin, 3 on green.	(June 22). As before.	14 on spills, 1 on green. Colour as before.
All 17 on twigs. They become much lighter when changing skin.	9 on sticks, 5 on green. Larvæ still very variegated.	13 on twigs, 1 on green.		
17 on twigs. Distinctly brown, and not purplish like III and IV.	12 on sticks, 2 on green. A few dark but mostly light and variegated with shades of brown.	All 14 light grey and harmonizing perfectly with twigs.	14 larvæ. All very light brown, but not greenish.	All 15 on spills. Larvæ resemble VIII, only not *quite* so light.
16 on twigs, 1 on green. All brown as before.	12 on sticks, 2 on green. Two larvæ variegated with dark green: the rest as before, but darker brown.	10 on twigs, 4 on green. 1 larva injured. Appearance as before.		11 on spills, 4 on green. Very light yellowish-brown.
16 on twigs, 1 on green.	13 on sticks, 1 on green. 4 larvæ with dark green patches, strongly developed in 2 of them.	11 on twigs, 2 on green.		12 on spills, 3 on green.

Dates in 1893.	I. Black twigs of Turkish oak.	II. Deep blue paper spills.	III. Dark purplish-brown glossy twigs probably of birch.	IV. White-spotted purplish-brown twigs of birch.
July 15. (W. Holland.)	15 on twigs. All very black.	10 on spills, 2 on green. All very dark.	14 on twigs, 1 on green. All very dark purplish-brown.	12 on twigs, 4 on green. Colour darkish brown but distinctly paler than III.
July 18. (W. Holland.)	As before.	As before.	As before.	As before.
July 23. (W. Holland.)	As before.	Some mature and spinning up.	As before.	As before.
July 27. Careful comparison (E. B. P.)	Some pupating. All black, but one has *very* faint traces of green on sides anteriorly. These larvæ blacker and less purple than those with blue spills (II).	6 larvæ remain, nearly mature. All *very* dark purplish, almost black, as on many previous occasions.	All a very uniform dark purplish-brown, almost black, but not so much so as those with the blue spills.	All dark greyish-brown and very uniform.
July 28. (W. Holland.)	8 larvæ still feeding. All on twigs.	5 still feeding. 4 on spills, 1 on leaf.	9 still feeding: all on twigs. (July 30.) A typical larva painted; shown in Plate XVI, fig. 3.	12 still feeding: all on twigs. (July 30.) A typical larva painted; shown in Plate XVI, fig. 4.
Aug. 3. (W. Holland.)	(July 31.) A typical larva painted; shown in Plate XVI, fig. 1. (Aug. 4.) Re-fed.		5 still feeding. 4 on twigs, 1 on green.	6 feeding. All on twigs.
(Aug. 8. W. Holland.)	Re-fed. One or two still feeding.		As before. All 5 on twigs.	5 feeding: all on twigs. Colour as before. (Aug. 19.) 3 still feeding.

V. Reddish-brown twigs.	VI. Lichen-covered sticks.	VII. Weathered pale grey barkless twigs.	VIII. Green leaves and shoots of food-plant (*Populus nigra*).	IX. Orange paper spills.
10 on twigs, 7 on green. All brown like twigs.	10 on sticks, 4 on green. 6 with green patches, very marked in 2.	12 on twigs, 1 on green. All very pale and extremely like twigs.		11 on spills, 4 on green. All pale yellowish-brown.
As before.	As before. Some larvæ mature.	As before.		As before.
Some larvæ mature.	Others mature.	As before.		Some larvæ mature.
Some larvæ have become of a much darker brown lately. The change probably due to maturity.	3 or 4 with green patches, 3 or 4 with brown.	All now much darker, but still like the darker twigs in the cylinder. Some mature.	Larvæ very light brown, like IX.	Very light brown, like VIII.
10 still feeding. 8 on twigs, 2 on green.	7 feeding. All on sticks.	10 feeding; all on twigs. A typical larva was painted; shown on Plate XVI, fig. 2.	(July 31.) A typical larva painted; shown on Plate XVI, fig. 5.	7 feeding, all on spills.
4 feeding. All on twigs.	2 feeding.	6 on twigs, 1 on green.	6 feeding. All pale brown.	5 feeding. 4 on spills, 1 on muslin.
(Aug. 19.) 1 still feeding.	(Aug. 18.) All pupated.	7 still feeding. (Aug. 19.) 2 still feeding.	5 feeding, 1 dead. (Aug. 19.) 5 feeding; all very pale brown. 4 feeding on Aug. 26, and 1 or more on Aug. 31.	As before. All 5 on spills. (Aug. 20.) All pupated.

darkness follow in the same order as that in which the results are recorded, except that V and VA were much alike, the brown differing in tint rather than in depth. VI were much lighter than any of the others.

B. Light larvæ of bidentata on July 6th.

VII. *Weathered grey barkless twigs.*—The larvæ were very light; of a distinct grey colour, harmonizing perfectly with the environment.

VIII. *Green leaves and shoots of food-plant.*—The 14 larvæ were all *very* light brown but not at all greenish.

IX. *Orange paper spills.*—The 15 larvæ closely resembled VIII, but were not quite so light.

Some of the results of this comparison have been incorporated in the tabular statement. Another careful comparison was made on July 27th, but in this case it was possible to include the whole in the table.

Second Experiments with Larvæ of O. bidentata. Experiments with Lichen on Larvæ of A. betularia (1893).

In sending the second mixed set of eggs of *bidentata*, Mr. Porritt wrote on June 13th, 1893—"I certainly had no expectation of seeing any more *Odontopera bidentata* this season. However, when collecting on Saturday, at Sledmere, in a high wood on the Yorkshire Wolds, I found several! Two of the females have deposited a few eggs, which I forward at once with this. Sledmere is on the chalk, and *bidentata* there is quite of a different type to our West Riding moth, being of the pale, ochreous banded, distinctly southern form."

The eggs were placed in a single cylinder, and as soon as a sufficient number of larvæ had hatched, I started Experiments X to XV, between June 27th and July 3rd, the 14 larvæ of *A. betularia* received from Mr. Arthur Sidgwick being divided between Experiments XII to XV. Experiments XVI to XVIII were started on August 3rd by Mr. Holland, with the latest larvæ of *bidentata*. All the observations on Experiments X to XVIII recorded in the tabular statement on pages 328—331 were made by Mr. Holland. The food-plant used throughout was *Populus nigra*. When flat pieces of bark were introduced (XII, XIII, XIV, as well as VA in the first series of experiments), they were tied together in pairs with the lichen-covered surfaces outwards.

EXPERIMENTS XVI, XVII, AND XVIII WITH THE LARVÆ OF O. BIDENTATA UPON GREEN LEAVES AND SHOOTS OF THE FOOD-PLANT (*Populus nigra*).

The results of these experiments were uniform, and require so little description that a tabular form of presentation is unnecessary.

Experiments XVI (10 young larvæ), XVII (17 larvæ), and XVIII (14 larvæ) were begun by Mr. Holland on August 3rd, 1893. He recorded that the larvæ of XVI were pale brown, 2 of them rather variegated; while of XVII, 14 were pale brown and 3 rather variegated. Of XVIII no record was made. The larvæ were the last hatched from the mixed batch of eggs which supplied the material for Experiments X to XV.

August 8th. All re-fed. Sixteen larvæ in XVII.

August 12th. XVI and XVIII re-fed; the latter noted as nearly all pale brown, a few rather variegated.

August 15th and *19th.* XVI and XVIII re-fed; larvæ 10 and 14 respectively.

August 17th. XVII re-fed; 16 larvæ.

August 21st. XVII re-fed; 8 larvæ had escaped. The 10 larvæ in XVI were all of a pale brown colour.

August 22nd. XVIII, 13 larvæ pale brown, 1 darker with a few green markings.

August 26th and *31st.* All re-fed; larvæ 10, 8, and 14 respectively.

September 5th. XVI, becoming mature (2 still feeding on 9th and 13th; no further notes on this set). XVII, 7 larvæ, all pale brown. XVIII, 14 larvæ.

September 8th. XVII, 2 mature (all mature on 13th). XVIII, 1 mature, 1 dead. Of 12 still feeding, 10 pale brown, 2 rather darker brown. Two out of the 12 slightly tinged with green.

September 13th. XVIII, 6 still feeding. On the 18th they were neither pupating nor feeding, and on the 23rd the last died. It appears possible that there was a tendency towards hybernation on the part of the larvæ with the slowest rate of growth.

Dates in 1893.	X. Dark purplish-brown glossy twigs, probably of birch.	XI. Reddish-brown twigs.	XII. Bark covered with bright yellowish-green powdery lichen, the colour of which faded and left the dark bark.
June 27.	(July 2.) 13 small larvæ introduced, mostly in 2nd stage.	(July 3.) 20 larvæ introduced, at beginning of second stage. The smallest about 5·5 mm. long, and none much longer.	3 *betularia*, smaller than in XIII and XV, introduced. 15 *bidentata*, similar to those introduced in XIII.
July 12.	Half of the larvæ becoming purplish.	20 counted. A few becoming reddish-brown.	3 *betularia*, pale yellowish-green. 15 *bidentata* variegated.
July 15.	Re-fed.	Re-fed. 20 counted.	Re-fed. 3 and 15 counted.
July 18.	9 on twigs, 4 on green.	10 on twigs, 8 on green. Larvæ becoming dark reddish-brown and variegated.	2 *betularia*, mature. 14 *bidentata*, all darkish, variegated.
July 23.	(July 24.) 12 on twigs, 1 on green. Almost all dark.	15 on twigs, 1 on green, 1 on muslin. As before.	Last *betularia* mature. 10 *bidentata* on bark, 1 on green, 3 on muslin. All variegated brown, slightly touched with green and with white dashes along sides.
July 28.	12 on twigs, 1 on green. 10 dark brown, variegated; 3 paler and less variegated.	(July 27.) 12 on twigs, 4 on green, 1 on muslin. 8 changed skin and of a more uniform brown colour.	13, all on bark (as also on Aug. 1). About half darker, but all still variegated. All except 2 with more or less green.
Aug. 3.	11 on twigs, 2 on green. 11 dark brown and more uniform than before, 2 rather paler. One or two have patches of pale green.	(July 31.) 14 on twigs, 1 on green. 8 brown like the twigs; 4 paler and less uniform; 3 variegated and patched with green. (Aug. 4.) 12 on twigs, 2 on green, 1 on muslin. As before.	12 on bark, 1 on muslin. As before, but have become darker. This is the darkest set of Experiments XII to XV.

XIII. Bark covered with bluish-green lichen, probably *Physcia pulverulenta.*	XIV. Bark covered with orange lichen, probably *Physcia parietina*, combined with *P. pulverulenta.*	XV. Lichen-covered sticks. The lichen probably *Ramalina farinacea.*
3 *betularia*, about 12 mm. long, introduced. 12 *bidentata*, about 6 mm. long, introduced, mostly changing skin.	(June 25.) 4 *betularia*, about 7 mm. long, introduced. 1 changing first or second skin, others rather larger. 8 *bidentata*, about 6 mm. long, introduced.	4 *betularia* and 10 *bidentata* introduced. Both similar to those in XIII.
2 *betularia* yellowish-green, 1 brownish-green. 10 *bidentata* much variegated.	3 *betularia* pale yellowish-green, 1 grey mottled with brown. 2 much smaller than others. *Bidentata* rather pale, variegated.	3 *betularia* yellowish-green, 1 dark brownish-green. *Bidentata* mottled.
Re-fed. 3 and 10 counted.	2 yellowish-green *betularia* still feeding.	4 and 10 counted, *Betularia* as before.
Betularia, all mature. 9 *bidentata* much variegated.	All *betularia* mature. 4 *bidentata* on bark, 3 on green. All brightly variegated.	3 *betularia* mature, 1 escaped. 10 *bidentata* dark, mottled; some green on sides.
8 on bark, 1 on green. 2 seemed unhealthy. All much variegated with pale brown and green. Small white dashes on sides.	4 on bark, 3 on green. All brightly variegated with shades of brown, and patched with green.	(July 24.) 8 on sticks, 1 on green, 1 on muslin. Nearly all patched with green.
7 on bark, 1 on green. Colours as before. Typical larvæ painted, Aug. 1st and 3rd, shown in Plate XVI, figs. 6 and 7.	6 on bark, 1 on green. As before.	10 on sticks. 6 darkish brown mottled with green and paler brown: white dashes on sides. 3 similar but paler. 1 without green.
8 on bark. 1 unhealthy. 6 brown, lighter than in XII, brightly mottled with paler brown and green. 1 paler, less variegated, with little green. 1 small and pale, without green. White lateral dashes only on former 6.	7 on bark. All changed skin. 1 blackish-brown, 4 darkish brown, 2 lighter brown; all variegated with much green, and the darker ones also with paler brown. All with lateral white dashes.	7 brown, more or less patched with green, some very strongly. 1 grey and brown strongly patched with pale green. 2 pale brown with little green. Most show white lateral dashes.

Dates in 1893.	X. Dark purplish-brown glossy twigs, probably of birch.	XI. Reddish-brown twigs.	XII. Bark covered with bright yellowish-green powdery lichen, the colour of which faded and left the dark bark.
Aug. 8.	9 on twigs, 4 on green. All dark brown, some with a little green.	(Aug. 7.) 14 on twigs, 1 on green.	10 on bark, 3 on green. 10 of a rich dark brown patched with lighter brown and green: 3 lighter brown variegated with still paler brown and green. All but one of these paler larvæ with little white dashes on sides. The green marks less pronounced than in XIII and XIV.
Aug. 12.	(Aug. 10.) 11 on twigs, 2 on green. 11 purplish-brown, 2 rather paler. Several larvæ with green patches on sides.	(Aug. 10.) 13 on twigs, 2 on green. All brown, mostly rather darker than twigs, but 4 rather paler. Several patched with green.	10 on bark, 2 on green, 1 on muslin.
Aug. 15.	12 on twigs, 1 on green. As before.	12 on twigs, 3 on green. As before.	(Aug. 14.) 10 on bark, 2 on green. All but 2 very dark brown, with far less green than XIII and XIV.
Aug. 19.	10 on twigs, 2 on green. Purplish-brown, several with a little green. 2 rather paler brown.	10 on twigs, 5 on green. All brown, several patched with green.	12 larvæ, as before.
Aug. 21.	8 on twigs, 4 on green. 10 purplish-brown, 2 brown. Only 1 or 2 slightly marked with green.	(Aug. 22.) 12 on twigs, 3 on green. All brown, 8 resembling twigs, 2 rather darker, 2 rather lighter.	(Aug. 22.) 9 on bark, 3 on green.
Aug. 26.	(Aug. 25.) 12 on sticks.	Re-fed.	10 on bark, 2 dead.
Aug. 30.	9 on sticks, 2 on green. 1 mature.	2 mature, and 2 more on Aug. 31.	6 on bark, 4 on green. The colour of the lichen had faded, and left the dark bark.
Sept. 5.	Mostly mature. 2 feeding Sept. 8. All mature Sept. 13.	(Sept. 4.) Nearly all mature. Only 1 feeding Sept. 9.	(Sept. 4.) Larvæ becoming mature. A few still feeding Sept. 9 and 13.

XIII. Bark covered with bluish-green lichen, probably *Physcia pulverulenta.*	XIV. Bark covered with orange lichen, probably *Physcia parietina,* combined with *P. pulverulenta.*	XV. Lichen-covered sticks. The lichen probably *Ramalina farinacea.*
5 on bark, 2 on green. As before.	7 on bark. As before. Typical larvæ painted Aug. 4 and 5, shown in Plate XVI, figs. 8 and 9.	10 on sticks. As before.
(Aug. 14.) 7 on bark. As before, except that smallest larva now marked with green.		(Aug. 10.) A typical larva painted, shown in Plate XVI, fig. 10.
	(Aug. 14.) 7 on bark. Lighter and greyer ground-colour. Green patches very marked.	(Aug. 14.) 10 on sticks. 8 grey-brown mottled with darker brown and much green, so that some are half green; 2 similar but browner.
7 on bark. Brown, variegated with paler brown and with green (strongly 5, less strongly 2).	5 on bark, 2 on green. Colour as before.	10 on sticks. Colour as before.
6 on bark, 1 on green. Colour as before.	6 on bark. All variegated greyish-brown, strongly patched with green. White lateral dashes.	10 on sticks. As before.
(Aug. 25.) 6 on bark, 1 on green.	(Aug. 25.) 6 on bark.	(Aug. 25.) 9 on twigs, 1 on floor.
2 mature. A typical larva painted Aug. 31, shown in Plate XVI, fig. 11.	6 on bark. Colour as on Aug. 21.	Larvæ becoming mature.
(Sept. 4.) All mature.	All mature except one. Last mature Sept. 8.	All mature.

Experiments upon the Larvæ of Gastropacha quercifolia (1893–4).

On July 22nd, 1893, Mr. W. Holland found a company of young larvæ of this species crowded together towards the end of a shoot of hawthorn near Steeple Aston, Oxfordshire. They were all the same size, and had evidently not long before hatched from a single batch of eggs. Thus was afforded the opportunity of trying another set of experiments upon a larva which is known sometimes to assume a lichen-like appearance. Furthermore, there was the additional interest of testing larval susceptibility to environment before, during, and after hybernation. The food-plant employed throughout was hawthorn. The present writer is responsible for the starting of the experiments, the arrangements for hybernation, and the comparison of larvæ on September 21st, October 3rd to November 3rd, March 26th, April 27th, May 7th and 25th. The other records were chiefly made by Mr. W. Holland, in much less part by the present writer.

I. *G. quercifolia.*

July 28th, 1893. Fifteen larvæ of *quercifolia* placed with intensely black twigs of the Turkish oak (*Quercus cerris*), intermixed with their food-plant, hawthorn. They were re-fed and examined on the following dates.

August 1st. Twelve larvæ on the green leaves and shoots, 3 on the black twigs. All blackish-grey in colour.

August 5th. Four larvæ on the leaves and shoots, 11 on the black twigs.

August 9th. Three larvæ on the leaves and shoots, 12 on the black twigs.

August 14th. Fifteen larvæ counted; all on the black twigs. The colours were black and white with a little grey.

August 19th. All 15 larvæ on black twigs.

August 22nd. All 15 larvæ on black twigs.

August 31st. All 15 larvæ on black twigs. The larvæ were now much blacker, but white markings were still present.

September 4th. Fifteen counted.

September 7th. Fifteen larvæ on black twigs.

September 9th. Fifteen larvæ on black twigs.

September 14*th.* Fifteen larvæ on black twigs, 2 blackish, 13 black with white markings.

September 16*th.* Fifteen larvæ on black twigs.

September 18*th.* Fifteen counted.

September 21*st.* Fourteen larvæ on twigs, and 1 little one on leaf. The larvæ were re-fed on September 26th and 30th.

II. *G. quercifolia.*

July 28*th*, 1893. Fifteen larvæ of *quercifolia* placed with sticks profusely covered with lichen (probably *Ramalina farinacea* was employed thoughout) intermixed with their food-plant, hawthorn. They were re-fed and examined on the following dates.

August 1*st.* One larva on lichen-covered stick; all the others on leaves and leaf-stalks. All blackish-grey in colour.

August 5*th.* Twelve larvæ on lichen-covered sticks; 3 on food-plant.

August 9*th.* Fourteen larvæ on lichen-covered sticks; 1 on food-plant.

August 14*th.* Fourteen larvæ on lichen-covered sticks. Colours black with white and grey markings; the latter larger than on the larvæ of the other experiments.

August 19*th.* Thirteen larvæ on sticks; 1 on food-plant.

August 22*nd.* Thirteen larvæ on sticks.

August 26*th.* Thirteen larvæ on sticks.

August 31*st.* Thirteen larvæ on sticks. The white and grey markings had now developed to a much greater extent.

September 4*th.* Thirteen larvæ on sticks.

September 9*th.* Thirteen larvæ on sticks.

September 14*th.* Twelve larvæ on sticks Colours white and grey and black, except in the case of 2 larvæ without any black.

September 16*th.* Twelve larvæ counted.

September 18*th.* Twelve larvæ on sticks.

September 21*st.* Nine larvæ on sticks; 3 on the twigs of hawthorn. At this time of the year it was almost impossible to get a sufficient quantity of the green shoots of the hawthorn, so that darker twigs were sometimes included, and upon these the larvæ occasionally rested. The larvæ never rested upon the lichen itself, but on the surface of the bark between the masses.

The 12 larvæ were re-fed on September 26th and 30th, and on October 3rd and 7th.

III. *G. quercifolia.*

July 28th, 1893. Fifteen of the *quercifolia* placed with red-brown stems of the bramble, intermixed with their food-plant, hawthorn. They were re-fed and examined on the following dates.

August 1st. Only 1 resting on bramble stem, others on leaf-stalks. Blackish-grey in colour.

August 5th. Seven on stems, 5 on green parts of food-plant, 3 on gauze top of cylinder.

August 9th. Thirteen on stems, 1 on green parts of food-plant, 1 missing.

August 14th. Fourteen on stems. Some black with white markings, some grey and some mottled reddish-brown.

August 19th. Fourteen on stems.

August 22nd. One missing, all on stems.

August 26th. Thirteen counted.

August 31st. Thirteen on stems. All were now grey-brown with black and white markings.

September 4th. Thirteen on stems.

September 7th. Thirteen on stems.

September 9th. Thirteen on stems.

September 14th. The colours were now as follows:—1 brown and grey with white markings, 2 brown with white markings, 3 brown with various shades of grey, 3 grey and brown with white markings, 2 grey with white markings and brown patches, 2 dark grey with white markings.

September 16th. Thirteen counted.

September 18th. Thirteen on stems.

September 21st. Twelve on stems; 1 on hawthorn twig.

They were also re-fed on September 26th, 30th, October 3rd and 7th.

IV. *G. quercifolia.*

July 28th, 1893. Fifteen larvæ of *quercifolia* placed with green leaves and shoots of the hawthorn. They were re-fed and examined on the following dates.

August 4th. Fifteen counted. Blackish-grey in colour.

August 8th. Fifteen counted.

August 14*th.* Fifteen counted. Rather variable in colour, but somewhat greyer than at first.

August 19*th.* Fifteen counted.

August 22*nd.* Fifteen counted.

August 26*th.* Fourteen counted.

September 1*st.* Fourteen counted.

September 5*th.* Fourteen counted.

September 9*th.* Fourteen counted.

September 13*th.* Fourteen counted. Colour variable: 3 black and white; 9 grey and black-and-white; 2 grey and brown-and-white.

September 16*th.* Fourteen counted.

September 18*th.* Fourteen counted.

September 21*st.* Fourteen counted. All on the shoots of the hawthorn.

September 26*th.* Fourteen counted.

October 3*rd.* Fourteen counted.

October 7*th.* Fourteen counted.

October 18*th.* Fourteen counted. Colour unchanged, but rather darker than when last noted. Arranged for hybernation in two muslin bags on the hawthorn tree described on p. 337: one bag containing the 7 darkest, the other the 7 lightest.

First General Comparison (September 21st), all the quercifolia Larvæ being placed upon a uniform background of white paper.

I. *G. quercifolia.*

As regards the larvæ with black twigs of Turkish oak, it should be noted that the moisture in the glass cylinders had encouraged the growth of small whitish spots of mould upon the dark bark, and it is possible that some effect may have been produced by their presence in the environment.

Of the 15 larvæ, 6 were remarkable for the very slight development of light markings upon the intense black ground-colour: in one larva indeed the light markings were altogether wanting. The remaining 9 larvæ were black, chequered with white markings, which were however far less developed than in the former group which had been with lichen-covered sticks. The ground-colour of these 15 larvæ differed strongly from that of all the others in its deep black shade.

Two of the 6 caterpillars described above, including the uniformly dark one, were selected for painting, together with a representative of the 9 chequered larvæ. The larva without white markings was painted by Mr. Bayzand on September 23rd, and is shown on Plate XVII, fig. 2; the one with minute white markings on September 26th (Plate XVII, fig. 3), and the chequered larva on September 25th (Plate XVII, fig. 1).

II. *G. quercifolia.*

By far the most marked result was seen in the 12 larvæ with an environment of lichen-covered sticks. Not one of the 12 could be mistaken for any larva of the other groups. In the case of 4 larvæ the effects were especially marked, these being of a light colour over nearly the whole of the exposed surface, the black ground-colour quite replaced by a pale brownish tint in one and by grey in the others. The 8 remaining larvæ closely resembled each other, being dark chequered with white; but the ground-colour, although dark, was not black like that of the larvæ with Turkish oak (I), while the white markings possessed a greyish tinge in one larva and a bluish in another.

The 4 larvæ first mentioned were separated from the others for painting at this date, together with the one in which the markings were bluish-white, and another representative of the commonest type of appearance, viz. a dark ground-colour with white markings.

III. *G. quercifolia.*

The ground-colour of all the larvæ with brown bramble-stems was very dusky and brownish. Five of them had a distinct brown patch on each side of the 2nd abdominal segment, partially extending on to the 1st, and another patch on the dorsal surface of the 5th abdominal. The dorsal hump on the 8th abdominal, and in some larvæ the area surrounding its base, were also brown. In the remaining larvæ the light markings were more generally greyish than white, and were often evanescent. Of the first-named 5 larvæ only one had the light markings well developed, and this was selected for painting together with another in which these markings were almost absent. The remaining larvæ were similarly represented by the larva with the white markings best developed and the one in which they were feeblest.

IV. *G. quercifolia.*

The larvæ with green leaves and shoots were very varied, showing tendencies in the direction of all the other groups, but chiefly resembling the chequered black-and-white larvæ with the black twigs of Turkish oak, although the ground-colour was not nearly so dark. A few tended towards the greater development of the light markings which was characteristic of the group with the lichen-covered sticks, while all of them approached the larvæ with the brown stems in the dusky tint of the dark ground-colour. There was no reason for painting any of these larvæ.

Arrangements for Hybernation and final Comparison of the quercifolia larvæ before Hybernation.

I. *G. quercifolia.*

October 3rd. Larvæ with black twigs. It was evident that the larvæ were ready to hybernate. They had eaten very little, and some of them were spinning a foot-hold. The size was that shown on Plate XVII, figs. 1 to 3. A great change had taken place since the last comparison on September 21st: only 3 larvæ instead of 9 were now chequered black-and-white, 6 having become nearly as dark as 5 out of the 6 darkest members of the group. The white patches of the chequered individual painted on September 25th were now far duller and less conspicuous. The larvæ of this and all the other series were specially arranged so as to test for the existence of any susceptibility to the colours of the environment during hybernation. All were enclosed in muslin sleeves upon a large hawthorn tree, with pink double flowers, in the garden of Wykeham House, Oxford. It should be noted that the branches enclosed in the sleeves were very dark, although not so intense a black as the twigs of the Turkish oak.

A. The 3 chequered black-and-white larvæ were enclosed with an abundance of black twigs of Turkish oak.

B. The 5 darkest were similarly placed with lichen-covered twigs.

C. Six dark larvæ, but not quite so dark as the last lot, were similarly enclosed with black twigs.

II. *G. quercifolia.*

October 16*th*. Larvæ with lichen-covered sticks. Many of these larvæ had also undergone considerable changes since September 21st; so much so indeed in certain cases, that two of the examples set aside for painting had to be changed for others which better represented the appearance borne by the former when they were selected. Of the 4 lightest larvæ on September 21st only one remained greyish (painted October 2nd, shown in Plate XVII, fig. 6); 2 were now of a brownish tinge (painted October 3rd, fig. 4, and October 7th, fig. 9, Plate XVII); while the 4th had become so much darker that another brownish larva was substituted for painting (painted October 6th, fig. 5, Plate XVII). The latter was not, however, as light as any of the other 3 set aside on Sept. 21st. Of the other 2 darker larvæ previously selected for painting, the one with bluish-white spots had altered, and another more like its former appearance was substituted (painted October 9th, Fig. 8, Plate XVII). The remaining 6 dark, white-marked unpainted larvæ had not changed, except that the white marks upon two of them had become smaller and less conspicuous.

These 6 larvæ, with the dark, white-marked one which was painted on October 10th, and is shown on Plate XVII, fig. 7, were divided into two groups for hybernation.

D. Four dark, white-marked larvæ, including the darkest larva of all the 7 with the smallest white spots, were enclosed with lichen-covered sticks.

E. Three dark, white-marked larvæ, including the darkest larva but one of all the 7, were enclosed with black twigs of the Turkish oak.

The 3 lightest larvæ were thus treated.

F. One larva was enclosed with lichen-covered sticks (Plate XVII, figs. 4 or 9).

G. Two larvæ, including the greyish one (Plate XVII, fig. 6), were enclosed with black twigs. The other larva is represented in Plate XVII, figs. 4 or 9.

H. The two remaining larvæ which had been substituted for painting, viz. the brownish larva (Plate XVII, fig. 5), and the dark one with bluish-white marks (Plate XVII, fig. 8), were enclosed with lichen-covered sticks.

III. *G. quercifolia.*

November 3*rd*. The larvæ with brown bramble-stems were compared and arranged for hybernation. The larvæ were more distinctly brown and more uniformly so than when last compared. The brown patches on three parts of the surface of certain larvæ, viz. the 2nd, 5th, and 8th abdominal segments, were still evident and more distinct than ever. On some individuals they had increased in size. In only a single larva were the light patches at all large and conspicuous. Seven larvæ were very uniform in appearance—dark brown with light brown patches generally present. The remaining 4 larvæ were also dark brown, but 1 was distinctly marked with white, 2 less distinctly marked with brownish-white, while the dorsal surface of 1 was overspread with grey. The latter larva was painted on October 17th (Plate XVII, fig. 12). One of the brownish-white-marked larvæ was painted on October 13th (Plate XVII, fig. 10); and 2 of the 7 first described were painted on September 30th (Plate XVII, fig. 11) and October 16th (Plate XVII, fig. 13).

This group of larvæ was arranged for hybernation as follows:—

I. Four of the 7 uniform larvæ were enclosed with lichen-covered sticks.

J. The remaining 3 were enclosed with black twigs.

K. The 4 more spotted or lighter larvæ were enclosed with brown stems.

First General Comparison after hybernation, March 26th, 1894.

The weather was very warm on March 25th and 26th, and the buds of the hawthorn were well out.

I. The 14 quercifolia larvæ on black twigs before hybernation.

A. *The* 3 *chequered larvæ with black twigs.*—All three larvæ were quite healthy, and freely moved about when disturbed. Two were at rest on the black twigs, 1 was walking about, probably disturbed by the examination. They had eaten many of the buds, and one had changed its skin probably since hybernation: the old skin was found in the muslin bag.

B. *The* 5 *darkest larvæ with lichen-covered sticks.*—All the larvæ were in the same healthy and vigorous condition as those just described, and had eaten the buds of the hawthorn. Every trace of the winter torpor had disappeared, and they moved freely when touched. The larvæ were uniformly dark brown, and quite unaffected by the presence of the lichen. Four were resting on a branch of the hawthorn, while one was on the muslin.

C. *The* 6 *dark larvæ with black twigs.*—Three were dead and dried up, 2 in the bag and 1 still fixed to a branch of the hawthorn. Of the living larvæ, 2 were fixed to the muslin and 1 to a branch. One larva appeared to be unhealthy. One had changed its skin, and the hawthorn-buds had been eaten. All the larvæ, including the dead ones, were uniformly dark.

It was clear from this comparison that no change had been wrought by the winter surroundings.

II. THE 12 QUERCIFOLIA LARVÆ WITH LICHEN-COVERED STICKS BEFORE HYBERNATION.

D. *The* 4 *dark, white-marked larvæ, including the darkest of the* 12, *with lichen-covered sticks.*—These larvæ had evidently eaten, and were healthy and easily disturbed. Three were on branches of the hawthorn, and 1 on a lichen-covered stick, but all had left their silken foot-holds. All retained the appearance they possessed before hybernation: the contrast between dark ground-colour and light markings was weakest in the larva on the lichen-covered stick.

E. *The* 3 *dark, white-marked larvæ, including the darkest but* 1 *of the* 12, *with black twigs.*—All 3 larvæ were on the hawthorn branch, and were in the same condition as the above-described set (D). One was resting on a silken foot-hold, but this was probably accidental, as there was no trace of torpidity. All possessed the lichen-like appearance borne before hybernation.

F. *One of the* 3 *lightest larvæ, with lichen-covered sticks.*—The larva was resting on the muslin. It was doubtful whether anything had been eaten, but the larva readily moved on disturbance, and was not resting upon a foot-hold. It still remained one of the three lightest larvæ, and had not undergone any change during hybernation.

G. *Two of the* 3 *lightest larvæ, with black twigs.*—Both larvæ were healthy and irritable; they had evidently eaten. One was resting on the hawthorn branch and 1 on a black twig. They still remained very light, like that described above (F), and were quite unaffected by their dark surroundings during hybernation.

H. *The* 2 *larvæ—the brownish one and that with bluish-white spots—with lichen-covered sticks.*—It is improbable that anything had been eaten, and these larvæ did not appear to have emerged from hybernation. The one with bluish-grey marks was upon a lichen-covered stick: it was shrunken, and it appeared doubtful whether it would survive. The other was still attached to its foot-hold on the hawthorn branch, and had evidently not moved during the winter. It was very lichen-like, and entirely unchanged by its winter environment.

III. THE 11 QUERCIFOLIA LARVÆ WITH BROWN BRAMBLE-STEMS BEFORE HYBERNATION.

I. *Four of* 7 *uniformly brown larvæ, with lichen-covered sticks.*—All were healthy and had eaten freely: 3 were on the hawthorn branch, 1 on the muslin. All were distinctly brown.

J. *Three of* 7 *uniformly brown larvæ, with black twigs.*—One larva was dead, while 2 healthy ones had evidently eaten. Both were on the black twigs, and possessed the same dark brownish ground-colour with brown patches as the 4 last-mentioned larvæ (I).

K. *The* 4 *most distinctly spotted or lightest larvæ, with brown stems.*—One larva was dead, while 3 healthy ones had evidently eaten. All 3 were on the hawthorn-branch. This set still included the most distinctly white-spotted individuals of the whole 11. It was evident that no change occurred during hybernation.

IV. THE 14 QUERCIFOLIA LARVÆ UPON GREEN LEAVES AND SHOOTS OF THE HAWTHORN.

L. *Seven larvæ enclosed in a muslin bag containing a branch of the hawthorn.*—One larva was dead, 3 were on the branch, 2 on the muslin, while 1 became detached in removing the bag. All had left their foot-holds, with the doubtful exception of one on the branch. All 6 were healthy and irritable, and most of them had evidently fed;

in fact one of those on the branch was eating when the examination was made. The larvæ were on the whole darkish but very variable.

M. *Seven larvæ arranged as in the last set* (L). One larva was dead, 2 were on the branch, and 4 were on the muslin. All had left their foot-holds and were healthy and irritable. They had evidently eaten. Their appearance was similar to that of the set last described.

A complete history of the larvæ of each set, I to IV, subsequent to hybernation, will now be given, followed by an account of the careful comparisons of the whole which were made from time to time, all the larvæ being then placed on a uniform background of white paper.

I. THE QUERCIFOLIA LARVÆ ON BLACK TWIGS BEFORE HYBERNATION.

A. *The 3 chequered black-and-white quercifolia larvæ on black twigs throughout.*

April 7th.—Re-fed. Three black larvæ with small white patches. Unchanged when re-fed on the 10th: all on twigs.

April 16th.—Re-fed. Two larvæ on twigs, 1 on hawthorn: appearance unchanged, as also when re-fed on 20th, 23rd, 27th, and May 3rd: all larvæ invariably resting on the twigs.

May 7th.—Re-fed. One larva unaltered, while 2 had changed skin, and the white markings had become less bright. In one of these the old skin was still adherent anteriorly. This larva was removed to cylinder C (p. 344). The other older darker larva was sent to Lord Walsingham on May 11th.

May 11th.—Re-fed. The single remaining larva was at rest on twig: it was still black with white markings, and was unaltered when re-fed on the 17th, 22nd, and 25th, its position on the twig being noted on the two former dates. It was sent to Lord Walsingham on May 31st.

B. *The five darkest quercifolia larvæ with lichen-covered sticks during and after hybernation.*

April 7th. Re-fed. All 5 larvæ black, 3 of them with white spots.

April 10th. Re-fed. Four larvæ on sticks. Appearance unchanged.

April 16th. Re-fed. Four on sticks, 1 on hawthorn. Only 1 larva was now entirely black, the remaining 4 had acquired large white patches. Two larvæ, including the first-mentioned, were removed to cylinder B[1].

April 20th. Re-fed. All 3 on sticks, appearance unchanged and on sticks, as also when re-fed on the 23rd.

April 27th. Re-fed. Two on sticks, 1 on hawthorn. It was noted that in one of the larvæ the white marks were less developed than in the others.

May 1st. Re-fed. The last-mentioned larva had changed skin and the white markings were reduced to a single anterior pair and were quite small. The 2 others remained as before, and no further change was seen when the 3 larvæ were re-fed on the 3rd, 11th, 17th, 21st, and 25th. They were noted as at rest on the sticks on all these dates, except the first and last. The darkest larva was painted by Mr. Bayzand on May 19th, and is shown in Plate XVII, fig. 14. Of the two others, the one with the more intensely black ground-colour was painted by him on the 22nd, and is shown in fig. 15 of the same plate. Both these figured larvæ were sent to Lord Walsingham on May 25th, and the third was sent on May 31st.

B[1]. *The two quercifolia larvæ separated from cylinder* B *on April 16th.*

April 16th. The larvæ were respectively entirely black, and black with white patches.

April 20th. Re-fed. Both on sticks, colour unchanged. Similar results were noted when re-fed on the 23rd and 27th.

May 1st. Both larvæ had apparently changed skin. The darker one had gained a pair of small white marks anteriorly. On May 5th the larvæ were brought back from London. No further change.

May 11th. Re-fed. The black-and-white larva was sent to Lord Walsingham. The single dark larva, on stick; appearance unchanged. Similar notes on the 17th, 22nd, and 25th, except that it rested on the hawthorn on the first-named date, and its position was not recorded on the last-named. The larva was sent to Lord Walsingham on May 31st.

C. *Three dark quercifolia larvæ* (*out of* 6) *on black twigs throughout.*

April 7th. Re-fed. Two larvæ dead. The third at rest on twig; black. When re-fed on the 10th it was on twig and unchanged.

April 16th. Re-fed. At rest on twig. It had changed skin and was black with a few whitish spots. When re-fed on the 21st, 23rd, 27th, and May 3rd it was unchanged, and on each occasion resting on a twig.

May 7th. Re-fed. At rest on twig; unchanged. A rather darker larva from cylinder A was added. Part of the skin of the previous stage was adhering to the anterior part. When re-fed on the 11th, 17th, 21st and 25th, these larvæ were unchanged in appearance. Upon all dates except the last it was noticed that they were both upon twigs. Both larvæ were sent to Lord Walsingham on May 31st.

II. THE QUERCIFOLIA LARVÆ ON LICHEN-COVERED STICKS BEFORE HYBERNATION.

D. *Four dark, white-marked quercifolia larvæ, including the darkest of* II, *on lichen-covered sticks throughout.*

April 7th. Re-fed. Four larvæ, of which one appeared to be unhealthy. All were darkish with large white patches.

April 10th. Re-fed. One larva had died, 3 upon sticks. Two had changed skin, 1 remaining unaltered, the other with a further extension of the white patches.

April 16th. Re-fed. Two larvæ upon sticks, 1 upon hawthorn. All were dark with large white patches, and 1 larva was very small.

April 21st. Re-fed. The 2 larger larvæ on sticks, the small one on hawthorn. The former dark grey and pale greyish-brown respectively; both with very large white patches. The small larva was brownish-grey with pale marks. When re-fed on the 23rd all were on sticks and unchanged, as also on the 26th, except that the small larva was on the hawthorn.

May 3rd. Re-fed. The pale greyish-brown larva had changed skin and was now a darker blackish-brown, with large pale markings. The other larvæ were unaltered.

May 11th. Re-fed. Two on sticks, the third, the large dark grey larva, having been sent to Lord Walsingham on this date. The remaining large larva was dark brown with large yellowish markings; the small larva had changed its skin and was bluish-grey. The larvæ were re-fed on the 17th and 22nd, when they were on sticks and unchanged in appearance. The larger larva appeared to be unhealthy on the 22nd and died on the 23rd.

May 15th. Re-fed. The colour of the small larva was unchanged, as also on June 1st and 7th. It continued to grow slowly without further change, and finally spun up on July 28th.

E. *Three dark, white-marked quercifolia larvæ, including the darkest but one in* II, *on black twigs during and after hybernation.*

April 7th. Re-fed.

April 10th. Re-fed. All 3 larvæ on twigs. Two larvæ had changed skin, but the appearance of all 3 remained the same, viz. black with very conspicuous white markings. They were unchanged and at rest on the twigs when re-fed on the 16th, 21st and 23rd.

April 26th. Re-fed. All on twigs. The dark colour of the larvæ appeared to have become more distinctly grey—dark grey in two cases, grey in the third. As before, the dark shade was combined with white markings.

May 2nd. One dark grey and white larva had changed skin and was blackish and white.

May 11th. Re-fed. The largest larva with a rather darker ground-colour than others was sent to Lord Walsingham. The 2 remaining larvæ on twigs; both blackish and white. Re-fed again on the 17th, when they were on the twigs and unchanged. The smaller larva did not seem healthy and had not grown like the other. The larger larva, the darkest of all in set II, was painted on May 17th, and is represented in Plate XVIII, fig. 4.

May 22nd. Re-fed. Two larvæ on twigs. The appearance unchanged, but neither looked healthy. The larger larva died on the 25th and the smaller on June 1st.

F. *One light quercifolia larva on lichen-covered sticks throughout.*

April 7th. Re-fed. White and pale grey.

April 10th. Re-fed. On stick. The larva had changed its skin, and had become white with markings of two shades of brown. It was re-fed on April 16th, 21st (markings of two shades of pale brown), and 23rd, and was always found on sticks with appearance unchanged.

April 26th. Re-fed. On stick. The larva was now white with grey and brownish markings. On May 3rd it was re-fed, the appearance being unchanged.

May 7th. The larva had changed skin; the white parts had become yellower. It was re-fed on May 11th, 17th, and 22nd, and was noted as at rest on stick on the 11th and 22nd. It remained to the end of a yellowish-white with markings of grey and brown.

May 25th. The larva was painted by Mr. Bayzand and is shown in Plate XVIII, fig. 3. It was sent to Lord Walsingham on the same date.

G. *Two light quercifolia larvæ on black twigs during and after hybernation.*

April 7th. Re-fed. Both lichen-like.

April 10th. Re-fed. Both at rest on twigs. One had changed skin, and the greyish markings had become rather darker. Both were at rest on twigs with appearance unchanged when they were re-fed on the 16th.

April 21st. Re-fed. Both on twigs. One larva was white with pale grey markings, the other creamy-white with markings of a brownish-grey. Unchanged and on twigs when re-fed on the 23rd.

April 26th. Re-fed. Both on twigs. The white colour of the larva first mentioned on the 21st had gained a faint bluish tinge. The other larva unchanged.

May 5th. Re-fed, after having been brought back from London. The creamy-white larva had changed skin and was rather paler in tint. Both were on twigs and unchanged when re-fed on the 11th. The creamy-white larva was painted by Mr. Bayzand on the 14th, and is shown in Plate XVIII, fig. 1.

May 17th. Re-fed. Both on twigs. One larva large and pale creamy-white with greyish-brown markings. The other much smaller, white with bluish-grey markings, but with tints duller than they were formerly. It had not grown much, nor changed its skin. Both larvæ were unchanged in appearnce, and were resting on twigs when they were re-fed on the 22nd. The creamy larva was sent to Lord Walsingham on May 25th. The smaller bluish-grey larva was painted on May 28th, and is shown in Plate XVIII, fig. 2. It was sent to Lord Walsingham on May 31st.

II. *The brownish quercifolia larva and the larva with bluish-white marks on lichen-covered sticks throughout.*

April 7*th*. Re-fed. One larva dead; the other grey and white. The larva was re-fed on the 10th, 16th, 20th, 23rd, 26th, and on May 3rd. Its appearance remained unchanged. On all these dates except the last it was noted that the larva was at rest on the sticks. On May 5th it was dead.

III. THE QUERCIFOLIA LARVÆ ON BROWN BRAMBLE-STEMS BEFORE HYBERNATION.

I. *Four uniform quercifolia larvæ on lichen-covered sticks during and after hybernation.*

April 7*th*. Re-fed. All 4 dark brown, 2 rather darker than the others.

April 10*th*. Re-fed. All 4 at rest on sticks: 2 unchanged, and 2 had changed skin, becoming respectively dark grey with white patches and blackish-grey with white patches and brown marks.

April 14*th*. Re-fed. Larvæ on sticks. The larger ones unchanged. The 2 smaller had now changed skin, becoming respectively very dark blackish-brown with white marks, and dark brown mottled with pale grey.

April 16*th*. Re-fed. Larvæ on sticks. The 2 larger darker larvæ were now placed in another cylinder. The two remaining were respectively mingled shades of dark and light grey with brown patches, and a uniform grey with large white patches. These 2 larvæ were re-fed on April 21st and 23rd without change. They were always at rest on the sticks.

April 26*th*. Re-fed. Both larvæ on sticks. One larva retained same appearance, grey with brown patches; the other was of a pale brownish-grey with paler marks.

May 1*st*. The latter larva had become of a much darker brownish-grey with brown and pale marks. On May 3rd they were re-fed, and both were on sticks: appearance unchanged.

May 11*th*. Both larvæ on sticks. The last described larva unchanged. The other had now also darkened, becoming blackish-grey with paler marks. The larvæ were re-fed on May 17th, 21st, and 25th, without further change in appearance. It was noted that they were at rest on the sticks on the 17th and 21st. On May 31st both larvæ were sent to Lord Walsingham.

I[1]. *The two larger darker quercifolia larvæ separated from* I *on April 16th.*

April 16th. One larva was now blackish-brown with white marks, the other very dark grey with white and brown marks.

April 21st. Re-fed. One larva on sticks, 1 on twigs of hawthorn. Appearance unchanged, as also on April 23rd and 26th, when they were re-fed and both found on sticks.

May 1st. The dark grey larva had changed skin and become blackish-brown with pale and brown spots. On May 3rd they were re-fed and found unchanged in appearance on the sticks.

May 11th. The larva with pale and brown spots was sent to Lord Walsingham. The remaining larva was at rest on stick, and blackish with two pale marks. It was re-fed on May 17th (on stick) and 25th. On the 31st it was sent to Lord Walsingham. There was no further change in its appearance.

J. *Two uniform quercifolia larvæ on black twigs during and after hybernation.*

April 7th. Re-fed. One larva purplish-brown and black, the other had changed skin and was black with small white patches and minute brown points. Both were resting on twigs and unchanged in appearance when re-fed on the 10th.

April 16th. Re-fed. Both on twigs. The purplish-brown and black larva appeared to be even darker, the other unchanged. Both were on twigs and unaltered when re-fed on 21st and 23rd.

April 26th. The black larva with small white patches and minute brown points was dying.

April 27th. The last-mentioned larva was dead. The other purplish-black larva was at rest on a twig.

May 1st. The larva had changed skin, and was black with a pair of small white marks. It was on a twig unchanged when re-fed on the 3rd.

May 25th. The larva was sent to Lord Walsingham. Mr. Bayzand completed his painting of it on the 11th, and the larva is represented on Plate XVIII, fig. 6.

K. *Three of the more spotted or lighter quercifolia larvæ on brown bramble-stems throughout.*

April 7th. Re-fed. One larva brown, 1 brown with few white marks. The third grey-brown one had changed its skin and become brown-grey with white patches.

April 10th. Re-fed. Larvæ resting on stems. The brown larva had become brown and very dark grey with white patches. The other two remained the same.

April 16th. Re-fed. Larvæ resting on stems. The brown larva with a few white marks had become darker, and was now black along the median dorsal area and very dark brown on the sides: the white patches large. The two other larvæ remained the same.

April 20th, 23rd, and *27th.* The larvæ were re-fed on each of these dates, and were invariably found upon the stems. The appearance was unchanged.

May 1st. One of the brownish-grey larvæ changed its skin, becoming rather browner in shade.

May 3rd. Re-fed. Three larvæ resting on stems. Appearance unchanged.

May 11th. Re-fed. Two larvæ on stems. Appearance unchanged. Mr. Bayzand finished painting the brownest larva which is represented on Plate XVIII, fig. 5. The brownish-grey larva sent to Lord Walsingham for preservation. Another brown one was sent on the 12th.

May 17th, 22nd, and *25th.* The single remaining larva was re-fed on each of these dates. It was noted as at rest upon a stem except on the 25th. Its appearance was the same on all occasions, viz. blackish with pale grey marks and brown spots. It was sent to Lord Walsingham on May 31st.

IV. THE QUERCIFOLIA LARVÆ ON LEAVES, TWIGS, OR SHOOTS OF THE HAWTHORN THROUGHOUT.

L

April 7th. Re-fed. One brown larva dead. Appearance of others unchanged, viz. 3 brown and 2 blackish-brown.

April 10th. Re-fed. Three larvæ unchanged. One brown and 1 blackish-brown larva had changed skin and become blackish-grey with large white patches.

April 16th. Re-fed. The two largest larvæ last described removed to another cylinder, L^1. The three others unchanged. One of two smaller brown larvæ appeared unhealthy.

April 20th. Re-fed. One larva had changed skin and grown much. Of the others, neither of which had changed skin, one was dead and one appeared to be dying.

April 23rd. The single healthy larva was brownish-black with white marks.

April 27th. The small larva was dead. The appearance of the other unchanged, as also on May 3rd and 11th, when it was again re-fed. On May 17th the larva had died.

L^1

The two larvæ separated from L on April 16th were re-fed and examined on April 21st, 23rd, and 27th, the appearance remaining the same throughout, viz. dark grey with large white patches. On May 3rd the larger of the two larvæ looked sickly; on May 5th it was dead and the smaller one seemed unhealthy. The latter died on May 7th.

M

April 7th. Re-fed. Five larvæ alive, all greyish-brown. One of two unhealthy-looking larvæ had died.

April 10th. Re-fed. Four larvæ unchanged; the fifth had changed skin and had developed larger white patches.

April 16th. The 2 largest larvæ were now separated and placed in another cylinder, M^1. The remaining 3 were brownish-grey, 2 of them with pale patches. The smallest was browner than the others and appeared to be unhealthy.

April 21st. Re-fed. The last-mentioned larva was dead; the others unchanged in appearance although one had changed skin during the interval.

April 23rd. Re-fed. Unchanged.

April 27th. Re-fed. One larva had become darker, viz. blackish-grey with white patches. The larvæ were re-fed and compared on May 3rd, 11th, and 17th, without change in appearance.

May 22nd. Re-fed. The brownish-grey larva had died, the darker one unchanged.

May 25th. The last-named larva had died. Neither of these larvæ had grown large.

M[1]

The 2 largest larvæ separated from M on April 16th. Both were greyish-brown with distinct white patches.

April 21st. Re-fed. Unchanged. The larvæ were also re-fed on the 23rd, 27th, May 3rd, 11th, 16th, and 22nd, and examined on each occasion. The appearance remained the same throughout. On the 25th both were sent to Lord Walsingham.

Second General Comparison after Hybernation.

April 27th, 1894. The larvæ were carefully compared and were all placed upon a background of white paper. Nearly all of them were sluggish, probably preparatory to the last ecdysis.

I. THE QUERCIFOLIA LARVÆ WITH BLACK TWIGS BEFORE HYBERNATION.

A. *The three chequered larvæ with black twigs.*—These larvæ were unchanged and still remained the lightest of the whole of series I. Hence the black twigs had produced no effect during hybernation.

B. *The five darkest larvæ enclosed with lichen-covered sticks during hybernation.*—One was very dark, the darkest of the whole group; 1 was dark with faint light spots; 3 were black chequered with white markings, which however were less developed than in A.

It is possible that these last-mentioned three larvæ may indicate some susceptibility to the effect of the lichen-covered sticks after they were enclosed upon the tree and before the commencement of hybernation.

C. *The six dark larvæ with black twigs.*—Only one larva was alive, and this was dark with very faint dull white spots.

All the above described 9 larvæ were healthy and well up to the average size.

II. THE QUERCIFOLIA LARVÆ WITH LICHEN-COVERED STICKS BEFORE HYBERNATION.

D. *The four dark, white-marked larvæ, with lichen-covered sticks.*—Three larvæ were alive and unchanged: one was very small.

E. *The three similar larvæ, with black twigs.*—These also were practically unchanged and like D. One of these was now the blackest larva, but the smallest in D was almost exactly the same. It is possible that some *very slight* effect was produced by these black twigs before hybernation.

F. *One of the three lightest larvæ with lichen-covered sticks.* —The larva was quite unchanged.

G. *Two of the three lightest larvæ with black twigs.*—No effect had been produced by the black surroundings. The bluish-grey larva remained very distinct.

H. *Two larvæ with lichen-covered sticks.*—The brownish larva had died. The other still remained the darkest individual of the lighter part of the group (F, G, H) as it was when the arrangements for hybernation were made.

Comparing these two important groups I and II as a whole, it was seen that the lightest larva of I (in A) was almost precisely similar to the darkest of II (in E):—in fact they could not have been distinguished as regards the size of the light patches. On the other hand, the larva in I was healthy and of the average size, while that in II was rather small. The smallest in D was not considered in this comparison, as it had grown but little and was a stage behind the others. Its light patches, although very dull and grey, were almost exactly the same size as those of the darkest larva in D. The remaining nine larvæ in II were all large and healthy, and much lighter than the lightest larva in I.

III. THE QUERCIFOLIA LARVÆ WITH BROWN BRAMBLE-STEMS BEFORE HYBERNATION.

Comparing these as a whole with sets I and II it was obvious that the lightest of them was distinctly darker than the darkest of the group just described (II) and exposed to lichen before hybernation. The larvæ were perhaps as dark as those in group I, exposed to Turkish oak before hybernation, but they were not so black, and, except in two larvæ, the light markings were less white, being greyish and clouded over.

I. *The four uniform dark larvæ with lichen-covered sticks.* —Two larvæ were very dark with a dull blackish ground-colour. The two others were not so dark and bore brown points and patches, which tended to fuse at their edges with the dark greyish ground-colour.

J. *The three similar larvæ with black twigs.*—Only one larva was alive, and this was rather darker than the darkest of the set just described (I), having a dull blackish ground-colour. One dead larva had a very black ground-colour with brown dorsal points and distinct although small white patches. It is probable that some slight effect was produced by the black twigs just before hybernation began.

K. *The four lightest and most distinctly spotted larvæ, with brown twigs.*—Three larvæ were alive. The smallest one possessed the blackest ground-colour and the whitest patches of any in the whole series (III). The other two closely resembled the two lighter larvæ in I.

IV. THE QUERCIFOLIA LARVÆ UPON GREEN LEAVES AND SHOOTS OF THE HAWTHORN.

L, M. There was no distinction between the two lots. The larvæ, as before hybernation, presented a great range of variation, but the ground-colour was upon the whole greyish. The lightest individual was rather lighter than the darkest of those upon lichen before hybernation (II), while the next in order was about the same as the darkest of II. Four others were rather less light, while a fifth was a distinctly dark form. Hence the set was upon the whole intermediate between I and II and distinctly lighter than III.

April 28th. The length of all those larvæ which had ceased to feed preparatory to a change of skin was about 56·0 mm. A few days later the cast skins were examined, and were seen to possess the white markings as well as the dark ground-colour. Hence these characters are in part, if not entirely, cuticular in position.

THIRD GENERAL COMPARISON OF THE LARVÆ MADE AFTER HYBERNATION, MAY 7TH.

I. THE QUERCIFOLIA LARVÆ WITH BLACK TWIGS BEFORE HYBERNATION.

A. *The 3 chequered larvæ with black twigs.*—Two larvæ were dark, and 1 black chequered with white markings, which were larger than those of any other larvæ in I, but much smaller than any in II, except the small larva in E and 1 in D.

B. *The 5 darkest larvæ with lichen-covered sticks.*—Three larvæ, 1 of which was changing its last skin, were black chequered with white markings, which were not quite so large as those of the larva in A. Two larvæ were very dark and unspotted.

C. *The single dark larva with black twigs* was changing its last skin, and was still dark.

Hence probably no effect had been produced by the surroundings to which the larvæ had been exposed since hybernation.

II. THE QUERCIFOLIA LARVÆ EXPOSED TO LICHEN-COVERED STICKS BEFORE HYBERNATION.

D. *The 3 dark, white-marked larvæ with lichen-covered sticks.*—Two larvæ were large in the last stage. One of them became much darker after changing its last skin, but still remained black with light markings. The effects of their dark and light tints were more brownish and yellowish, and on the whole darker than those of the 2 large larvæ in E. In fact, a comparison of D and E did not support the conclusion that the larvæ were sensitive to their environment after hybernation.

The small larva in D which had lagged behind the others had changed its skin and was rather lighter. It was still in an earlier stage than any of the others, but apparently healthy.

E. *The 3 similar larvæ with black twigs during and since hybernation.*—Two larvæ were large in the last stage and remained black-and-white. The third larva was smaller and had been injured. It was probably unable to change its skin in consequence.

F. *One of the lightest larvæ with lichen-covered sticks throughout.*—This larva was in last stage, and its light markings had become much darker in tint, being of a yellowish-brown colour.

G. *Two of the lightest larvæ with black twigs during and since hybernation.*—The lighter of the 2 remained about as in the previous stage; the other, the bluish-grey larva, had not yet changed its last skin, but was apparently rather darker. These 2 larvæ were upon the whole somewhat lighter than those in F and H.

H. *The larvæ with bluish-white spots exposed to lichen-covered sticks throughout.*—This larva was dying. It was now lighter than the larva in F, but this difference was entirely due to changes in the latter.

III. THE QUERCIFOLIA LARVÆ WITH BROWN BRAMBLE-STEMS BEFORE HYBERNATION.

I. *The 4 uniform larvæ with lichen-covered sticks during and since hybernation.*—Three larvæ were in the last stage, 2 of them brownish with small white spots like those in K, but with the ground-colour darker. The 3rd was considerably darker. The 4th larva was changing its skin. It possessed a deep brownish-black ground-colour, which appeared to be overspread with grey.

J. *The uniform larva with black twigs during and since hybernation.*—The larva was very large in the last stage, and very uniformly dark and unspotted, although rather less black than those which had been exposed to black twigs before hybernation (I).

K. *The 3 spotted or lighter larvæ upon brown stems throughout.*—Two larvæ in the last stage were dark brownish with small light patches. The third, in the last stage but one, was more black-and-white, resembling the larvæ which had been exposed to black twigs before hybernation (I).

Compared as a whole the larvæ of I were blacker than III, although these were very dark. The latter were distinguished by greyish-brown shades absent from the ground-colour of I. The light patches, when present, were distinguished in III by a brownish tinge, and were more clouded and less distinct than in I.

Comparing carefully the darkest larva of II (viz. the 4 darkest in D) with those of I, it was seen that the pale patches were of the same size as those of the larvæ in which they were most developed of all exposed to black twigs (viz. the lightest larvæ in A). But although the patches were of the same size, those of the former were yellowish-brown and clouded, and those of the latter white. The ground-colour of the larva in II was, however, much lighter, being a brownish-black, than that of the lightest larva in I. Hence the darkest larva in II was distinctly darker than the lightest in I as regards its pale patches, but distinctly lighter as regards its ground-colour. And this comparison only holds for a single exceptional dark larva. All others in II were far lighter than any in either I or III.

IV. THE QUERCIFOLIA LARVÆ EXPOSED THROUGHOUT TO THE LEAVES AND SHOOTS OF THE HAWTHORN.

Only 6 larvæ remained alive, and of these but 2 were in the last stage. Four larvæ possessed a ground-colour very like that of series III, but the white patches were far larger, and tended to spread as a greyish shade down the sides. The light patches were, however, much smaller than in the larvæ of series II. One of the smallest larvæ was dark with very small white patches, like one of the darkest of III. A dying larva, unable to change its skin, was intermediate between this latter and the 4 first-mentioned larvæ.

The colours of these larvæ in series IV seem to have been influenced by the brownish and greyish twigs and shoots of the hawthorn.

LAST GENERAL COMPARISON OF THE QUERCIFOLIA LARVÆ AFTER HYBERNATION, MAY 25TH.

Of series I it was recorded that the single larvæ in A and 2 in B were black with conspicuous white markings; while 1 in B, 1 in B^1, and 2 in C were dull black with only a pair of small inconspicuous white markings.

Of series II nothing is recorded which is not contained in the description of cylinders D to G.

Of the 4 larvæ then remaining in III it was noted that the larvæ in K much resembled the black-and-white ones in A and B; while the 3 in I and I^1 were dull blackish with the pale markings very inconspicuous.

Only 2 larvæ remained alive in IV. The brownish ground-colour of both was much clouded and overspread with grey, and the pale patches tended much to spread downwards, becoming grey and clouded especially towards the ventral surface.

TRANSFER EXPERIMENTS WITH THE LARVÆ OF AMPHIDASIS BETULARIA IN 1896.

A female moth, captured at Oxford, laid a small batch of eggs, which provided the material for the following experiments, undertaken in order to attempt to ascertain the susceptible stages of this highly-sensitive larva.

The experiment started on May 10th, when the young larvæ were first fed upon the leaves of *Populus nigra,* all dark twigs and branches being at first rigidly excluded. It must be remarked, however, that for a few days after May 10th the leaves had only just expanded and were somewhat brownish. Various sets of larvæ were withdrawn from the stock, and the transference experiments were then conducted in the following manner. All measurements were taken when the larvæ were stretched and straight. A convenient summary of the results of the following experiments will be found in the table on page 319.

A. *A. betularia.*

May 16th. Twenty *betularia* larvæ at the end of the 1st stage, and nearly all changing the first skin, and 5·0 mm. long, were transferred from green to black surroundings (the twigs of the Turkish oak). Up to this date the green leaves of *P. nigra* upon which they had been placed on May 10th were somewhat brownish, because the buds had only just opened.

May 20th. The larvæ were examined from time to time between the 16th and this date, and had always been found upon the leaves and never upon the twigs. On the 20th every single larva was found upon the leaves. They even avoided the stem of the food-plant. Ten larvæ changing the 2nd skin, and 8·5 mm. long, were re-transferred into green surroundings (A^1). The 10 remaining larvæ had attained various degrees of development in the 2nd stage, 3 being at the end of it, but not yet changing the 2nd skin. From this date to the 29th these 10 larvæ were fed upon Balsam Poplar, but from the latter date onwards upon *P. nigra.*

May 25th. Only 1 on the twigs, the rest on the leaves. One larva was changing the 2nd skin, and none had yet entered the 3rd stage.

May 29th. Two larvæ on the twigs, and both these were changing the 3rd skin. Of the rest 1 was changing the 3rd skin and 12·5 mm. long, and 2 had just changed it. These 5 were re-transferred to green surroundings (A^2). The remaining 5 were in the 3rd stage, 4 nearly at the end of it, and 1 very small.

May 31st. Only 1 on twigs. Four changing 3rd skin, the 5th still small in the 3rd stage. The black twigs were removed at this date, and the 5 larvæ by this means re-transferred to green surroundings.

June 2nd. Four in 4th stage, and 1 nearly at the end of 3rd stage. Four distinct medium brown colour; 1 very black.

June 5th. One changing 4th skin and light reddish-brown; 2 in 4th stage, both darkish brown; 1 at beginning of 5th stage and medium brown; the 5th small one was only 9·0 mm. long.

June 14th. One small in 6th stage, and dark brown with distinct grey markings prominent on it; 1 changing 5th skin and light brown with ventral surface rather greenish; 2 at end of 5th stage, 1 intermediate and 1 similar to but rather darker than the larva changing its skin.

June 20th. Four in 6th stage, 2 dark, overspread with greyish, 1 green with brown dorsal line and lateral patches, 1 dark form becoming greenish on the sides.

June 26th. One dark larva mature and removed.

July 2nd. The green larva and the one with greenish sides mature and removed. The remaining larva was very dark, with distinct sharply-marked pale yellowish spots on its sides, and one on each side of the dorsal surface of each segment.

July 12th. The larva described above had been accidentally drowned.

CONCLUSIONS.

The effect of the dark surroundings is evident. The green environment of the three last stages was doubtless the cause of the greyish tint, the greenish sides, and the yellowish spots on the 3 dark larvæ. In the case of the 4th larva the effects of the latter surroundings were predominant, although the larva still retained strong traces of its earlier environment in the brown markings. Comparing this result with that of A¹, the relative unimportance of environment in stage II becomes clear.

A¹. *A. betularia.*

May 20th. The 10 *betularia* larvæ re-transferred from black into green at the end of the 2nd stage, changing the 2nd skin, and 8·3 mm. long.

From this date to the 29th the larvæ were fed upon Balsam Poplar, and then again upon *Populus nigra*.

May 25th. Most of the larvæ were changing the 3rd skin, and all were apparently dark.

May 29th. All had changed the 3rd skin except 2, which were changing it. All were dark brown except the 2 latter, which, together with 1 which had just changed, were light brown. The average length was 14·25 mm.

June 2nd. Four were changing the 4th skin; 5 were at various points in the 4th stage, with an average length of 20·75 mm.; 1 was in the 5th stage. All were brown, although not very dark.

June 5th. Four were changing the 5th skin, 33·0 mm. long, and 1 at end of 5th stage. The latter was medium brown, the others 3 light brown and 1 green with light brown markings. The remaining 5 were much smaller, being all in the 4th stage, 3 dark brown and 2 light brown.

June 14th. Five were nearly mature, 2 green sprinkled with distinct greyish dots much more numerous in the larger larva, which was practically mature and 55·0 mm. long. The ground-colour of this latter larva was bright green, the dorsal tubercles dark grey. Of the other 3 large larvæ, 1 was very light grey, almost whitish with darker dots and mottling, 2 were much darker, blackish rather than brown, with light grey markings. The largest of the set of smaller larvæ was changing its 5th skin and greenish-brown, 1 smaller in the 5th stage was green with dorsal brown line, 1 smaller still, chocolate brown. Two larvæ were still quite small, viz. 12·25 mm., and probably still in the 4th stage. Both were dark brown, but they appeared to be unhealthy.

June 15th. The greenest, the whitish, and 1 dark larva had become mature and were removed.

June 20th. One green larva mature and removed. Two in 6th stage, 1 dark with greyish markings not greatly developed, 1 intermediate, brownish-green; 1 changing 5th skin, green, 2 in 5th stage and lightish brown.

June 22nd. The dark larva in 6th stage mature and was removed. Two larvæ in 6th stage, 1 on green side of intermediate, viz. green clouded over but not entirely obscured by brown, 1 distinct green with a brown dorsal line and a little brown on the sides. Of the 2 smaller larvæ, 1 was in the 5th stage and brownish-green, 1 in the 4th and light brown.

June 26*th*. The brownish-green larva in the 5th stage was dead. The 2 large ones as last described.

July 2*nd*. The greenish intermediate larva had become mature and was removed. The distinct green one was very large, being 64·6 mm. long. The green ground-colour was somewhat dull, and the brown dorsal line broad but not dark. The remaining larva was in the 5th stage and intermediate.

July 12*th*. The last-mentioned larva was dead. The other had pupated.

CONCLUSION.

The effect of a dark environment during the 2nd stage alone, although slight, is very remarkable. The grey which overspread the green forms may be compared to the grey patches on the dark form in this and so many of the other experiments.

A². *A. betularia*.

May 29*th*. The 5 *betularia* larvæ re-transferred to green surroundings after they had been in black during the 2nd and 3rd stages.

May 31*st*. All 5 larvæ were advancing in the 4th stage, and all dark or distinct brown.

June 2*nd*. Two larvæ were changing the 4th skin and 22·0 mm. long: the 3 others advancing in the 4th stage. Appearance unchanged.

June 5*th*. One larva changing 5th skin and medium brown: 2 half-grown in 5th stage and 1 nearly at end of it; 2 dark brown, 1 of the larger pair light brown. The 5th larva in 4th stage and dark brown.

June 14*th*. Four approaching the end of the 6th stage; 2 very black and 2 similar, except that the ground-colour was overspread with light grey, in one case slightly, in the other thoroughly. The latter was nevertheless a darkish larva. The 5th larva was changing the 5th skin, and green with a brown median dorsal line.

June 15*th*. One dark larva had become mature and was removed.

June 20*th*. One dark larva mature and removed. The remaining 3 larvæ were all in the 6th stage. The grey colour of one of the dark larvæ was still very distinct. The brown dorsal line was pronounced upon the green larva.

June 26th. The 2 dark larvæ mature and removed. The 5th larva had now became a typical and distinct bright green form, the brown dorsal line having almost disappeared.

July 2nd. The green larva mature and removed.

CONCLUSIONS.

This is a deeply interesting little set, showing the effect of the dark surroundings persisting unaltered in the 2 larvæ which were first to pupate, the green environment producing some effect in the greyness overspreading the next 2, and predominating altogether in the last.

B. *A. betularia.*

May 20th. The 51 *betularia* larvæ remaining in the stock, with green leaves and shoots of *Populus nigra*, were carefully examined. Two larvæ had just entered the 3rd stage, having changed the 2nd skin, 5 were small in the 2nd stage, while all the rest were changing the 2nd skin, and thus at the end of the 2nd stage. Twenty of these latter were transferred to a cylinder (B^1) with an abundance of black twigs of the Turkish oak, while the remainder were put back into the green environment. From this date to the 25th all the larvæ were fed on Balsam Poplar.

May 25th. Thirty larvæ counted at this date. Of these, 15 changing the 3rd skin were transferred to a cylinder (B^2) with black twigs. The remaining larvæ were smaller, but even in the 3rd stage a small proportion of green individuals had begun to appear among the brown. All the larvæ were fed on *Populus nigra* from this date (May 25th) onwards.

May 29th. The 15 larvæ remaining in the green environments were mostly at the end of the 3rd stage and many were changing the 3rd skin. They were mostly light brown but some were green.

June 2nd. Six larvæ had reached the end of the 4th stage, although they were not changing their skins. Of these 5 were green with slight traces of brown, while the 6th, although green, retained a larger amount of the darker shade. Six larvæ were smaller, having reached various points in the 4th stage. Of these 2 were green with slight traces of brown, while four were brownish-green or light greenish-brown. Three larvæ were still in the 3rd stage, and of these the smallest was dark brown while the other 2 were light greenish-brown.

June 3rd. The five largest larvæ were changing the 4th skin, and were placed in a cylinder (B[5]) with black sticks. Their colour was as described on June 2nd, and their length 20·5 mm. The colours of the remaining 10 larvæ had not altered.

June 5th. Only 9 larvæ were found. Two larvæ were in the 5th stage and bright green. Five were more or less advanced in the 4th stage, and were distinctly green with a variable degree of development of brown patches. Two were much smaller in the 4th stage and light greenish-brown in colour.

June 20th. Three larvæ were large in the 6th stage, and all very bright green with only a trace or no trace at all of a brownish tint along the median dorsal line. The other 6 larvæ were not noted on this date.

June 26th. Only 8 larvæ were found. Two of the largest green larvæ had become mature, and were removed for pupation. The remaining 6 were of various sizes, but all were bright green except one.

July 2nd. One green larva was mature and was removed. Three were in the 6th stage, 2 bright green, one of them with a little brown on the sides and a brown dorsal line; the 3rd was intermediate, with a brown dorsal line, and green and brown patches alternating on the lateral surfaces. One was changing the last skin and one in the 5th stage, both bright green.

July 12th. One green larva mature and removed. The 2 small ones were dead. Of the two remaining larvæ in the 6th stage 1 was bright green and 1 intermediate.

CONCLUSIONS.

The only point which calls for remark is the occurrence of a single intermediate larva. This was a probable result of the large numbers of the young larvæ in a single cylinder: so that some effect in a specially susceptible individual followed from the presence of other young brownish caterpillars.

B[1]. *A. betularia.*

May 20th. The 20 *betularia* larvæ changing the 2nd skin transferred from green leaves and shoots to an environment of black twigs. The larvæ were of a very uniform length of 8·5 mm.

May 25th. Six were found on the black twigs, the rest on the leaves. Ten larvæ, all about 14·0 mm. long, at the end of the 3rd stage, and mostly changing the 3rd skin, were transferred to green surroundings (C^1). The remaining larvæ were fed on Balsam Poplar from May 20th until the 29th. Green forms had begun to appear among the brown.

May 29th. Only 1 on black twigs. Seven larvæ were at the beginning of the 4th stage, 6 dark and 1 greenish. Two were changing the 3rd skin and 1 nearly mature in the 3rd stage.

June 2nd. Four larvæ on the twigs. Two were changing 4th skin, and 8 at various degrees of development in the 4th stage. All brown and the largest larvæ very dark brown.

June 3rd. Only 1 on the twigs. Two had now changed 4th skin on the 2nd, and were transferred to green surroundings (C^1): 1 was very black, the other a medium brown.

June 4th. Three on twigs. All larvæ in 4th stage, all brown of various shades: those on the twigs very black.

June 5th. Only 1 on twigs and that a light brown one. One light brown larva changing 4th skin and transferred to green surroundings (C^1). Five in the 4th stage, including 1 dark brown larva which had just died, 1 in 3rd stage. All brown (more or less dark).

June 7th. Two on twigs, dark and medium brown. The latter was changing its 4th skin and was transferred to green (C^1), together with another dark brown larva which had just entered the 5th stage. The remainder were as last described, and all were advancing in the 4th stage.

June 14th. Two were on the twigs; both in the 5th stage, one dark greyish-brown and the other dark chocolate-brown. Two were on the leaves, both in the 5th stage and greyish-brown, lighter than the former two.

June 20th. Two large in the 6th stage and very dark.

June 26th. Four in the 6th stage and all very dark indeed.

July 2nd. Two of the dark larvæ had become mature and were removed. The remaining larvæ were very black and nearly mature.

July 12th. The 2 last larvæ had forced their way through the hole in the plate and were drowned. Their appearance had not changed, and it is probable that they had become mature and began to wander.

CONCLUSIONS.

In the final result we probably see the full and characteristic effect of the black twigs unmodified by the green environment in which the two youngest stages were passed.

B^2. *A. betularia.*

May 25th. Fifteen *betularia* larvæ transferred from green to black; all changing the 3rd skin and 14·0 mm. long. Some were becoming greenish, but most were brown.

May 29th. All examined: the colour varied very greatly, but none were altogether green although there was much green ground-colour on some. All were in the 4th stage; 1 only on the black twigs and that happened to be a particularly green one. Many light brown and many dark brown.

June 2nd. Five on twigs, 3 in the 5th stage, 1 changing 4th skin, and 1 nearly at end of 4th stage. The latter and 1 in the 5th stage dark greenish-brown, the remaining 3 very dark brown. On the leaves and green stems there were in the 5th stage, 1 green, 3 light brownish-green, and 2 light brown (1 slightly greenish); in the 4th stage, 2 brownish-green and 2 medium brown.

June 5th. On the black twigs there were 8 larvæ, 7 in the 5th stage (3 of them changing the 5th skin), 5 dark brown, 1 bright green (changing skin), and 1 brownish-green (half-grown in stage); 1 in 4th stage and brownish-green. On the light brown stem of *P. nigra* was a single larva which harmonized with it very exactly. On the leaves were 5 larvæ, 2 small in the 5th stage and light brown, 3 in the 4th, 1 dark (changing the 4th skin), 1 brownish-green, and 1 greenish-brown.

June 14th. Six larvæ in the 6th stage were on the twigs and very deep black, some of them with a small amount of greyish markings. One similar larva on green: 1 larva in the 6th stage on green was of a uniform dull light grey tint: of 2 larvæ in the 5th stage, 1 was changing the 5th skin and light brown overspread with grey, 1 smaller and darker with less grey. Two smaller larvæ, probably in the 4th stage, or perhaps at the beginning of the 5th, were respectively lightish and darkish-brown.

June 15*th.* One of the darkest larvæ had become mature and was removed.

June 18*th.* One of the darkest larvæ become mature and was removed.

June 20*th.* Two very dark larvæ mature and removed. One very small one dead. Of the 6 in the last stage, 4 were very black, in 3 cases overspread with dull greyish patches; 1 was greyish on the dorsal surface, lighter grey elsewhere; the 6th and smallest somewhat resembled that last described.

June 26*th.* All had become mature except that last-mentioned, which had become a dark brownish-black.

July 2*nd.* No further change.

July 12*th.* The larva had become mature and was removed.

CONCLUSIONS.

The power of the black surroundings is evident, the influence of the green being only seen in the occasional greyness on the black larvæ, and especially in the one larva which was entirely grey. The brownish shade of the larva which was the last to reach maturity is unusual on the twigs of Turkish oak. These probable effects of the green on the larvæ which had been longest exposed to the influence of black (being the last to pupate), are contrary to the results observed in the other experiments.

B^3. *A. betularia.*

June 3*rd.* Five *betularia* larvæ in green surroundings up to the end of the 4th stage were transferred to black. They were changing the 4th skin and 20·5 mm. long.

June 5*th.* One larva, a green one, was on a black twig, the others on the leaves. Four were brownish-green and 1 medium brown. All were advancing in the 5th stage and about the same size.

June 20*th.* Three large in the 6th stage, 1 dark smoky-black; 1 greyish smoky-black, and 1 intermediate, greenish-brown. One small one dead, 1 missing.

June 26th. One had pupated, and 1 was mature and removed. The 3rd larva was greyish smoky-black.

July 2nd. The last larva had become mature and was removed.

CONCLUSIONS.

The great power of a black environment is well shown, in the production of 2 dark larvæ and 1 intermediate. At the same time the dark larvæ were not quite the characteristic forms produced by black-barked twigs.

C. *A. betularia.*

May 25th. Ten of the 20 *betularia* larvæ transferred from green to black for the 3rd stage, and re-transferred to green at the end of it when they were changing the 3rd skin and 14·0 mm. long.

May 29th. All in 4th stage and all dark.

June 2nd. Four in 5th stage, 5 changing 4th skin, 1 not quite mature in 4th stage. All dark brown.

June 5th. Four changing 5th skin and 33·0 mm. long; 2 nearly mature in 5th stage; all lightish brown overspread with a greyish cloud. Three small in the 5th stage, 2 of them as above and 1 dark brown. One in 4th stage and very black.

June 14th. Six nearly mature in the 6th stage and all very dark smoky-black with a pair of distinct grey patches on the dorsal surface of each segment. Three in the 5th stage, 2 as above and 1 lighter and really intermediate.

June 15th. Three dark larvæ had become mature and were removed.

June 18th. One dark larva mature and removed.

June 20th. Two larvæ large in the 6th stage, very dark smoky-black with the paired segmental light grey patches distinct.

June 26th. The 2 larvæ above described had become mature and were removed. Of the 3 remaining larvæ, 2 were large in the 6th stage, one bright green with brown dorsal line and a small brown patch on anterior part of each side of the segments, the other smaller and darker with more brown upon it, but still with a bright green ground-colour. The third larva in the 5th stage and chocolate-brown.

July 2nd. All 3 in 6th stage, but the smallest was now intermediate. In view of the considerable development of brown markings the other 2 can only be considered as rather on the green side of intermediate.

July 12th. The smallest larva was still feeding and still intermediate. The other two had become mature and were removed. There was no further change.

CONCLUSIONS.

These results are deeply interesting. The 6 larvæ which first became mature were certainly influenced by the green environment of the three last stages, inasmuch as the final appearance was a dark smoky-black with a pair of distinct grey patches on each segment, instead of the well-known intense dead black which is the characteristic effect of the black-barked twigs of Turkish oak. At the same time, the remarkable susceptibility to this stimulus is seen in the pronounced darkness of these 6 larvæ after only a single stage (of 5 days' duration) had been passed among black twigs. It is interesting to note that the 3 intermediate larvæ grew more slowly after May 25th, and thus passed a relatively longer time in the green environment.

C[1]. *A. betularia.*

June 3rd. Two *betularia* larvæ at the beginning of the 5th stage re-transferred to green surroundings after they had been in black for the 3rd and 4th stages.

June 5th. A third larva, changing its 4th skin, was similarly re-transferred. It was of a light brown colour. Of the 2 former, 1 was nearly at the end of the 5th stage and dark brown, the other rather smaller and darkish brown overspread with grey.

June 7th. A fourth larva changing its 4th skin and a fifth at the beginning of the 5th stage were similarly re-transferred.

June 14th. Three larvæ in 6th stage, smoky-black with prominent light grey markings especially distinct in one of them. One in 5th stage and 1 changing 5th skin, both dark chocolate-brown with a little grey.

June 20th. Four large in the 6th stage, smoky-black overspread with grey. The black ground-colour resembles that of the larvæ still in black surroundings.

June 23rd. Two had become mature and were removed.

June 26th. Two mature and removed. The 5th was now large in the 6th stage, a dark brownish-black rather than the dead black of the other 4 and those still on the black twigs.

July 12th. Mature and removed. No further change in appearance.

CONCLUSIONS.

In this case the grey which overspread the black ground-colour of 4 larvæ must be regarded as an effect of the green environment during the 2 last stages. The 5th larva took longer to develop, and there was a slight departure from the characteristic dead black of the other four.

Explanation of Plate XVI.

Results of Experiments in 1893 upon the colour-relation between the larvæ of *Odontopera bidentata* and their environment.

All the figures are of the natural size.

Fig. 1. Nearly mature larva of *O. bidentata* showing the effect of an environment of black-barked twigs (*Quercus cerris*). This typical example of the results of Experiment I was painted by Mr. P. J. Bayzand on July 31st, 1893. All the larvæ figured on this plate were fed upon the leaves of *Populus nigra*, but they nearly always rested by day on the twigs or pieces of bark made use of in the experiments here illustrated. The larva represented in this figure is not in its normal diurnal resting position, having been disturbed; and the same is more or less the case with Figs. 3, 5, 7 and 9.

2. Nearly mature larva showing the effect of an environment of weathered pale grey barkless twigs. This typical example of the final results of Experiment VII was painted on July 28th. A little earlier the larvæ had been rather paler and resembled more closely the majority of the twigs made use of.

3. Nearly mature larva showing the effect of an environment of dark purplish-brown, glossy twigs, probably of birch. This typical result of Experiment III was painted on July 30th.

4. Nearly mature larva showing the effect of an environment of white-spotted, purplish-brown twigs of birch. This typical result of Experiment IV was painted on July 30th. Although the details of the environment were not reproduced, the larva was distinctly less dark than that shown in Fig. 3.

5. Nearly mature larva showing the effect of an environment of green leaves and shoots. The food-plant (*Populus nigra*) was employed for this purpose, all dark-barked twigs being carefully excluded. A comparison of this figure with the others on the same plate indicates that the leaves of the food-plant produce no effect when they are combined with dark twigs or lichen-covered bark; while a reference to Experiments I to XV shows that the great majority of the larvæ rest by day upon these latter objects in preference to the leaves. This typical result of Experiment VIII was painted on July 31st.

FIG. 6. About half-grown larva showing the effect of an environment of bark covered with bluish-green lichen, probably *Physcia pulverulenta.* This typical result of Experiment XIII was painted on August 1st.

7. About half-grown larva showing the effect of the environment last described. This second typical example of the results of Experiment XIII was painted on August 3rd.

8. Nearly mature larva showing the effect of an environment of bark covered with orange lichen, perhaps *Physcia parietina*, probably combined with *P. pulverulenta.* This typical result of Experiment XIV was painted on August 4th.

9. Nearly mature larva showing the effect of the environment last described. This second typical example of the results of Experiment XIV was painted on August 5th.

10. Nearly mature larva showing the effect of an environment of lichen-covered sticks. The lichen was probably *Ramalina farinacea.* This typical result of Experiment XV was painted on August 10th.

11. Nearly mature larva showing the effect of the environment described in Fig. 6. This third typical example of the results of Experiment XIII was painted on August 31st.

Comparing the last six figures of larvæ together with the representation of the various forms of lichen-covered bark employed in the experiments, it is seen that there was no special resemblance to the characteristic features which distinguished one form of environment from the others. Thus the orange colour of the lichen did not produce any corresponding effect upon the larvæ shown in Figs. 8 and 9.

The whole results prove that *bidentata* is a larva with remarkable susceptibility to the colour of its environment. In this respect it is equal to the most sensitive of all larvæ hitherto tested—*Amphidasis betularia.* The latter is more susceptible to green leaves and shoots, becoming bright green when restricted to their influence. When exposed to lichen-covered bark, however, *bidentata* was shown, in Experiments XII to XV, to be far more sensitive.

EXPLANATION OF PLATE XVII.

Results of Experiments in 1893–4 upon the colour-relation between the larvæ of *Gastropacha quercifolia* and their environment.

All the figures are of the natural size, and all represent the normal resting position, except that the larvæ more frequently rest with the head downwards than is shown in the plate. Perhaps the young larvæ under normal conditions invariably rest in this position.

Figs. 1—13 represent the larvæ in the autumn of 1893, just before the beginning of hybernation.

Figs. 14 and 15 represent the larvæ, nearly mature in the last stage, in May 1894.

FIG. 1. Larva of *Gastropacha quercifolia* just before hybernation, showing the effect of an environment of black-barked twigs (*Quercus cerris*). This typical example of the nine black larvæ, chequered with white, described on September 21st, 1893, was painted by Mr. Bayzand on September 25th. Although these larvæ had eaten very little, and had not grown appreciably by October 3rd, the white marks on six out of nine of them had become reduced almost to the condition represented in Fig. 3. The white patches on the larva shown in Fig. 1 had also become much duller and less conspicuous. The persistence of the process of colour-adjustment right up to the beginning of hybernation is very interesting, and contrasts remarkably with its entire cessation during and after hybernation. The difficulty with which the contour of the larvæ could be made out against the black bark is correctly rendered in Figs. 1—3.

2. Larva at the same period and exposed to the same environment as that shown in Fig. 1. The figure represents the darkest larva, without any trace of white markings, described on September 21st. The painting was made on September 23rd.

3. Larva at the same period and exposed to the same environment as that shown in Fig. 1. This typical example of five out of the six darkest larvæ, described on September 21st, was painted on September 26th.

4. Larva just before hybernation, showing the effect of an environment of lichen-covered sticks. The lichen was probably *Ramalina farinacea*. The figure represents one of the four lightest coloured larvæ produced in this environment and separated for painting on September 21st. The larva was painted on October 3rd. By October 16th, when the larvæ of series II were arranged for hybernation, many changes had taken place, but this larva remained among the lightest throughout.

5. Larva at the same period and exposed to the same environment as that shown in Fig. 4. The figure represents

one of the four lightest larvæ on October 6th when it was painted. It was not among the four lightest larvæ on September 21st, but changes took place after this date.

FIG. 6 Larva at the same period and exposed to the same environment as that shown in Fig. 4. The figure represents one of the four lightest larvæ separated for painting on September 21st, and the only one which remained of a greyish tint, the others becoming brownish. It was painted on October 2nd.

7. Larva at the same period and exposed to the same environment as that shown in Fig. 4. The figure represents one of the commonest types of appearance on September 21st, viz. the group of six dark white-marked larvæ. The drawing was made on October 10th.

8. Larva at the same period and exposed to the same environment as that shown in Fig. 4. Among the eight darkest larvæ of this series II on September 21st, was one in which the white markings possessed a bluish tinge. This was set aside for painting. But changes took place later on, and one of the other seven larvæ was found more nearly to represent the previous appearance of the separated larva. The former, which had become greyish, was therefore painted on October 9th.

9. Larva at the same period and exposed to the same environment as that shown in Fig. 4. The description of Fig. 4 applies in every respect except that the larva here represented was painted on October 7th.

10. Larva just before hybernation, showing the effect of an environment of reddish-brown stems of bramble. The larva represented was one of the two mentioned on October 16th, in which the light patches were well developed and of a brownish tint. It was painted on October 13th.

11. Larva at the same period and exposed to the same environment as that shown in Fig. 10. The larva represented was the lightest of the seven very uniform dark brown larvæ with lighter brown patches and small white marks mentioned on October 16th. These light patches, which are not very distinct in this figure and in Fig. 13, were generally present on the 2nd, 5th, and 8th abdominal segments. The larva was painted on September 30th.

12. Larva at the same period and exposed to the same environment as that shown in Fig. 10. The larva represented was the brown individual with the dorsal surface

overspread with grey mentioned on October 16th. The greyish appearance does not come out in the figure, the effect being merely to render the brown of a paler tint. The larva was painted on October 17th.

FIG. 13. Larva at the same period and exposed to the same environments as that shown in Fig. 10. The description of Fig. 11 applies in every respect, except that the larva here represented was a specially dark example, and was painted on October 16th.

14. Larva, nearly mature in the last stage, showing the effect of an environment of black-barked twigs up to the beginning of hybernation. During and after hybernation the larva was placed (I, B) in an environment of lichen-covered sticks, but, as the figure indicates, it had ceased to be susceptible to such influences, and no effect was produced. Before hybernation it had been one of the five darkest larvæ. The painting was made on May 19th.

15. Larva at the same period and exposed to the same environments (I, B) both before and after hybernation as that shown in Fig. 14. Although conspicuous white patches appeared on this and other larvæ subsequent to hybernation, it is improbable that this effect was due to the lichen which formed the surroundings after the beginning of hybernation. The comparison of the whole of the larvæ indicates that they had then ceased to be susceptible to the colours of the environment. The larva was painted on May 22nd.

EXPLANATION OF PLATE XVIII.

Results of Experiments in 1893–4 upon the colour-relation between the larvæ of *Gastropacha quercifolia* and their environment.

All the figures are of the natural size, and all represent the natural resting position.

All the figures represent the larvæ in the last stage, and all but one nearly mature, in May 1894.

FIG. 1. Larva of *Gastropacha quercifolia*, nearly mature in the last stage, showing the effect of an environment of lichen-covered sticks up to the beginning of hybernation. The lichen employed was probably *Ramalina farinacea*. During and after hybernation the larva was placed in an environment of black-barked twigs (II. G) which, it is

obvious, produced no effect whatever. The appearance of this same larva just before hybernation is represented in Plate XVII, fig. 4 or 9. The painting of the nearly mature larva was made on May 14th.

FIG. 2. Larva, small but probably in the last stage, exposed to the same environments (II, G) both before and after hybernation, as that represented in fig. 1. Here too it is clear that the black-barked twigs which surrounded the larva during winter and spring produced absolutely no effect. The appearance of the same larva just before hybernation is represented on Plate XVII, Fig. 6. The painting of the more mature larva was made on May 28th.

3. Larva, nearly mature in the last stage, showing the effect of lichen-covered sticks throughout (II, F). The lichen was probably *Ramalina farinacea*. The appearance of this same larva just before hybernation is represented in Plate XVII, fig. 4 or 9. The painting of the nearly mature larva was made on May 25th.

4. Larva at the same period and exposed to the same environments both before and after hybernation as that represented in Fig. 1. The larva here represented (from II. E) was the darkest of all the mature larvæ which had been exposed to an environment of lichen before hybernation (series II). There is no reason to suppose that the black twigs produced any effect in winter and spring. The larva was one of the seven darkest in series II before hybernation. The painting was made on May 17th.

5. Larva, nearly mature in the last stage, showing the effect of reddish-brown stems of bramble throughout (III, K). The specimen represented was one of the four more spotted or lightest larvæ before hybernation, and the same relationship towards the other divisions of this series (III) was maintained during and after hybernation. The painting was finished on May 11th.

6. Larva, nearly mature in the last stage, showing the effect reddish-brown stems of bramble before hybernation. During and after hybernation the larva was placed in an environment of black-barked twigs (III, J). It had been one of the uniform brown larvæ before the winter, and there is no reason for the belief that the black twigs introduced later produced any effect. The painting was finished on May 11th.

XIX.—*A Revision of the Old World Lymantriidæ in the National Collection.* By COLONEL CHARLES SWINHOE, M.A., F.L.S., etc.

THE order in which the genera and species of this Family are placed in this paper is the same as that in which they now stand in the National Collection.

In working out the material, I have gone through the whole of the accessible literature: I may have increased the synonomy somewhat by describing species that have been described before, but their careful descriptions will in any case be useful.

The difficulties to be overcome in examining literature published in German, Dutch, Swedish, and French is much increased by the extraordinary system now prevailing in the formation of indices to the various scientific serials. With the exception of the "Tring Journal," the "Journal of the Bombay Natural History Society" (and perhaps one or two others), all the scientific periodicals have generic indices: this may be sufficient for mammalia, etc., where the genera are so few you can almost count them on your fingers; but for entomological workers such indices are merely an aggravation, and are absolutely useless with so large a number of genera. In working out small insects mistakes in the reference of species to genera are very liable to be made, and it is next to impossible to decide with any accuracy the genus in which an author has put the species one is looking for. The result of this is that in working out references it becomes necessary to plod through the papers of each writer, species by species.

I have found it necessary to sink a number of so-called genera, especially under the well-known genus *Dasychira*; and though I have twice examined every type specimen of every one of these genera, I can detect no distinctive points in any of them sufficient to differentiate it.

Both sexes of typical *Dasychira* have peculiar dorsal tufts of hairs on the abdomen, and a second characteristic is the enlarged and truncate formation of the anal segment of the abdomen, especially noticeable in the female.

Sir George Hampson, in his able work on the Moths of India, has included in this genus, under separate sections, moths otherwise agreeing, but without these particular characteristics, and I have followed him; but I should here point out that the species without dorsal tufts on the abdomen have likewise the anal segments pointed in both sexes, and that therefore these sections are to that extent divergent from the type. I have, however, been content to separate merely into sections those species with tufts and those without, as a guide for future workers.

The species of the Australian genus *Anthela* = *Colussa* = *Darala* = *Newmania* differ in the neuration of the hind-wings from typical *Lymantriidæ*; veins 7 and 8 are divergent from base, and never approximate at any point of the cell. In one species, *Anthela* (*Colussa*) *varia*, the type of the genus *Colussa*, these veins are united by a strong bar. This disposition of the veins 7 and 8 of the hind-wings is the same as in the *Eupterotidæ*; but vein 5 of both wings rises below the middle of the discocellulars, whereas in *Eupterotidæ* it should arise from, or from above the middle. This Australian genus therefore appears to claim a place for itself intermediate between the true *Lymantriidæ* and the *Eupterotidæ*, and though included in the former in this paper, must be considered as partially abnormal.

Genus Dendrophleps, Hmpsn., Moths, India, i, p. 491 (1892).

Dendrophleps semihyalina.

Dendrophleps semihyalina, Hmpsn., l. c.

1 ♂, Khasia Hills (type). 1 ♀, Sikhim.

Genus Caragola, Moore, Lep. Atk., p. 46 (1879).

Caragola impressa.

Leucoma impressa, Snellen, Tijd. v. Ent., xx, p. 8, pl. 1, f. 1 (1877).

Redoa impressa, Kirby (part), Cat. Moths, i, p. 435 (1892).

1 ♀, Sandakan. 1 ♀, Fergusson Isl.

Snellen's type came from Java. It is just as distinct from *cygna*, Moore, as *vinaria*, Moore, is from *dica*, Swinh.; I have both sexes from Java and Amboina; the male has acute fore-wings like the males of *ochripes*, Moore.

CARAGOLA RINARIA.

Redoa rinaria, Moore, Cat. Lep. E. I. C., ii, p. 336 (1859).
Caviria rinaria, Hmpsn. (part), Moths, India, i, p. 490 (1892).
Leucoma margaritacea, Snellen, Tijd. v. Ent., xxix, p. 35, pl. 1, f. 2, 2a (1886).
Arctornis snelleni, Kirby, Cat. Moths, i, p. 432 (1892).

1 ♂, Sumatra. 3 ♂, 1 ♀, Java, including the type. Snellen's type came from Sumatra.

CARAGOLA DICA.

Redoa dica, Swinh., Trans. Ent. Soc., 1891, p. 478.
Caviria rinaria, Hmpsn. (part), Moths, India, i, p. 490 (1892).

1 ♀, Khasia Hills (type).

I do not think the sinking of this form to the Island species is justifiable: *dica* is much larger, and has rounded hind-wings, whereas the hind-wings of *rinaria* are more or less square, the margin being straight from vein 2 to vein 7; I have both sexes from the Khasia Hills in my own collection.

CARAGOLA CLARA.

Redoa clara, Walker, xxxii, 343 (1865).
Caviria clara, Hmpsn., Moths, India, i, p. 490 (1892).

1 ♂, Hong Kong. 3 ♂, 5 ♂, Sikhim, including the type.

CARAGOLA CYGNA.

Caviria cygna, Moore, P. Z. S., 1877, p. 601.
Caviria cygna, Hmpsn., Moths, India, i, p. 489 (1892).

1 ♂, Ceylon (type). 1 ♀, Andamans (type).

CARAGOLA MARIA.

Redoa maria, Kirby, Ann. Mag. N. H. (6), xviii, p. 383 (1896).

1 ♂, Mtzbe, E. Africa (type).

CARAGOLA SERICEA.

Stilpnotia sericea, Moore, Lep. Atk., p. 45 (1879).
Caviria sericea, Hmpsn., Moths, India, i, p. 490 (1892).

1 ♂, 3 ♀, Masuri. 2 ♂, 2 ♀, Sikhim, including the types. 4 ♀, Thibet. 4 ♀, Kashmir.

CARAGOLA OCHRIPES.

Stilpnotia ochripes, Moore, Lep. Atk., p. 45 (1879).
Cariria ochripes, Hmpsn., Moths, India, i, p. 490 (1892).
Dendrophleps semihyalina, ♀, Swinh. (nec Hmpsn.), Trans. Ent. Soc., 1895, p. 14.

1 ♂, Moupin, W. China. 1 ♀, Chin Hills. 1 ♀, Khasia Hills.

The type from Darjiling is in coll. Staudinger.

Genus LEUCOMA, Steph., Ill. Brit. Ent. Haust., ii, p. 64 (1829).

Redoa, Walker, iv, 826 (1855).
Kanchia, Moore, Lep. Ceylon, ii, p. 92 (1883).

LEUCOMA SUBMARGINATA.

Redoa submarginata, Walker, iv, 826.
Leucoma submarginata, Hmpsn., Moths, India, i, p. 487 (1892).
Redoa transiens, Walker, Journ. Linn. Soc. Lond., vi, p. 128 (1862).
Leucoma hipparia, Swinh., Ann. Mag. N. H. (6), xii, p. 214 (1893).

2 ♂, Sarawak, Borneo, including the type of *transiens*. 1 ♂, Sandakan. 1 ♂, Pulo Laut. 3 ♂, 1 ♀, Singapore, including the type of *hipparia*. 1 ♂, Selangor. 2 ♂, Fergusson Isl. 2 ♂, N. Guinea. 1 ♂, N. Ireland. 1 ♂, N. Britain. 2 ♂, 1 ♀, Java. 1 ♂, Chusan Isl. 1 ♂, Ichang, W. China. 1 ♂, 1 ♀, Darjiling. 2 ♂, 1 ♀, Cachar. 5 ♂, Trevandrum. 2 ♂, Ceylon. 1 ♂, Maulmein. 1 ♂, 1 ♀, Silhet (types). 2 ♂, Burma. 1 ♂, Andamans. 1 ♂, Nilgiri Hills.

LEUCOMA CYGNA.

Redoa cygna, Moore, P. Z. S., 1879, p. 401.
Redoa cymbicornis, Butler, Ill. Het., v, p. 48, pl. 89, f. 2 (1881).
Redoa nigricilia, Swinh., Trans. Ent. Soc., 1881, p. 478.

1 ♀, India (type). 2 ♀, Yokohama. 1 ♂, Pu-tsu-fong, China. 5 ♂, 1 ♀, Sikhim, including the type of *cymbicornis*. 1 ♀, Khasia Hills (type *nigricilia*). 1 ♀, Nilgiri Hills. 1 ♂, Andamans. 3 ♂, Penang. 1 ♂, Borneo. 1 ♂, Singapore. 2 ♂, Queensland.

LEUCOMA FLAVESCENS.

Redoa flavescens, Moore, P. Z. S., 1877, p. 600.
Leucoma flavescens, Hmpsn., Moths, India, i, p. 488 (1892).
Redoa sericea, Moore, l. c.

3 ♂, Andamans, including both types. 1 ♂, 1 ♀, Nilgiri Hills. 2 ♂, Travancore.

LEUCOMA PRUINOSA.

Leucoma pruinosa, Butler, Ann. Mag. N. H. (5), iv, p. 236 (1879).
Arctornis pruinosa, Kirby, Cat. Moths, i, p. 433 (1892).

1 ♀, Madagascar (type).

LEUCOMA NITIDA, nov.

♂, ♀. Palpi, fore-legs and frons orange ochreous; top of head, middle and hind legs, body and wings above and below pure white; antennæ with the shaft white, branches ochreous grey; thorax of the male suffused with orange ochreous; fore-wings with a beautiful silvery sheen, with thin longitudinal curved waves in certain lights; the first runs from base to apex, the second from hinder margin near base to outer margin above the middle, and the third from the middle of the hinder margin to outer margin below the middle. Costal line and cilia ochreous grey; hind-wings without the sheen and without any markings.

Expanse of wings ♂ $1\frac{8}{10}$, ♀ $2\frac{3}{10}$ inches.

♂ ♀, types, Old Calabar (*S. D. Crompton* and *F. W. Sampson*). 1 ♀, Ogove River. 1 ♀, Lagos (*H. Strachan*). 1 ♀, Sapele, River Niger. 1 ♀, Gold Coast (*W. H. Johnston*).

LEUCOMA LUTEIPES.

Stilpnotia luteipes, Walker, iv, 843, ♀ (1855).
Homœomeria luteipes, Kirby, Cat. Moths., i, p. 437 (1892).
Redoa lola, Schaus and Clements, Lep. Sierra Leone, p. 25, pl. 1, f. 4 ♂ (1893).
Redoa ogovensis, Holland, Ent. News, Phil., 1893, p. 63, pl. 3, f. 12, 13.

2 ♂, 2 ♀, Sierra Leone, including the type. 1 ♂, Old Calabar. 1 ♀, Ogove River.

There can be no doubt that *lola* is its male: the locality and description fit it exactly; and I have compared an example from Mr. Druce's collection, given him by Dr. Holland as *ogovensis*, with Walker's type: these are also identical.

LEUCOMA EGERINA.

Leucoma egerina, Swinhoe, Ann. Mag. N. H. (6), xii, p. 214 (1893).

4 ♂, 1 ♀, Singapore, including the type.

LEUCOMA MARGINALIS.

Redoa marginalis, Walker, Journ. Linn. Soc. Lond., vi, p. 128 (1862).

Leucoma marginalis, Swinhoe, Cat. Het. Mus. Oxon., i, p. 202 (1892).

1 ♂, Singapore. 3 ♂, Sarawak. 1 ♂, 1 ♀, Kuching.
The type from Sarawak is in Mus. Oxon.

LEUCOMA ALBA.

Arna alba, Brem., Bull. Acad. Pet., iii, p. 478 (1861).
Arna alba, Brem., Lep. Ost. Sib., p. 41, pl. 3, f. 18 (1864).
Leucoma alba, Leech, Trans. Ent. Soc., 1899, p. 143.
Redoa sinensis, Moore, Ann. Mag. N. H. (4), xx, p. 92 (1877).

3 ♂, 2 ♀, N. China, including Moore's type. 1 ♂, Shanghai. 1 ♂, 1 ♀, Fusan. 2 ♂, 1 ♀, Gensan.

LEUCOMA MOOREI.

Leucoma moorei, Leech, Trans. Ent. Soc., 1899, p. 143.
Redoa alba, Moore, Ann. Mag. N. H. (4), xx, p. 92 (1877) (preocc.).

1 ♀, Shanghai (Moore's type). 3 ♂, Ichang. 1 ♂, Chang Yang. 2 ♂, 1 ♀, Omeishan. 3 ♂, Moupin. 1 ♀, Wa-Shan.

LEUCOMA MINUTISSIMA, nov.

♂. Pure white: frons, pectinations of the antennæ, and the tarsi tinged with greyish ochreous: a very small black dot at the end of the cell of the fore-wings; otherwise the insect above and below is entirely without markings.

Expanse of wings $\frac{7}{10}$ inch.

Hab. SARAWAK, Borneo (*Wallace*).
I should think it is the smallest species of the genus; the example is in excellent condition.

LEUCOMA DIVISA.

Euproctis divisa, Walker, iv, 836 (1855).

1 ♂, Silhet (type). 1 ♂, Bhutan. 2 ♂, Donat Range, Burma. 5 ♂, 1 ♀, Singapore. 1 ♂, 1 ♀, Penang, 1 ♂, 1 ♀, Java. 2 ♂, Pulo Laut. 1 ♂, Sarawak.

Walker described two perfectly distinct moths as male and female of his species: I take his type to be the first one, following his description: it is a female from Nepal, a true *Euproctis*; the next is a male from Silhet, a *Leucoma*, and as the name is not preoccupied and his description is sufficient, it must stand.

Leucoma silhetica.

Penora silhetica, Walker, xxxii, 341 (1865).

1 ♂, Khasia Hills. 1 ♀, Silhet (type).

This is a common form in the Khasia Hills: it is almost completely hyaline, and is quite distinct from *dirisa*, which is well clothed in both sexes.

Leucoma diaphana.

Redoa diaphana, Moore, Lep. Atk., p. 46, no. 1051, ♂ (1879).

Redoa lactea, Moore, l. c., no. 1053 ♀.

4 ♂, 2 ♀, Darjiling, including both types. 1 ♂, Sikhim. 3 ♀, Bengal. 2 ♂, Kulu. 1 ♂, 1 ♀, Omeishan. 1 ♀, Moupin. 1 ♀, Kwei-Chow.

Leucoma pellucida, nov.

♂, ♀. White; palpi and top of head orange; frons white; antennæ and thorax tinged with orange in the males; wings very thinly clothed, almost hyaline; the costal line orange; cilia tinged with orange; a small, rather prominent, black mark in the middle of the discoidal vein of fore-wings; fore-legs orange, hind-legs white.

Expanse of wings ♂ $1\frac{7}{10}$, ♀ $2\frac{8}{10}$ inches.

Hab. Khasia Hills.

I have two from the same locality in my own collection; one I have had for some years unnamed.

Leucoma tiphia, nov.

♂, ♀. Antennæ black, the shaft speckled with white; palpi black with some ochreous hairs; frons with some ochreous hairs in the male; pectus ochreous in the male, and the thorax below covered with ochreous brown hairs; legs white; fore tibiæ striped with black in front in both sexes; head, body, and wings above and below pure white sparsely covered with shining scales, semi-hyaline; costal line of fore-wings black for one-third of its length from the base above and below, but below the whole costal space is also tinged with ochreous; no other markings.

Expanse of wings ♂ $1\frac{6}{10}$, ♀ $1\frac{8}{10}$ inches.

Hab. NAIROBI FOREST, KIKUYU, British E. Africa (*Crawshay*), 4 ♂, 1 ♀.

LEUCOMA USEBIA, nov.

♂. Antennæ black, shafts whitish; frons, fore-legs, and hind tibiæ ochreous; otherwise the insect is pure white without any markings whatever above or below; veins 6 and 7 of the hind-wings are on a long stalk.

Expanse of wings $1\frac{3}{10}$ inches.

5 ♂, Lake Nyassa (*de Jersey*).

LEUCOMA CROCIPES.

Cypra crocipes, Boisd., Faune Madag., p. 87, pl. 12, f. 2 (1833).

Cypra crocipes, Kirby, Cat. Moths, i, p. 438 (1892).

2 ♂, Madagascar.

LEUCOMA TAVETENSIS.

Leucoma tavetensis, Holland, Ent. Suppl., xxv, p. 93 (1895).

Antiphella telesilla, Druce, Ann. Mag. N. H. (7), iii, p. 469 (1889).

The type came from the Taveta Forest, Kilimanjaro (*Abbott*), and is in the U.S. Nat. Mus.: in the B. M. there is one male from the same locality (*Hannington*), and two males from Lagos (*Strachan*); there is no apparent difference between the Eastern and Western examples; Druce's type is from Zanzibar; it is rather larger than the continental examples, but otherwise identical.

LEUCOMA GRACILLIMA.

Leucoma gracillima, Holland, Ent. News, Phil., 1893, p. 64, pl. 3, f. 9.

1 ♂, Ogove River. 1 ♀, Old Calabar.

LEUCOMA VATA, nov.

♂. Antennæ and frons orange; legs white, orange-grey in front; head, body, and wings above and below silky white; costal line of fore-wings orange; no other markings; fore-wings rather long and narrow, the outer margin being longer than the hinder margin, the hinder angle well rounded.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. RIVER NIGER, Sapele (*F. W. Sampson*).

LEUCOMA RUFIMARGINATA, nov.

♂, ♀. Pure silky white; palpi and branches of antennæ, body beneath, and legs ochreous grey, the last with some dark brown spots; costa of fore-wings rufous; a spot of that colour at the end of the cell, and the outer margins and cilia of both wings rufous, except at the angles.

Expanse of wings ♂ 1 inch, ♀ $1\frac{1}{2}$ inches.

2 ♂, 1 ♀, Pulo Laut.

Allied to *L. submarginata*, Walker, but has no white frons, and no black and yellow spots and markings on the fore-legs.

LEUCOMA PRIMULA, nov.

♂, ♀. Palpi chestnut-brown, whitish beneath and on the inner sides; antennæ grey, the shafts pale primrose; frons dark chestnut-brown; legs, body, and wings above and below of a uniform pale primrose colour; fore-wings with the apical third of the costa and the outer margin, including the cilia, dark chestnut-brown, a small space just before the hinder angle not coloured; hind-wings with the outer marginal line and cilia from a little before the middle to near the anal angle similarly coloured; a very small brown dot in the middle of the discoidal vein of the fore-wings. The fore-wings are broad, and the hinder margin is nearly as long as the costa.

Expanse of wings ♂ $1\frac{4}{10}$, ♀ $\frac{8}{10}$ inches.

Hab. SANGIR (*Doherty*).

LEUCOMA MICACEA.

Redoa micacea, Walker, Journ. Linn. Soc. Lond., vi, p. 127 (1862).

Leucoma micacea, Swinhoe, Cat. Het. Mus. Oxon., i, p. 203 (1892).

4 ♂, Sarawak, Borneo, including the type.

LEUCOMA FLORA, nov.

♂. Palpi and antennæ pale chestnut ochreous, shaft of antennæ grey speckled with white; frons pure white; top of head white; space between the antennæ chestnut-brown; fore-legs with brown patches, tarsi ochreous; body and wings white tinged with primrose; thorax and fore-wings slightly irrorated with chestnut-brown atoms; a suffused lunular mark of that colour at the end of cell; the costa near apex and the upper middle portion of the outer marginal space both rather darkly suffused with the same colour; on the hind-wings, which are otherwise unmarked, there are triangular marks on the outer margin, and the cilia are of paler chestnut-brown.

Expanse of wings $1\frac{1}{10}$ inches.

Pulo Laut, 2 ♂ (*Doherty*); Sandakan, 1 ♂ (*Pryer*).

LEUCOMA DISCIRUFA, nov.

Antennæ, palpi, head, body, and fore-wings above ochreous fawn colour; fore-wings with a large ochreous red mark at the end of the cell; the costal margin and outer marginal line and cilia of both wings of the same colour; hind-wings with the costal half whitish, the lower half the same colour as the fore-wings; a few minute black irrorations in the fore-wings; underneath, body, legs, and wings pale yellow, nearly white, the wings with the margins and cilia red.

Expanse of wings 1 inch.

Hab. PULO LAUT (*Doherty*).

LEUCOMA SATURNIOIDES.

Laelia saturnioides, Snellen, Tijd. v. Ent., xxii, p. 105, pl. 8, f. 7, 7a—c (1879).

Leucoma saturnioides, Snellen (part), Iris, viii, p. 139 (1895).

The type came from Celebes: it is in the B. M. from Singapore.

The venation is well figured by Snellen; it is not quite typical, but very nearly so, vein 5 arising a little above the lower end of the cell instead of from it: it certainly is not a *Laelia*. Snellen says *Leucoma fenestrata*, Hmpsn., Ill. Het., ix, p. 78, pl. 160, f. 6 ♀ (1893), is the same thing; but in this I am convinced he is wrong; Hampson's and Snellen's figures are both good; both the types are females, so is the example of *saturnioides* from Singapore; and they appear to me to be quite distinct one from the other.

LEUCOMA FENESTRATA.

Leucoma fenestrata, Hmpsn., Moths, India, i, p. 489 (1892).

Macrauzata fenestrata, Hmpsn., Ill. Het., ix, p. 78, pl. 160, f. 16 (1893).

1 ♀, Ceylon (type).

LEUCOMA SUBVITREA.

Leucoma subvitrea, Walker, xxxii, 344 (1865).
Kanchia subvitrea, Moore, Lep. Ceylon, ii, p. 93, pl. 113, f. 5 (1883).

1 ♂, 4 ♀, Hong Kong. 1 ♀, Bengal (type).

LEUCOMA L-NIGRA.

Bombyx l-nigrum, Müll., Faun. Fridr., p. 40 (1764).
Bombyx v-nigrum, Fabr., Syst. Ent., p. 577 (1775).
Leucoma v-nigra, Steph., Ill. Brit. Ent. Haust., ii, p. 64, pl. 16, f. 2.

♂, ♀, Tokio, Japan (*Pryer*), and many European examples.

LEUCOMA COMMA.

Ocinara comma, Hutton, Trans. Ent. Soc., 1865, p. 330.
Leucoma comma, Hmpsn. (part), Moths, India, i, p. 487 (1892).

2 ♀, Masuri, including the type. 1 ♀, Darjiling.

LEUCOMA AURIFRONS.

Euproctis aurifrons, Möschler, Abh. Senck. Ges., xv, p. 75, f. 3 (1887).

1 ♀, Eb Urru, British E. Africa (*Betton*).

Möschler's type, a male, came from Aburi on the Gold Coast. Though he called it a *Euproctis* the venation of his figure is that of a *Leucoma*; and as his description corresponds exactly with the female *Leucoma* from Eb Urru I feel sure my identification is correct, though the localities are very far apart; but we have many instances of East and West Africa having the same forms of moths.

Genus CREAGRA, Wallengr., K. Vet. Akad. Handl., (2), v, (4), p. 38 (1865).

CREAGRA DEALBATA.

Liparis dealbata, Herr.-Schäff., Ausser-Eur. Schmett, i, f. 111 (1854).
Creagra dealbata, Wallengr., l. c.
Creagra dealbata, Kirby, Cat. Moths, i, p. 460 (1892).

12 ♂, 1 ♀, South Africa. 2 ♂, 2 ♀, Knysna.

Genus CALTURA, Moore, P. Z. S., 1879, p. 401.

CALTURA ALBA.

Caltura alba, Moore, l. c.
Caltura alba, Moore, Lep. Ceylon, ii, p. 98, pl. 114, f. 2, 2a, b (1883).
Cispia alba, Hmpsn., Moths, India, i, p. 493 (1892).

3 ♂, 1 ♀, Ceylon.
The type, from Ceylon, is in Mus. Dublin.

CALTURA FLAVIPES.

Cispia flavipes, Hmpsn., Moths, India, i, p. 493 (1892).

1 ♀, Sikhim (type).

CALTURA PUNCTICILIA.

Naxa puncticilia, Moore, P. Z. S., 1872, p. 575.
Cispia puncticilia, Hmpsn., Moths, India, i, p. 493 (1892).
Caltura puncticilia, Swinhoe, Cat. Het. Mus. Oxon., i, p. 204 (1892).

1 ♂, 1 ♀, Nilgiri Hills (co-types).
The types from the Nilgiri Hills, both males, are in Mus. Oxon.

Genus NAROMA, Walker, vii, 1744 (1856).
Hysibada, Walker, xxxii, 497 (1865).
Zarfa, Walker, Proc. Nat. Hist. Soc. Glasg., i, p. 338 (1869).

NAROMA SIGNIFERA.

Naroma signifera, Walker, vii, 1744 (1856).
Naroma signifera, Kirby, Cat. Moths, i, p. 716 (1892).
Hysibada varipes, Walker, xxxii, 498 (1865).
Zarfa lunifera, Walker, Proc. Nat. Hist. Soc. Glasg., i, p. 339.

1 ♂, Sierra Leone (type). 2 ♂, Accra. 2 ♂, Old Calabar. 1 ♂, 2 ♀, Natal, including type of *varipes*. 1 ♀, Congo (type *lunifera*). 5 ♂, 2 ♀, South Africa. 1 ♂, Uganda. 1 ♂, S. Nigeria.

Genus HIMALA, Moore, Lep. Atk., i, p. 57 (1879).

HIMALA ARGENTEA.

Redoa argentea, Walker, iv, 827 (1855).

Himala argentea, Moore, l. c.
Himala argentea, Butler, Ill. Hep., v, p. 49, pl. 89, f. 6 (1881).
Dasychira ilita, Moore, Cat. Lep. E. I. C., ii, p. 341 (1859).

1 ♂, Kangra. 1 ♂, Dalhousie. 1 ♂, Dehra Doon. 1 ♂, 1 ♀, Darjiling, including Moore's type ♀. 1 ♂, Assam (type).

Genus Gazalina, Walker, xxxii, 398 (1865).
Oligoclona, Felder, Reise Nov., pl. 94, f. 10 (1868).

Gazalina apsara.

Dasychira apsara, Moore, Cat. Lep. E. I. C., ii, p. 341 (1859).
Gazalina venosata, Walker, xxxii, 398.
Oligoclona nervosa, Felder, l. c., pl. 95, f. 8.

1 ♀, Subathu. 1 ♀, Dalhousie. 1 ♂, Dharmsala. 1 ♀, North India (type). 1 ♂, 1 ♀, N.E. Himalayas. 5 ♂, 7 ♀, Sikhim, including Walker's type.

Gazalina chrysolopha.

Liparis chrysolopha, Kollar, Hüg. Kasch., iv, p. 470 (1844).
Dasychira antica, Walker, iv, 867 (1855).
Gazalina antica, Butler, Ill. Het., v, p. 49, pl. 89, f. 4 (1881).
Oligoclona chordigera, Felder, Reise Nov., pl. 94, f. 10 (1868).

1 ♂, N. India (type *antica*). 1 ♂, Dalhousie. 1 ♂, 1 ♀, Murree. 1 ♂, 1 ♀, Dharmsala. 1 ♀, Kangra. 8 ♂, 2 ♀, Sikhim. 1 ♂, 1 ♀, Washan. 1 ♂, Chang Yang. 1 ♂, Pu-tsu-fong. 1 ♂, Kwei-chow.

Gazalina intermixta.

Gazalina intermixta, Swinhoe, Ann. Mag. N. H. (7), vi, p. 306 (1900).

1 ♂, Jaintia Hills.

A very distinct form; the wings are much shorter than the wings of *chrysolopha*, the bands more erect, the inner band almost upright and not oblique; I have a nice series of both sexes.

Genus Ivela, nov.

Palpi short, covered with hair, last joint depressed; abdomen cylindrical, of male slender, just reaching the end of hind-wings in both sexes; antennæ bipectinate, the pectinations ciliated; fore-wings with the costa slightly arched, apex rounded, outer margin convex, not oblique, hinder margin slightly rounded, nearly as long as the costa, making the wing somewhat triangular; vein 2 from middle of cell, 3 from one-sixth before end, 4 and 5 from end, discoidal angled inwards, 6 from upper end, 7, 8, and 9 stalked from end of cell, 10 from one-third before end, 11 from a little beyond the middle. Hind-wings rounded, 2 from beyond middle, 3 from one-sixth before end of cell, 4 and 5 from lower end, their origins not quite touching, discoidal with the lower arm produced and angled, its upper portion erect, 6 and 7 on a short stalk.

Type, *Ivela auripes* (*Leucoma*), Butler, from Japan.

Ivela auripes.

Leucoma auripes, Butler, Ann. Mag. N. H. (4), xx, p. 402 (1877).
Leucoma auripes, Butler, Ill. Het., ii, p. 9, pl. 24, f. 1 (1878).
Sitvia denudata, Swinhoe (nec Walker), Cat. Het. Mus. Oxon., i, p. 202 (1892).

8 ♂, 5 ♀, Japan, including the type. 1 ♂, Omeishan, W. China.

Genus Stracena, nov.

♀. Palpi short, upturned, and hairy; antennæ bipectinate with cilia and fine spines at the ends of the branches; fore-wings long, rather narrow, costa arched before apex, which is rounded, outer margin curved, oblique, hinder angle rounded, hinder margin nearly straight; vein 2 from near middle of cell, 4 and 5 from lower angle, 3 from half-way between 2 and 4, discoidal angled inwards, 6 from upper angle of cell, 7, 8, 9, and 10 stalked, 11 from one-third before end of cell; hind-wings with the outer margin rounded; vein 2 from one-third before end of cell, 3, 4, and 5 from end, but not touching each other at their origin; discoidal having its lower half produced and angled, its upper portion erect; vein 6 and 7 from upper angle.

Type, *S. fuscivena,* nov.

Stracena fuscivena, nov.

♀. Antennæ, palpi, and legs black; head, frons, pectus, and shoulders ochreous; thorax, abdomen, and wings dull white, tinged slightly with grey, the costa of fore-wings tinged with ochreous;

costal line, the median vein, discoidal, and veins 1, 2, 3, 4, 5, 6 and 7 brown; hind-wings with the veins grey near the outer margin; both wings are semi-hyaline, and have very minute grey irrorations; no other markings.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. RIVER NIGER, Sapele, 5 ♀ (*Sampson*).

STRACENA PROMELÆNA.

Sulychra promelæna, Holland, Ent. News, Phil., iv, p. 61, pl. 3, f. 11 (1893).

1 ♀ from R. Gaboon.

Genus SAPELIA, nov.

♂, ♀. Palpi upturned and hairy, very short in the female; antennæ bipectinated, with cilia and fine spines at the ends of the branches; fore-wings with the costa nearly straight but rounded before apex, which is also rounded, the outer margin curved, not very oblique, but nearly as long as the costa and rounded at the hinder angle, the hinder margin also rounded; vein 2 from middle of cell, curved hindwards in its middle, 4 from angle of cell, 3 from half-way between 2 and 4, 5 from a little above the angle, discoidal angled inwards, 6 from upper angle, 7, 8 and 9 stalked, 10 from just before end of cell, 11 from one-third; hind-wings rounded, vein 2 from a little beyond middle of cell, 3 from a little before end, 4 and 5 from the end, but their origins not quite touching, discoidal angled inwards, 6 and 7 stalked, the stalk about half the length of the veinlet.

Type, *Sapelia limpida*, nov.

SAPELIA LIMPIDA, nov.

♂, ♀. Antennæ black, body above and below, legs and wings pure white; wings of the male very thinly clothed, of the female hyaline; costa of fore-wings and veins of both wings more or less covered with ochreous scaling, making them somewhat prominent; the male has a grey dot at the lower extremity of the end of the cell; no other markings.

Expanse of wings ♂ $1\frac{6}{10}$, ♀ $2\frac{3}{10}$ inches.

Hab. RIVER NIGER, Sapele (*Sampson*).

SAPELIA FLAVIPECTUS, nov.

♀. Like *limpida*, but the antennæ are only blackish at the tips, the rest being yellowish; the head, frons, entire body below, and femora are bright yellow, the tibiæ and tarsi white; the veins of the wings are more prominent and more ochreous, and veins 6 and 7 of the hind-wings are on a long stalk; in the other forms of this genus the stalk is short.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. SAPELE, Niger River (*Sampson*).

Genus SITVIA, Walker, xxxii, 387 (1865).
Kettelia, Butler, Trans. Linn. Soc. Lond. (2), i, p. 560 (1879).

SITVIA DENUDATA.

Sitvia denudata, Walker, xxxii, 388.
Kettelia lowii, Butler, l. c.

1 ♂, Malacca. 1 ♀, Penang. 5 ♂, 1 ♀, Borneo, including type of *lowii*.

Walker's type from Malacca is in Mus. Oxon.

Genus OLAPA, Walker, iv, 823 (1855).
Antiphella, Walker, vii, 1743 (1856).

OLAPA FLABELLARIA.

Phalæna flabellaria, Fabr., Mant. Ins., ii, p. 188 (1787).
Liparis crocicollis, Herr.-Schäff., Ausser-Eur. Schmett., i, f. 110 (1854).
Olapa temperata, Walker, iv, 823.
Antiphella vecontia, Druce, Ann. Mag. N. H. (7), iii, p. 469 (1899).

7 ♂, 10 ♀ from Abyssinia, Knysna, Natal, and the Cape. Druce's type came from E. Africa; it is smaller than usual, but one of the Natal examples is still smaller.

OLAPA ARGENNA.

Cypra argenna, Mab., Ann. Soc. Ent. Fr., lviii, p. 725 (1899).

1 ♂, Madagascar.

Mabille does not give the sex of his type, neither does he give the measurement, but his description exactly corresponds with this example; it is a true *Lymantrid*, and not a *Cypra*, Boisd. = *Cozistra*, Walker, the type of which, *delicatula*, Boisd., is a *Boarmid*, as shown in my Memoir on the Geometers in the National Collection, Trans. Ent. Soc. Lond., 1902, p. 633.

OLAPA (?) ATRINOTATA.

Antiphella atrinotata, Butler, P. Z. S., 1896, p. 854, pl. 43, f. 5.

1 ♂, Nyassaland (type).

This species does not appear to belong to this genus, but as Sir George Hampson is writing a paper on the moths of Africa south of the Zambesi, I leave it to him to determine its genus.

Genus OGOA, Walker, vii, 1763 (1855).

OGOA SIMPLEX.

Ogoa simplex, Walker, vii, p. 1764, ♀.

1 ♂, 1 ♀, Natal, including the type. 3 ♂, Brit. E. Africa.

Genus CROPERA, Walker, iv, 825 (1855).

CROPERA TESTACEA.

Cropera testacea, Walker, iv, 826, ♀.

1 ♂, 2 ♀, Brit. E. Africa. 5 ♂, 6 ♀, Natal and Cape Colony, including the type.

CROPERA ADSPERSA.

Liparis adspersa, Herr.-Schäff., Ausser-Eur. Schmett., f. 109 (1854).
Laelia prolixa, Wallengr., Wien. ent. Mon., iv, p. 162 (1860).

6 ♂, Natal.

CROPERA FULVINOTATA.

Olapa fulvinotata, Butler, P. Z. S., 1893, p. 678.

5 ♂, Zomba, including the type. 7 ♂, 1 ♀, S. Africa.

Genus CROREMA, Walker, iv, 811 (1855).

CROREMA MENTIENS.

Crorema mentiens, Walker, iv, 811.
Cispia (?) *obliqua*, Walker, vii, 1734 (1856).
Euproctis ampla, Walker, xxxii, 346 (1865).

1 ♂, 1 ♀, Old Calabar. 4 ♂, 3 ♀, Sierra Leone, including all three types. 1 ♀, S. Nigeria. 1 ♂, Gold Coast.

Genus Topomesa, Walker, xxxv, 1921 (1866).

Topomesa subinanis.

Topomesa subinanis, Walker, xxxv, 1921.
,, ,, Hmpsn., Moths, India, i, p. 469 (fig.), (1892).

2 ♂, Java, including the type. 1 ♀, Borneo. 2 ♂, Singapore. 2 ♂, Tenasserim.

Topomesa discolor.

Topomesa discolor, Hmpsn., Moths, India, iv, p. 490 (1896).
2 ♂, Ceylon, including the type.

Genus Cobanilla, Moore, Lep. Ceylon, ii, p. 120 (1883).

Cobanilla marginata.

Cobanilla marginata, Moore, l. c., p. 121, pl. 124, f. 4.
2 ♂, Ceylon, including the type.

Genus Porthesia, Steph., Ill. Brit. Ent. Haust., ii, p. 65 (1829).
Chionophasma, Butler, Trans. Ent. Soc., 1886, p. 384.

Porthesia similis.

Phalæna similis, Fuessl., Verz. Schweiz. Ins., p. 35 (1775).
Bombyx chrysorrhœa, Esper. Schmett., iii, pl. 39, f. 1, 2 (1785).
Bombyx auriflua, Hübn., Bomb., f. 68, 69 (1800).
9 ♂, 5 ♀, Japan and Corea. 1 ♂, Shanghai. 3 ♂, 1 ♀, W. China. Besides many European examples.

Porthesia virguncula.

Euproctis virguncula, Walker, iv, 836 (1855).
Euproctis marginalis, Walker, vii, 1731 (1856).
3 ♂, 5 ♀, N. India, including both types. 2 ♂, 2 ♀, Kutch. 1 ♀, Trevandrum. 3 ♂, 2 ♀, Burma. 4 ♂, 3 ♀, Java. 1 ♂, Sumatra.

Porthesia paradoxa.

Chionophasma paradoxa, Butler, Trans. Ent. Soc., 1886, p. 385, pl. 9, f. 2, ♀ (1886).
Porthesia panabra, Turner, Tr. Roy. Soc., S. Austral., 1902, p. 176.
2 ♂, 3 ♀, Queensland, including the type. 2 ♂, 1 ♀, Bondin Island. 2 ♀, Damma Island. 1 ♀, Queen's Island.

Hardly separable from *virguncula*, but uniformly smaller. One of the males from Queensland was received from Dr. Turner as *panabra*.

Porthesia galactopis.

Porthesia galactopis, Turner, Tr. Roy. Soc., S. Austral., 1902, p. 176.

2 ♂, 1 ♀, Queensland.

Porthesia enthysana.

Porthesia enthysana, Turner, Tr. Roy. Soc., S. Austral., 1902, p. 175.

1 ♂, Queensland (*Turner*).

Porthesia mixta.

Porthesia mixta, Butler, Ann. Mag. N. H. (5), ix, p. 88 (1882).
Leucoma mixta, Kirby, Cat. Moths, i, p. 445 (1892).

2 ♀, Tasmania, including the type.

Porthesia fimbriata.

Teara fimbriata, Lucas, Proc. Linn. Soc., N. S. W., 1891, p. 285.
Porthesia fimbriata, Turner, Tr. Roy. Soc., S. Austral., 1902, p. 176.

2 ♂, Queensland (*Turner*).

Porthesia aliena.

Porthesia aliena, Butler, Trans. Ent. Soc., 1886, p. 386.
Leucoma aliena, Kirby, Cat. Moths, i, p. 445 (1892).

1 ♂, Peak Downs (type).

Porthesia melanosoma.

Porthesia melanosoma, Butler, Ann. Mag. N. H. (5), ix, p. 87 (1882).
Leucoma melanosoma, Kirby, Cat. Moths, i, p. 445 (1892).

1 ♂, Melbourne (type).

Porthesia nigrifinis, nov.

♀. Antennæ ochreous-grey, shafts white; head, body above and below, legs, and wings above and below pure white, without any markings. There is a very slight ochreous tinge on the thorax and the costal and basal portions of the fore-wings ; the last segment of the abdomen is black above and golden yellow below, and there is a black stripe underneath.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. KIKUYU, Machakos to Neugia (*Crawshay*).

The only African *Porthesia* in the National Collection, and, I believe, the first one recorded.

PORTHESIA PRODUCTA.

Euproctis producta, Walker, P. Z. S., 1863, p. 168.
Porthesia depauperata, Mab., Comptes-Rend. Soc. Ent. Belg., xxiii, p. xvii (1880).

1 ♂, 4 ♀, Madagascar, including the type.

PORTHESIA VARIA.

Nola varia, Saalm., Ber. Senck. Ges., 1880, p. 176.
" " Kirby, Cat. Moths, i, p. 372 (1892).

Hab. NOSSI BÉ.

Not in B. M.

PORTHESIA PULVEREA.

Porthesia pulverea, Hmpsn., Monograph Christmas Isl., p. 69, pl. 9, f. 9 (1900).

8 ♂, 6 ♀, Christmas Isl., including the types.

PORTHESIA IRRORATA.

Euproctis irrorata, Moore, Cat. Lep. E. I. C., ii, p. 347 (1859).
Leucoma irrorata, Kirby, Cat. Moths, i, p. 445 (1892).

1 ♀, Java (type).

PORTHESIA XANTHORRHŒA.

Liparis xanthorrhœa, Kollar Hugel's Kasch., p. 470 (1844).
Euproctis subdita, Moore, P. Z. S., 1879, p. 400.
Euproctis flavonigra, Moore, l. c., pl. 32, f. 11.
Euproctis subnigra, Moore, Lep. Atk., i, p. 48 (1879).

7 ♂, Punjab. 3 ♂, N. W. India. 1 ♂, Sultanpore. 2 ♂, Umballa. 1 ♂, Kangra. 2 ♂, Nepal, including type of *flavonigra*. 1 ♂, Jawar Hills. 1 ♂, Khasia Hills (type *subnigra*). 1 ♂, Travancore. 3 ♂, Ceylon, including type of *subdita*.

PORTHESIA LUTEA.

Bombyx lutea, Fabr., Syst. Ent., p. 574 (1775).
Porthesia lutea, Turner, Trans. Roy. Soc., S. Australia, 1902, p. 177.
Artaxa chrysophila, Walker, xxxii, 334 (1865).
Porthesia iobrota, Meyrick, Trans. Roy. Soc., S. Australia, 1891, p. 194.
Artaxa iobrota, Lucas, Proc. Linn. Soc., N. S. W. (2), vii, p. 251 (1892).

2 ♂, 1 ♀, Queensland. 3 ♂, Australia, including Walker's type. 1 ♂, St. Aignan, Louisiade Islands. 2 ♂, Kapaur, N. Guinea.

The Fabrician type and another are in the Banksian Cabinet, both females. *Artaxa varians*, Walker, doubtfully referred to this species by Turner, and *lucifuga*, Lucas, have vein 5 of the hind-wings present, and are true *Euproctis*.

PORTHESIA FULVONIGRA, nov.

♂ ♀. Antennæ blackish; palpi, frons, head, thorax, and fore-wings above ochreous; hind-wings black with the border broadly ochreous; abdomen black, anal tuft of female yellow; body below, legs and wings yellow; both wings with the interior portions suffused with black. The males somewhat vary; one has a great deal of blackish suffusion on the fore-wings, another has it slightly, and there is a melanistic variety entirely black above and below, the wings with some yellow in the cilia, the frons, palpi, and legs yellow.

Expanse of wings ♂ 1 inch, ♀ $1\frac{2}{10}$ inches.

Hab. GUADALCANAR ISLAND, Solomons (*Meek*), 4 ♂, 1 ♀.

PORTHESIA AURANTIACA.

Porthesia aurantiaca, Hmpsn., Moths, India, i, p. 485 (1892).

1 ♂, Sikhim (type).

PORTHESIA STIGMATIFERA.

Porthesia stigmatifera, Hmpsn., Moths, India, iv, App., p. 491 (1896).

1 ♀, Bhutan (type).

Genus EUPROCTIS, Hübn., Verz. bek. Schmett., p. 159 (1818).

Lacipa, Walker, iv, 790 (1855).
Artaxa, Walker, iv, 794.

Antipha, Walker, iv, 806.
Dulichia, Walker, iv, 809.
Lopera, Walker, iv, 919.
Arna, Walker, v, 1176 (1855).
Somena, Walker, vii, 1734 (1855).
Utidava, Walker, xxvi, 1689 (1862).
Cozola, Walker, xxxii, 390 (1865).
Adlullia, Walker, xxxii, 392.
Themaca, Walker, xxxii, 394.
Orvasca, Walker, xxxii, 502.
Bembina, Walker, xxxii, 505.
Microgymna, Wallgrn., K. Vet. Akad. Handl., 2 (v), 4, p. 38 (1865).
Gogana, Walker, xxxv, 1920 (1866) (preocc.).
Chærotricha, Felder, Reise Nov., pl. 98, Erk., p. 3 (1874).
Terphothrix, Holland, Psyche, vi, p. 474 (1893).

EUPROCTIS NEGRITA.

Euproctis negrita, Hmpsn., Moths, India, i, p. 471 (1892).

4 ♂, Sikhim.

The types ♂ ♀ from Sikhim are in coll. Elwes.

EUPROCTIS JOSIATA.

Orgyia josiata, Walker, xxxii, 326 (1865).
Artaxa josiata, Kirby, Cat. Moths, i, p. 453 (1892).
Chærotricha nobilis, Felder, Reise Nov., pl. 98, f. 17 (1868).

1 ♂, Celebes (type).

EUPROCTIS SUBNOBILIS.

Porthesia subnobilis, Snellen, Tijd. v. Ent., xxiv, p. 128 (1881).
Artaxa subnobilis, Kirby, Cat. Moths, i, p. 453 (1892).
Artaxa simulans, Butler, Ann. Mag. N. H. (5), xiii, p. 200 (1884).

1 ♀, Amboina (type *simulans*). 2 ♀, Key Island.

EUPROCTIS NIGRIBASALIS, nov.

♀. Palpi, head, fore part of thorax and shafts of antennæ orange colour; branches of antennæ, rest of thorax, and abdomen above and below black; pectus and legs pale yellow; wings nearly white, tinged faintly with primrose; a black spot at the end of the cell on fore-wings, and some slight blackish suffusion at the base; on the hind-wings nearly the entire basal half is black, in which the black cell spot can be traced ; the under-side is more distinctly primrose ; there is a black spot at the end of each cell, and nearly the entire basal half of both wings is suffused with black.

Expanse of wings $1\frac{7}{10}$ inches.

Hab. Kina Balu.

Euproctis renominata.

Charnidas uniformis, Hmpsn., Ill. Het., viii, p. 56, pl. 140, f. 4 (1891) (preocc.).
Euproctis renominata, Hmpsn., Moths, India, i, p. 471 (1892).

1 ♂, Nilgiri Hills (type).

Euproctis leucomelas.

Euproctis leucomelas, Walker, iv, 838 (1855).
Euproctis obsoleta, Walker (nec Fabr.), iv, 839.
„ „ Swinh., Cat. Het. Mus. Oxon., i, p. 192 (note) (1892).

A long series from Hobart, Tasmania ; N. Holland ; and Melbourne. The Fabrician *obsoleta*, the type of which is in the Banksian Cabinet, is a *Lælia*, and was misidentified by Walker ; *leucomelas* is a very variable insect.

Euproctis divisa.

Euproctis divisa, Walker, iv, 836 (1855).
„ „ Hmpsn., Moths, India, i, p. 471 (1892).

1 ♀, Nepal (type). 4 ♂, 7 ♀, Sikhim. 4 ♂, 2 ♀, W. China.

Euproctis latifascia.

Leucoma latifascia, Walker, iv, 831, ♀ (1855).
Euproctis latifascia, Hmpsn., Moths, India, i, p. 472 (1892).
Euproctis antica, Walker, iv, 835, ♂.
Euproctis postica, Walker, xxxii, 348, ♂ (1865).
Euproctis abdominalis, Moore, P. Z. S., 1888, p. 398, ♂.

1 ♂, N. India (type *postica*). 1 ♂, 1 ♀, Dharmsala (type *abdominalis*). 2 ♀, Kangra. 1 ♂, 2 ♀, Nepal (types *antica* and *latifascia*). 1 ♀, Sikhim. 1 ♀, Bhutan.

Euproctis subfasciata.

Artaxa subfasciata, Walker, xxxii, 332 (1865).
Euproctis subfasciata, Hmpsn., Moths, India, i, p. 472 (1892).

2 ♂, 2 ♀, Sikhim. 2 ♂, Assam. 1 ♀, Cachar. 1 ♂, 4 ♀, Nilgiri Hills.

The type from Darjiling is in coll. Staudinger.

EUPROCTIS SIGNATA.

Liparis signata, Blanch. Jacquemont, Voy. Inde, iv, Ins., p. 24, pl. 1, f. 7 (1844).

1 ♂, Murree. 1 ♂, Punjab Hills. 1 ♂, Skardo.

EUPROCTIS CHIONITIS.

Euproctis chionitis, Turner, Trans. Roy. Soc., S. Australia, 1902, p. 177.

2 ♂, 2 ♀, S. E. Australia. 1 ♂, 1 ♀, Queensland (*Turner*).

EUPROCTIS VIRGO, nov.

♂. Antennæ ochreous, shafts white; head, body, and wings above and below uniform white, rather dull in colour; anal tuft ochreous; a pale greyish suffusion on the costa of fore-wings above, and a dark brown costal stripe below, though the margin itself is white; fore-legs striped with brown on their inner sides, tarsi with grey marks.

Expanse of wings 1 inch.

1 ♂, Mandalay (type). 4 ♂ from Katha and Thyetmyo, Upper Burma, collected by the late Capt. E. Y. Watson, and 1 ♂, Rangoon.

EUPROCTIS TENUIS, nov.

♂ ♀. Antennæ, frons, head, thorax, and legs greyish-ochreous; shafts of antennæ white; wings white, thinly clothed; an ochreous costal stripe on fore-wings in the male only; a very slight tinge of ochreous all over both wings; no other markings.

Expanse of wings ♂ $\frac{8}{10}$, ♀ 1 inch.

Hab. SAMBAWA (*Doherty*).

There is also a male from Kapaur, N. Guinea, collected by Doherty, and a male from St. Aignan, one of the Louisiade Islands, collected by Meek, which do not appear to me to be separable from the Sambawa species, only differing in being without the ochreous tinge.

EUPROCTIS BIMACULATA.

Euproctis bimaculata, Walker, iv, 836 (1855).
Euproctis bigutta, Walker, iv, 837.

Euproctis lutescens, Walker, iv, 837.
Euproctis celsa, Walker, xxxv, 1915 (1866).

1 ♀, Shanghai. 5 ♂, 4 ♀, W. China. 1 ♂, India (type *lutescens*, ♂). 1 ♂, Poona. 2 ♂, 1 ♀, Kanara, including type *bigutta*, ♂. 1 ♀, Nilgiri Hills. 1 ♀, Ceylon (type). 2 ♂, 1 ♀, Burma. 1 ♀, Philippines (type *celsa*).

EUPROCTIS ALBESCENS, nom. nov.

Euproctis immaculata, Moore, Trans. Ent. Soc., 1884, p. 358 (preocc.).

2 ♀, Sikhim, including the type. 1 ♂, Bhutan. 1 ♀, Java. 1 ♀, Levuka.

This immaculate white insect must be distinct from *bimaculata*.

EUPROCTIS TITANIA.

Euproctis titania, Butler, Ann. Mag. N. H. (5), iv, p. 237 (1879).
" " Kirby, Cat. Moths, i, p. 444 (1892).

1 ♂, 1 ♀, Madagascar (types).

EUPROCTIS LUNATA.

Euproctis lunata, Walker, iv, 837 (1855).
" " Butler, Ill. Het., v, p. 50, pl. 89, f. 9 (1881).

1 ♀, Subathu. 2 ♀, Kangra. 1 ♂, 2 ♀, Umballa. 1 ♂, 1 ♀, N. India (type). 1 ♀, Bengal. 4 ♂, Poona. 2 ♂, 2 ♀, Madras.

EUPROCTIS CONSOCIA.

Euproctis consocia, Walker, xxxii, 347 (1865).
Artaxa modesta, Schaus and Clem., S. Leone Lep., p. 26 (1893).

1 ♂, 1 ♀, Sierra Leone (type). 2 ♂, Brit. E. Africa. 6 ♂, 1 ♀, Machakos.

EUPROCTIS SEMISIGNATA.

Cispia semisignata, Walker, xxxii, 356 (1865).
Artaxa citrina, Moore, Ann. Mag. N. H. (4), xx, p. 344 (1877).
Artaxa leithiana, Moore, P. Z. S., 1879, p. 399, pl. 32, f. 9.
Artaxa erecta, Moore, l. c., p. 399, pl. 32, f. 6.

Artaxa brevivitta, Moore, l. c., p. 400, pl. 32, f. 10.

19 ♂, 11 ♀ from various parts of India, including all the types except *citrina*.

EUPROCTIS ILLANTA.

Euproctis illanta, Swinhoe, Trans. Ent. Soc., 1891, p. 138.

1 ♂, Poona, 1 ♀, Alibagh, Bombay (types).

A small pure white form, without any markings.

EUPROCTIS HOWRA.

Artaxa howra, Moore, Lep. Atk., ii, p. 51 (1879).
Artaxa rhoda, Swinhoe, Trans. Ent. Soc., 1891, p. 138.
Artaxa obsoleta, Hmpsn., Ill. Het., viii, p. 57, pl. 140, f. 12 (1891).

1 ♂, Calcutta (type). 1 ♂, N. Kanara (type *rhoda*). 1 ♂, Nilgiri Hills (type *obsoleta*). 1 ♂, Burma. 2 ♂, Andamans.

EUPROCTIS ENDOPLAGIA.

Euproctis endoplagia, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 295 (1897).

1 ♂, Khasia Hills (type). 1 ♂, Ichang. 1 ♂, Moupin.

EUPROCTIS PAUPERATA.

Euproctis pauperata, Leech, Trans. Ent. Soc., 1899, p. 138.

2 ♂, 2 ♀, Moupin, including the types.

EUPROCTIS ZEBOE.

Artaxa zeboe, Moore, Cat. Lep. E. I. C., ii, p. 350, pl. 9a, f. 7 (1859).

1 ♂, Java (type).

EUPROCTIS SULPHURESCENS.

Artaxa sulphurescens, Moore, P. Z. S., 1888, p. 399.

5 ♂, Subathu. 3 ♂, 2 ♀, Kangra, including the types. 1 ♀, Dharmsala. 1 ♂, Sikhim. 2 ♂, Sultanpore. 1 ♂, Burma.

EUPROCTIS MONTIS.

Artaxa montis, Leech, Entom., xxiii, p. 111 (1890).

2 ♂, Chang Yang, including the type. 1 ♀, Chia-kow-ho (type).

Euproctis inconcisa.

Artaxa inconcisa, Walker, xxxii, 332 (1865).

5 ♂, 4 ♀, Sikhim, including the type. 1 ♂, Sultanpore. 1 ♀, Khasia Hills.

Euproctis inconspicua.

Euproctis inconspicua, Leech, Trans. Ent. Soc., 1899, p. 133.

1 ♀, Kia-ting-fu (type). 1 ♀, Omeishan.

Euproctis venosa.

Artaxa venosa, Moore, Lep. Atk., p. 50, pl. 2, f. 5 (1879).

1 ♀, Tenasserim.

The type from Sikhim is in coll. Staudinger.

Euproctis fulvipuncta.

Euproctis fulvipuncta, Hmpsn., Moths, India, i, p. 474 (1892).

Lopera fulvipuncta, Hmpsn., Ill. Het., ix, p. 76, pl. 159, ff. 2–8; pl. 175, f. 14 (larva) (1893).

1 ♂, 4 ♀, Ceylon, including the types.

Euproctis bifascia.

Euproctis bifascia, Hmpsn., Ill. Het., viii, p. 58, pl. 141, f. 18 (1891).

1 ♀, Nilgiri Hills (type). 1 ♀, Travancore.

Euproctis idonea, nov.

♂. Antennæ (including shafts), palpi, frons, body above and below, and legs ochreous; wings above and below whitish, slightly tinged with ochreous, the fore-wings rather darker than the hind-wings, with the costal and hinder borders, the outer marginal line and cilia darker ochreous; two thin transverse bands, composed of blackish-brown atoms, antemedial and discal, both stopping short of the costa; under-side uniform pale ochreous white, the apical portion of the fore-wings tinged with fuscous; otherwise both wings are unmarked.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. Sherlock River, W. Australia (*Clement*); two examples.

Euproctis impuncta.

Lacipa impuncta, Butler, P. Z. S., 1898, p. 427, pl. 32, f. 6.

3 ♂, 5 ♀, Brit. E. Africa, including the types.

EUPROCTIS POSTINCISA.

Euproctis (?) *postincisa*, Moore, P. Z. S., 1879, p. 400, pl. 32, f. 5.

2 ♀, N. E. Bengal, including the type.

EUPROCTIS BIZONOIDES.

Lacipa bizonoides, Butler, P. Z. S., 1893, p. 677.

1 ♀, Zomba (type).

EUPROCTIS KARGALIKA.

Euproctis kargalika, Moore, Ann. Mag. N. H. (5), i, p. 231 (1878).

" " Moore, 2d. Yark. Miss. Lep., p. 7, pl. 1, f. 18 (1879).

1 ♂, 1 ♀, Yarkand. 1 ♂, 1 ♀, Tura. 1 ♂, 2 ♀, Samarkand. 2 ♀, Turkistan. 1 ♂, 1 ♀, Amur.

The types from Yarkand are in the Indian Museum, Calcutta.

EUPROCTIS NOBILIS.

Panthea (?) *nobilis*, Herr.-Schäff., Ausser-Eur. Schmett, f. 388 (1855).

Lopera nobilis, Kirby, Cat. Moths, i, p. 463 (1892).

1 ♂, Cape Colony. 1 ♀, Knysna.

EUPROCTIS GEMMATA.

Lacipa gemmata, Distant, Ann. Mag. N. H. (6), xx, p. 200 (1897).

1 ♂, 2 ♀, Natal.

The types, from the Transvaal, in coll. Distant.

EUPROCTIS OSTRA, nov.

♀. Fulvous above and below; legs striped with dark brown above, tarsi brown; fore-wings darker than hind-wings; orange spots on the hinder portion of the wings, showing indications of three transverse bands, subbasal, antemedial, and discal; five black spots from near the lower end of cell in a row towards apex, the outer orange spots connected with this row of black spots hindwards; under-side with the interior of the wing suffused with brown; no other markings.

Expanse of wings $1\frac{1}{10}$ inches.

1 ♀, Machakos (*Crawshay*) (type). 4 ♀, Kibanui, Brit. E. Africa (*Crawshay*).

It belongs to the group of *nobilis*, Herr.-Schäff., and the male has probably got the orange bands complete, the outer one running through the row of black spots.

EUPROCTIS QUADRIPUNCTATA.

Lacipa quadripunctata, Dew., L.-C. Akad., xlii, p. 67, pl. 3, f. 4 (1881).

Lacipa sexpunctata, Distant, Ann. Mag. N. H. (6), xx, p. 201 (1897).

Lacipa quinquepunctata, Distant, l. c. (7), i, p. 117 (1898).

5 ♂, 3 ♀, South Africa.

EUPROCTIS FLORIDA, nov.

♂. Antennæ grey, shafts white; palpi ochreous, black at the base; head and thorax white, pale yellow at the sides; abdomen yellow, with broad black segmental bands, anal tuft yellow; thorax beneath and legs grey, the latter striped with black; fore-wings silvery white; costal and outer marginal line yellow; two thin transverse orange bands, antemedial and discal; the former bent outwards above its middle, the latter nearly straight, from hinder margin one-fourth before the angle to the costa near the apex; spots deep black and prominent, one subbasal, below the costa, another at one-fourth, below the middle, three, with indications of a fourth, at the end of cell, two smaller spots on the interior margin of the outer orange band a little above its middle, and a submarginal row close to the margin; hind-wings pale yellowish without markings; under-side pale yellowish; fore-wings suffused with brown, hind-wings with a brown spot at end of cell.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. NAIROBI PLAINS, Kikuyu, Brit. E. Africa (*Crawshay*).

Allied to *E. quadripunctata*, Dewitz.

EUPROCTIS SUNDARA, nov.

♂. Antennæ ochreous grey, shafts white; palpi and frons dark ochreous orange, the former striped with black below; head orange, collar white; thorax orange in front; abdomen pale orange, the base and middle marked with grey; under-side of body and legs ochreous; tarsi brownish; wings white, not shining; fore-wings with the bands and spots bright orange; bands subbasal, antemedial, and discal, all more or less sinuous and outwardly curved; a row of somewhat triangular marginal spots of a darker orange than the bands, three (and indications of a fourth) similarly coloured smaller spots at the end of the cell; hind-wings with all but a broad outer marginal space suffused with pale blackish-brown; under-side white; fore-wings with all but the margins suffused with darker blackish-brown, and the hind-wings similarly suffused at the base.

Expanse of wings $\frac{9}{10}$ inch.

Hab. KATESA, Uganda, Brit. E. Africa (*Betton*).

EUPROCTIS GRACILIS.

Lacipa gracilis, Hopff., Peter's Reise Zool., v, p. 430, pl. 28, ff. 4, 5 (1862).

1 ♂, Brit. E. Africa. 1 ♀, Lake Nyassa.

EUPROCTIS PUBESCENS, nom. nov.

Lacipa pulverea, Distant, Ann. Mag. N. H. (7), i, p. 117 (1898) (preocc.).

4 ♂, Natal. 1 ♂, Zululand.

Pulverea is pre-occupied, Leech having employed the name in 1888 for a Chinese *Euproctis*.

EUPROCTIS PICTA.

Liparis picta, Boisd. Delagorgue, Voy. Afr. Austr., ii, p. 599 (1847).

3 ♂, Knysna. 1 ♂, Cape. 2 ♂, Natal.

EUPROCTIS DERSA.

Euproctis dersa, Moore, Cat. Lep. E. I. C., ii, p. 347 (1859).

1 ♂, 2 ♀, Java, including the types.

EUPROCTIS HOLOXUTHA.

Euproctis holoxutha, Turner, Trans. Roy. Soc., S. Australia, 1902, p. 178.

1 ♂, Adelaide River. 3 ♀, Townsville, Queensland.

Dr. Turner has not described the female; it resembles the male, except that the last four segments of the abdomen have broad black bands above, and the tip of the anal tuft is pale blackish, or dark grey; one example has the fore-wings dark deep orange like the male; the other two are paler, the fore and hind-wings being almost concolorous; it is quite distinct from *crocea*, Walker.

Euproctis pura, nov.

♂ ♀. Palpi, frons, pectus, under-side of body, and legs bright ochreous; antennæ, thorax, and fore-wings of a uniform clear lilac grey; abdomen above with the base and anal tuft ochreous, the remaining portions deep black; actually the four last segments are banded with black, the bands in the ♂ type specimen being quite close together, while in the others there are slight indications of ochreous segmental lines; the hind-wings are ochreous, without any markings in either of the males, and with some black suffusion in the abdominal marginal third in the female; the under-side is pale uniform ochreous, with no markings in the males, and black suffusion in the female as on upper side.

Expanse of wings ♂ $1\frac{1}{2}$, ♀ $2\frac{1}{10}$ inches.

1 ♂, 1 ♀, Townsville, Queensland, bred (*Dodd*). 1 ♂, Queensland (Raynor coll.).

I cannot find that this has been described by any one in Australia, probably because it stands in collections as *E. edwardsii*, Newman; but we have Newman's type, and in my opinion it is quite a different insect, being more nearly allied to *E. holoxutha*, Turner; Newman's type is well figured in Trans. Ent. Soc., 1856, pl. 18, f. 10, and any one comparing it with this beautiful Queensland species will see that it is quite different.

Euproctis edwardsii.

Teara edwardsii, Newm., Trans. Ent. Soc., 1856, p. 284, pl. 18, ff. 9, 10.

1 ♂, Australia (type).

Euproctis ochrea.

Gogana ochrea, Butler, Ann. Mag. N. H. (5), ii, p. 459 (1878).

Nygmia ochrea, Kirby, Cat. Moths, i, p. 449 (1892).

1 ♂, 1 ♀, Madagascar (types).

Euproctis crocea.

Teara crocea, Walker, xxxii, 355 (1865).

Nygmia crocea, Kirby, Cat. Moths, i, p. 449 (1892).

Artaxa arrogans, Lucas, Proc. Roy. Soc., Queensland, xv, p. 140 (1900).

Type ♀, Moreton Bay.

Lucas' types came from Cairns; his description exactly suits Walker's type.

EUPROCTIS PULVEREA.

Artaxa pulverea, Leech, P. Z. S., 1888, p. 623, pl. 31, f. 5.

2 ♂, 2 ♀, Satsuma, including the types. 2 ♂, Nagasaki. 2 ♂, 1 ♀, Loo Choo Islands. 1 ♂, Gensan. 1 ♀, Kiating-fu.

EUPROCTIS FLAVINATA.

Artaxa flavinata, Walker, xxxii, 331 (1865).
Euproctis flavinata, Hmpsn., Moths, India, i, p. 475 (1892).
Euproctis [illegible], Leech, Trans. Ent. Soc., 1899, p. 138.

1 ♂, 1 ♀, Shanghai, including the type. 2 ♂, Chusan. 1 ♂, Ningpo. 3 ♂, Chang Yang, including Leech's type. 1 ♂, Sarawak. 2 ♂, 1 ♀, Nilgiri Hills. 1 ♂, 1 ♀, Ceylon. 1 ♀, Maulmein.

EUPROCTIS ARGENTATA.

Euproctis argentata, Leech, Trans. Ent. Soc., 1899, p. 139.

1 ♂, Japan (type).

EUPROCTIS CALVA, nov.

♂ ♀. Antennæ, palpi, head, body, and fore-wings dark bright orange ochreous without any markings; hind-wings pale whitish ochreous, also without any markings.

Expanse of wings ♂ $1\frac{4}{10}$, ♀ $1\frac{7}{10}$ inches.

1 ♂, Sambawa (*Doherty*) (type). 1 ♀, Bali, Low Country (*Doherty*) (type). 1 ♀, Lombok.

The species is much like *E. holoxutha*, Turner, from Australia, but that species has a pale spot at the end of the cell of the fore-wings, the hind-wings are dark orange ochreous instead of being whitish, and the abdomen of the female has broad black bands.

EUPROCTIS FULVA.

Artaxa fulva, Butler, Ann. Mag. N. H. (5), x, p. 227 (1882).

1 ♂, Duke of York Isl. (type). 1 ♀, N. Britain. 1 ♂, Port Darwin. 1 ♀, Queensland.

EUPROCTIS VARIANS.

Artaxa varians, Walker, iv, 796 (1855).
Euproctis pygmaea, Moore, Lep. Atk., p. 48 (1879), (preocc.).

Artaxa pusilla, Moore, Lep. Ceylon, ii, p. 86, pl. 112, f. 4 (1883).

26 ♂, 14 ♀ from various parts of China, India and Ceylon, including the types of *varians* and *pygmæa*.

EUPROCTIS PYGMÆA.

Aroa pygmæa, Walker, iv, 793 (1855).

5 ♂, Sierra Leone, including the type. 3 ♂, Accra. 1 ♂, Congo. 1 ♂, Gold Coast. 1 ♂, Old Calabar.

EUPROCTIS SCOTOCHYTA.

Euproctis scotochyta, Turner, Tr. Roy. Soc., S. Austral., 1902, p. 178.

1 ♂, Adelaide River.

EUPROCTIS CERVINA.

Artaxa cervina, Moore, Ann. Mag. N. H. (4), xx, p. 345 (1877).

6 ♂, 3 ♀, Ceylon, including the type.

EUPROCTIS CHRYSOPHÆA.

Orgyia chrysophæa, Walker, xxxii, 324 (1865).
Notolophus chrysophæus, Kirby, Cat. Moths, i, p. 493 (1892).

Abyssinia, type ♂.

Veins 3 and 4 of the hind-wings are on an unusually long stalk.

EUPROCTIS MAZA, nov.

♂. Primrose yellow; body and legs without markings; fore-wings darker and brighter yellow; a large round subbasal red spot near the hinder margin; a broad red discal band, divided by the veins into elongated marks, acutely angled in its middle towards the outer margin, which it does not touch; it also stops short of the costa; there are likewise indications of a central band of scales darker than the ground colour of the wing, in two examples more pronounced than in the others.

Expanse of wings $\frac{8}{10}$ inch.

Four examples from Kapaur, N. Guinea (*Doherty*); it is closely allied to *E. titania*, Druce, from Fergusson Isl.; there is a female in the collection from N. Guinea with orange streaks between the veins, but with some of the transverse markings distinguishable ; it may be the female of this species.

EUPROCTIS DRUCEI, nom. nov.

Euproctis titania, Druce, Ann. Mag. N. H. (7), iii, p. 469 (1899), (preocc.).

2 ♂, Fergusson Island.

Titania is pre-occupied in the genus by Butler for a Madagascar *Euproctis*.

EUPROCTIS DANA, nov.

♂. Palpi, antennæ, head, body above and below, and legs brownish ochreous, paler and brighter below than above ; fore-wings much the same colour but inwardly suffused with brown, with two indistinct transverse pale lines beyond the middle rather close together, forming a band which in some examples is darker than the rest of the wing, as in *E. cervina*, Moore, from Ceylon : hind-wings blackish-brown ; cilia of both wings rather long and bright ochreous.

Expanse of wings $\frac{9}{10}$ inch.

6 ♂, Dana, Kashmir, June 1888 (*McArthur*).

Two of the examples have the fore-wings almost clear of the brownish suffusion and the transverse pale lines nearly obsolete, the insect thus looking very like *E. chrysophæa*, Walker, from Abyssinia.

EUPROCTIS LUCIFUGA.

Artaxa lucifuga, Lucas, Proc. Linn. Soc., N. S. W., 1892, p. 250.

Euproctis chrysophæa, Turner (nec Walker), Trans. Roy. Soc., S. Australia, 1902, p. 178.

3 ♂, Mackay, Queensland.

This is not the same as Walker's Abyssinian species, the type of which is now before me, and it is hardly to be expected that it would be ; the fore-wings of *chrysophæa* are perfectly smooth dull orange colour, and the under-side of both wings pale bright orange without any suffusions, whereas *lucifuga* has the fore-wings more or less covered with brown irrorations, which give the wings a fuscous orange appearance, and on the under-side both wings are dark brown with orange borders.

EUPROCTIS FULVISTRIATA, nov.

♂ ♀. Bright orange ochreous, with darker orange streaks in the interspaces, leaving the veins pale yellow ; two indistinct pale yellow transverse lines, medial and discal, both curving outwards; abdomen with whitish segmental lines, the last segment entirely whitish; anal tuft grey; legs with the tarsi whitish; under-side of wings pale ochreous yellow without any markings.

Expanse of wings ♂ $1\frac{3}{10}$, ♀ $1\frac{6}{10}$ inches.

Hab. St. Aignan Isl., Louisiade Group (*Meek*).

Euproctis arclada, nov.

♀. Much larger and darker in colour than *fulvistriata*; the anal end of the abdomen is narrowly white; the legs are orange ochreous without any white on the tarsi; the orange stripes on the fore-wings are similar, but the hind-wings are much darker than the fore-wings, being of a curious vermilion orange colour.

Expanse of wings $2\frac{2}{01}$ inches.

Hab. Woodlark Island (*Meek*).

Euproctis apicalis.

Bembina apicalis, Walker, xxxii, 505 (1865).

1 ♂, 2 ♀, Ceylon, including the type ♀.

Euproctis fervida.

Artaxa fervida, Walker, P. Z. S., 1863, p. 168.

„ „ Saalm., Lep. Madag., p. 185, pl. 7, ff. 115, 116 (1884).

1 ♂, Madagascar (type).

Euproctis subfuscula.

Artaxa subfuscula, Hmpsn., Ill. Het., viii, p. 56, pl. 140, ff. 5–11 (1891).

3 ♂, 3 ♀, Nilgiri Hills, including the type.

Euproctis terminalis.

Aroa terminalis, Walker, iv, 794 (1855).

9 ♂, 1 ♀, Natal, including the types.

Euproctis squamosa.

Lopera squamosa, Walker, iv, 920 (1855).

1 ♂, 1 ♀, Natal (types).

Euproctis punctifera.

Aroa punctifera, Walker, iv, 792 (1855).

Lopera gaudens, Walker, xxxii, 357 (1865).

1 ♂, Caffraria (type). 7 ♂, 1 ♀, Natal, including the type of *gaudens*.

Euproctis crocata.

Liparis crocata, Boisd. Delagorgue, Voy. Afr. Austr., ii, p. 599 (1847).
„ „ Herr.-Schäff., Ausser-Eur. Schmett., i, f. 112 (1854).

8 ♂, 2 ♀, S. Africa.

Euproctis pallida.

Cropera pallida, Kirby, Ann. Mag. N. H. (6), xviii, p. 384, pl. 19, f. 6 (1896).

1 ♂, Mozambique (type). 1 ♂, Mandala. 1 ♀, Delagoa Bay. 4 ♂, 5 ♀, Natal. 2 ♂, Mashonaland.

Euproctis monosticta.

Lopera monosticta, Butler, P. Z. S., 1898, p. 428, pl. 32, f. 7

1 ♂, Taru, E. Africa (type). 1 ♂, Machakos.

Euproctis fasciata.

Dulichia fasciata ♂, Walker, iv, 809 (1855).
Artaxa squamiplaga ♀, Walker, Proc. Nat. Hist. Soc., Glasgow, i, p. 338 (1869).
Euproctis susanna, Staud., Iris, vii, p. 258, pl. 9, f. 9 (1894).
Euproctis torrida ♂, Distant, Ann. Mag. N. H. (6), xx, p. 202 (1897).
Euproctis stellata ♀, Distant, l. c.

Twenty-two examples of both sexes from Natal, Zululand, Congo (including type of *squamiplaga*), Old Calabar, Sierra Leone (type), Aden, and Palestine.

Euproctis jonasi.

Aroa jonasi, Butler, Ann. Mag. N. H. (4), xx, p. 402 (1877).
„ „ Butler, Ill. Het., ii, p. 10, pl. 23, f. 11 (1878).

8 ♂, Japan, including the type.

Euproctis unipunctata.

Euproctis unipunctata, Leech, Trans. Ent. Soc., 1899, p. 136.

2 ♂, 5 ♀, W. China, including the types.

Euproctis trifasciata.

Artaxa trifasciata, Moore, Lep. Atk., p. 51 (1879).

1 ♂, Kangra. 2 ♂, Umballa. 1 ♂, Darjiling. 1 ♂, Assam (type). 2 ♂, Cachar. 1 ♂, Bhamo. 1 ♂, Chia-kow-ho.

Euproctis digramma.

Bombyx digramma, Guérin, Icon. R. Anim., Ins., p. 508, pl. 86, f. 4 (1830).

1 ♀, Hong Kong. 1 ♀, Bhutan. 1 ♀, Nepal. 2 ♂, 2 ♀, Ceylon. 1 ♂, Burma. 1 ♂, Sumatra. 3 ♂, 1 ♀, Java.

Kirby puts this as a synonym to *flava*, Fabr.; I have examined the two specimens in the Banksian Cabinet, put with a query as types; they are too faded and discoloured for purposes of identification.

Euproctis unimacula.

Artaxa unimacula, Moore, P. Z. S., 1879, p. 399.

1 ♂, 2 ♀, Khasia Hills, including the type.

Euproctis guttata.

Artaxa guttata, Walker, iv, 795 (1855).

1 ♀, N. India (type). 2 ♂, 1 ♀, Dharmsala. 1 ♀, Kangra.

Euproctis pelona.

Artaxa pelona, Swinhoe, Trans. Ent. Soc., 1891, p. 138.

2 ♂, Khasia Hills, including the type.

There is a form from Ceylon, which appears to me to be different from either *guttata* or *pelona*, but we want more material for decision.

Euproctis fraterna.

Artaxa fraterna, Moore, Lep. Ceylon, ii, p. 85 (1883).

2 ♂, Subathu. 1 ♂, Sahibgunge. 1 ♂, 1 ♀, Bombay. 5 ♂, 5 ♀, Ceylon, including the types.

Euproctis sastra.

Artaxa sastra, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

2 ♂, Java, including the type.

Euproctis incommoda.

Artaxa incommoda, Butler, Cist. Ent., iii, p. 11 (1882).

1 ♂, Madagascar (type).

EUPROCTIS COMMUTANDA, nom. nov.

Aroa immaculata, Butler, Ann. Mag. N. H. (5), x, p. 227 (1882) (preocc.).

1 ♂, Duke of York Island (type).

EUPROCTIS CHEELA, nov.

♂. Ochreous yellow; palpi, antennæ, head, and body dark bright chrome yellow; branches of the antennæ, thorax, and basal third of fore-wings suffused with pale brown; hind-wings pale yellow; under-side whitish, just tinged with yellow, a little blackish suffusion on fore-wings near the base on the hinder margin; no other markings above or below.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. SINGAPORE (*Ridley*).

EUPROCTIS MUNDA.

Euproctis munda, Walker, Journ. Linn. Soc. Lond., vi, p. 129 (1862).

2 ♂, Sarawak, including the type. 1 ♀, Nias. 1 ♂, Singapore.

EUPROCTIS CIVITTA.

Euproctis civitta, Swinhoe, Ann. Mag. N. H. (7), xii, p. 195 (1903).

1 ♂, Kuching, Borneo.

EUPROCTIS LODRA.

Euproctis lodra, Moore, Cat. Lep. E. I. C., ii, p. 349, pl. 9a, f. 6 (1859).
„ „ Semper, Het. Philipp., p. 471 (1898).

1 ♀, Java (type).

EUPROCTIS INTENSA.

Artaxa intensa, Butler, Ann. Mag. N. H. (4), xx, p. 402 (1877).
„ „ Butler, Ill. Het., ii, p. 10, pl. 23, f. 12 (1878).

6 ♂, 2 ♀, Central China. 6 ♂, 6 ♀, Japan. 5 ♂, 2 ♀, Corea.

EUPROCTIS VITELLINA.

Liparis vitellina, Kollar, Hugel's Kasch., iv, p. 471 (1844).
Euproctis gamma, Walker, vii, 1731 (1856).

Artaxa princeps, Walker, xxxii, 331 (1865).
Themaca comparata, Walker, xxxii, 395.

3 ♂, 1 ♀, Murree. 4 ♂, Dalhousie. 1 ♂, Dharmsala. 2 ♂, 3 ♀, Kangra. 2 ♂, 3 ♀, N. India, including all Walker's types. 1 ♂, 2 ♀, Sultanpore.

EUPROCTIS LIMONEA.

Chærotricha limonea, Butler, Cist. Ent., iii, p. 11 (1882).

1 ♂, Madagascar (type).

EUPROCTIS STRAMINEA.

Euproctis straminea, Leech, Trans. Ent. Soc., 1899, p. 135.

1 ♂, Chia-kow-ho (type). 1 ♀, Omeishan (type).

EUPROCTIS CONSPERSA.

Artaxa conspersa, Butler, Cist. Ent., iii, p. 117 (1882).
Euproctis conspersa, Leech, Trans. Ent. Soc., 1899, p. 140.

5 ♂, 7 ♀, Japan, including the type.

EUPROCTIS INEPTA.

Artaxa inepta, Butler, Ann. Mag. N. H. (5), xix, p. 223 (1887).

1 ♂, 2 ♀, Alu, including the types.

EUPROCTIS ANGULIGERA.

Artaxa anguligera, Butler, P. Z. S., 1886, p. 385.

1 ♂, Murree (type). 1 ♂, Andamans.

EUPROCTIS AMPHIDETA.

Euproctis amphideta, Turner, Trans. Roy. Soc., S. Australia, 1902, p. 177.

1 ♂, Townsville, Queensland.

Turner's description is not quite clear, but I think I have properly identified the insect, and the size and locality agree; moreover, as Turner says, this species has vein 7 of the fore-wings absent: but in the specimen before me the grey portion of the fore-wing is limited by a sordid pink band, which runs along the costa with a spot in its centre, then submarginally to the hinder margin, having a tooth outwards in the centre, not at "two fifths of termen" as Turner says.

EUPROCTIS PECLA, nov.

♂. Antennæ, palpi, head, thorax, and fore-wings dark bright yellow; two bands composed of blackish-brown, minute scales; first before the middle, interrupted but erect, consisting of a small piece on the hinder margin and a spot in the cell; the other discal, also erect, but dentated above the middle, with a prolonged tooth that reaches the outer margin; abdomen, hind-wings, and under-side whitish, slightly yellow-tinged, with no markings.

Expanse of wings 1 inch.

Hab. MILNE BAY, New Guinea (*Meek*).

EUPROCTIS LIVIA, nov.

♂. Pale yellow; palpi ochreous; antennæ grey; head and body pale yellow; fore-wings with chestnut grey bands covering nearly the whole surface; the first occupying more than the basal third, divided from the second by a thin yellow outwardly curved band; the second narrower, also with a narrow yellow outer margin, which is acutely bent outwards above the middle; there is a yellow spot on the costa, attached to it, and the outer portion of the wing is grey on the costa and at apex, and thinly on the outer margin; its inner portion yellow, with two prominent black spots at the end of the angle of the outer margin of the second band, these spots being joined together by a line of black scales; cilia pinkish-yellow; hind-wings and under-side pale yellow, nearly white, without markings.

Expanse of wings $\frac{9}{10}$ inch.

Hab. MILNE BAY, New Guinea (*Meek*).

EUPROCTIS BASALIS.

Artaxa basalis, Moore, Lep. Atk., p. 51, pl. 2, f. 16 (1879).

1 ♂, Khasia Hills.

The type from Darjiling is in coll. Staudinger.

EUPROCTIS BIDENTATA.

Euproctis bidentata, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 296 (1897).

1 ♂, Darjiling (type). 1 ♂, Yatong, Sikhim.

EUPROCTIS GENTIA.

Euproctis gentia, Swinhoe, Ann. Mag. N. H. (7), xii, p. 195 (1903).

1 ♀, Kina Balu (type).

EUPROCTIS SEXMACULA.

Euproctis sexmacula, Swinhoe, Ann. Mag. N. H. (7), xii p. 195 (1903).

1 ♀, Kina Balu (type).

EUPROCTIS MIRABILIS.

♂, ♀. Antennæ, palpi, frons, and head pale ochreous; palpi brown above; thorax brown; abdomen ochreous; fore-wings with the ground colour pale ochreous, but the wing is entirely covered with dark brown scales, except at the costa and outer margin; the latter in the male is broadly yellow, with two short projections into it from the brown portion, but in the female these projections are broad and run into the outer margin; there is also a transverse ochreous thin band through the brown portion a little before the middle of the wing, which contains a large ochreous spot above its centre; abdomen of the female brown, anal tuft ochreous; hind-wings and under-side pale ochreous without any markings.

Expanse of wings ♂ 1 inch, ♀ $1\frac{3}{10}$ inches.

Hab. ANDAMAN ISLANDS.

EUPROCTIS UTILIS, nov.

♂, ♀. Palpi brown above, white beneath; frons whitish with some ochreous hairs above the palpi; head, thorax, and fore-wings pale yellow; two broad transverse bands, medial and sub-marginal, composed of blackish scales, not very thickly packed together and divided by the veins; abdomen whitish, anal tuft fulvous; hind-wings, both wings below, body, and legs pure white, without any markings.

Expanse of wings ♂ $1\frac{4}{10}$, ♀ $1\frac{9}{10}$ inches.

Hab. OLD CALABAR (*Crompton*).

Corresponds somewhat to Holland's description of his *Artaxa melaleuca* from the Ogove River, but his insect, a male, measures only 15 mm. and has a basal band.

EUPROCTIS SUBFLAVA.

Aroa flava, Brem., Bull. Acad. Sci. Pet., iii, p. 479 (1861) (preocc.).

Aroa subflava, Brem., Lep. Ost. Sib., p. 41, pl. 3, f. 19 (1864).

Leucoma subflava, var. *piperita*, Oberth. Ét. d'Ent., v, p. 35 (1880).

Porthesia snelleni, Staud., Rom. sur Lep., iii, p. 207, pl. 12, f. 3 (1887).

6 ♂, 2 ♀, Japan. 2 ♂, 2 ♀, W. China.

EUPROCTIS ATROSQUAMA.

Gogana atrosquama, Walker, xxxv, 1921 (1866).
Euproctis atrosquama, Semper, Het. Philipp., p. 464, pl. N, ff. 11–13 (1898).
Chærotricha glandulosa, Felder, Reise Nov., pl. 98, f. 14 (1868).

1 ♀, Philippines (type).

EUPROCTIS PLANA.

Euproctis plana, Walker, vii, 1731 (1856).
Chærotricha plana, Butler, Ill. Het., v, p. 51, pl. 89, f. 13 (1881).
Euproctis discinota, Moore, P. Z. S., 1877, p. 601.

1 ♀, Hong Kong. 3 ♂, 1 ♀, Dharmsala. 1 ♂, 1 ♀, Kangra. 2 ♂, 1 ♀, Darjiling, including the type. 1 ♀, Burma. 2 ♀, Omeishan, W. China. 1 ♂, 1 ♀, Andamans (type *discinota*).

EUPROCTIS IMMACULATA.

Chærotricha immaculata, Butler, Ill. Het., v, pl. 89, f. 14 (1881).
Euproctis immaculata, Leech, Trans. Ent. Soc., 1899, p. 137.

1 ♀, Darjiling (type).

There is no more constant character in the species of this genus than the cell spot, and therefore I cannot believe that this *immaculate* insect with *white* hind-wings is the same as *plana*, as Hampson says.

EUPROCTIS CATALA, nom. nov.

Euproctis atomaria, Walker, iv, 837 (1855) (preocc.).
" " Moore, Cat. Lep. E. I. C., ii, p. 347, pl. 16, f. 1, 1a (larva) (1859).
" " Snellen, Tijd. v. Ent., xx, p. 11, f. 4, ♂ (1877).
Euproctis mülleri, Snellen, l. c., f. 6, ♀ (only).

6 ♂, 5 ♀, Java, including the types.

Horsfield bred this species, and we have his examples in the National Collection; therefore I feel no doubt that Snellen's figure of his female *mülleri* represents this species; I have not been able to identify his male. The name *atomaria* is preoccupied, Walker himself having used it at p. 796 of the same vol. under his genus *Artaxa*, which is the same as *Euproctis*.

Euproctis anna.

Euproctis anna, Swinhoe, Ann. Mag. N. H. (7), xii, p. 194 (1903).

1 ♂, 1 ♀, Kina Balu (types).

Euproctis orestes.

Chærotricha orestes, Druce, P. Z. S., 1887, p. 674.

1 ♂, Aburi. 2 ♂, 1 ♀, Gold Coast.
The type from Mongo-ma-Lobah is in coll. Druce.

Euproctis madana.

Euproctis madana, Moore, Cat. Lep. E. I. C., ii, p. 348 (1859).

1 ♀, Darjiling (type).

Euproctis icilia.

Bombyx icilia, Stoll, Suppl. Cram., p. 158, pl. 35, f. 5 (1791).
Chærotricha decussata, Moore, Ann. Mag. N. H. (4), xx, p. 345 (1877).
„ „ Moore, Lep. Ceylon, ii, p. 91, pl. 113, f. 2, 2a, b (1883).

2 ♂, Durbunga. 1 ♂, Karwar. 1 ♂, Malabar. 1 ♀, Trevandrum. 1 ♂, 2 ♀, Ceylon, including the type of *decussata*.

Euproctis stirasta.

Adlullia stirasta, Swinhoe, Ann. Mag. N. H. (6), xii, p. 214 (1893).

1 ♂, Mone, Shan States (type).
I have a female from the same locality in my own collection.

Euproctis barbara.

Euproctis barbara, Swinhoe, Ann. Mag. N. H. (7), xii, p. 197 (1903).

1 ♂, Kuching, Borneo (type).

Euproctis staudingeri.

Chærotricha staudingeri, Leech, P. Z. S., 1888, p. 624, pl. 31, f. 6.

5 ♂, 5 ♀, Japan, including the types.

Euproctis varia.

Euproctis (?) *varia*, Walker, iv, 840 (1855).
„ „ Moore, Cat. Lep. E. I. C., ii, p. 348, pl. 9a, f. 5 (1859).

1 ♂, Subathu. 3 ♂, 1 ♀, Sikhim. 1 ♀, Khasia Hills.
The type, without locality, is in Mus. Oxon.

Euproctis oreosaura.

Adlullia oreosaura, Swinhoe, Ann. Mag. N. H. (6), xiv, p. 435 (1894).

1 ♂, 1 ♀, Khasia Hills (types).
There is a small male from Kuching, Borneo, which much resembles this species.

Euproctis niphonis.

Chærotricha niphonis, Butler, Trans. Ent. Soc., 1881, p. 9, ♂.
Chærotricha squamosa, Butler, l. c., ♀.
Porthesia raddei, Staud., Rom. sur Lep., iii, p. 207, pl. 17, f. 3 (1887).

7 ♂, 5 ♀, Japan, including both Butler's types. 2 ♂, 1 ♀, Amur.

Euproctis plagiata.

Cispia plagiata, Walker, iv, 858 (1855).

1 ♀, Nepal (type). 1 ♂, Mount Parisnath. 1 ♀, N. India.

Euproctis marginata.

Chærotricha marginata, Moore, Lep. Atk., p. 49 (1879).
Chærotricha quadrangularis, Moore, l. c., p. 50, pl. 2, f. 23.

2 ♂, 2 ♀, Darjiling, including the type. 1 ♂, Kurseyong.
The type of *quadrangularis*, from Manipur, is in coll. Staudinger.

EUPROCTIS PRÆCURRENS.

Adlullia præcurrens, Walker, xxxii, 392 (1865).
Chærotricha globifera, Felder, Reise Nov. Lep., pl. 98, f. 13, ♀ (1868).
Nygmia globifera, Kirby, Cat. Moths, i, p. 449 (1892).
Euproctis guttulata, Snellen, Notes Leyden Mus., viii, p. 7 (1886).
„ „ Snellen, Tijd. v. Ent, xxix, p. 36, pl. 1, f. 3 (1886).
Adlullia bolcora, Swinhoe, Cat. Het. Mus. Oxon., i, p. 186, pl. 6, f. 2, ♂ (1892).

4 ♂, 5 ♀ from Dinding, Sarawak, Kuching, and Singapore; Felder's type came from the Moluccas, and is undoubtedly a female, though figured as a male; the types of *præcurrens* from Celebes and of *bolcora* from Sarawak are in Mus. Oxon.

EUPROCTIS PALLIPES.

Euproctis pallipes, Snellen, Tijd. v. Ent., xxii, p. 108, pl. 9, f. 3 (1879).

1 ♂, Celebes.

EUPROCTIS OSUNA, nov.

♀. Dull ochreous tinged with chestnut colour; fore-wings long, costa arched, outer margin nearly as long as the costa, much rounded, the curve taking in the short hinder margin to the base; two macular transverse chestnut-coloured bands, discal and marginal; the first consisting of five or six square spots; the other complete, the spots well separated; indications of another band towards the base, where there is a small group of black irrorations; all the spots covered with these irrorations, as also are the cilia of both wings, the antecilial line being pale; abdomen and abdominal half of hind-wings suffused with black; under-side much as above.

Expanse of wings 2 inches.

Hab. KAPAUR, New Guinea (*Doherty*).

Somewhat like *E.* (*Chærotricha*) *armandvillei*, Oberth., Etud. Ent., xix, p. 35, pl. 5, f. 31 (1894).

EUPROCTIS EGREGIA, nov.

♀. Palpi ochreous with some brown hairs; head and thorax ochreous; abdomen blackish-brown, tip ochreous; fore-wings blackish-brown, with a very broad orange ochreous outer marginal border, occupying quite one-fifth of the wing; hind-wings with the basal third black, the outer portion orange ochreous; cilia of both wings ochreous; under-side of body and legs blackish-brown; wings as above, but the brown part darker.

Expanse of wings $2\frac{3}{10}$ inches.

Hab. BATJAN.

EUPROCTIS SERVILIS.

Euproctis servilis, Walker, xxxii, 350 (1865).
Artaxa servilis, Swinhoe, Cat. Het. Mus. Oxon., i, p. 190 (1892).
Darala prima, Walker, xxxv, 1917 (1866).
Euproctis incompta, Snellen, Tijd. v. Ent., xx, p. 9, pl. 1, f. 2 (1879).
Euproctis cinerea, Heylaerts, Ann. Soc. Ent. Belg., xxxvi, p. 10 (1892).
Euproctis norma, Druce, Ann. Mag. N. H. (7), iii, p. 469 (1899).

3 ♂, 1 ♀, Java. 1 ♂, Sambawa (*Doherty*). 1 ♂, Celebes (*Doherty*).

Type Celebes (*Wallace*) in Mus. Oxon., as is also the type of *prima* from the same locality; Snellen's and Heylaert's types came from Java, Snellen also records it from Celebes; Druce's type came from Timor. The colour of fore-wings varies much, from very pale yellow to olive-brown, and the hind-wings from yellow to white. I have before me the two extremes from the same locality: the female has all yellow fore-wings, white hind-wings, without markings.

EUPROCTIS UNIFORMIS.

Chærotricha uniformis, Moore, Lep. Atk., p. 49 (1879).

1 ♀, Darjiling.

The type from Darjiling is in coll. Staudinger.

EUPROCTIS CALESIA.

Euproctis calesia, Swinhoe, Ann. Mag. N. H. (6), ix, p. 81 (1902).

1 ♀, Lawas, Borneo (type). 1 ♀, Sandakan.

Euproctis postnigra, nov.

♀. Antennæ, palpi, head, and thorax brownish-ochreous; fore-wings with the ground colour sordid ochreous, irrorated with minute, deep black atoms; a whitish space at the end of the cell, in which there is a somewhat large black spot; a discal, indistinct, transverse whitish band, outwardly curved above its middle; abdomen and hind-wings black, anal tuft and cilia of both wings sordid ochreous; under-side of body and legs black; wings blackish-brown, with the margins narrowly sordid ochreous.

Expanse of wings $2\frac{2}{10}$ inches.

1 ♀, Matang, Borneo (type). 1 ♀, Pulo Laut (*Doherty*). I have it in my own collection from Pulo Laut.

Euproctis indecora.

Teara indecora, Walker, xxxii, 353 (1865).

1 ♀, Moreton Bay (type).

Euproctis deficita.

Teara deficita, Walker, xxxii, 352 (1865).

3 ♂, 2 ♀, Australia, including the type.

Euproctis funeralis, nov.

♂, ♀. Palpi, frons, and anal tuft of abdomen ochreous, paler in some examples than in others; antennæ ochreous grey, shafts white; head, thorax, and fore-wings ochreous, the ground colour of the fore-wings is ochreous grey, and the wings are covered with brown, minute irrorations; one Sarawak male example has the fore-wings much darker than the others, and a Sarawak female is the palest and yellowest of the lot; the hind-wings of the ♂ type are nearly white, the abdominal margin broadly suffused with blackish; in the female they are entirely blackish-brown with pale yellowish outer margins; abdomen above and below black; legs yellowish; wings below whitish in the male with blackish internal suffusions, entirely suffused in the female. The species varies much in size and in shade of colour; in some of the females the veins of the fore-wings are yellow and prominent.

Expanse of wings ♂ $1\frac{6}{10}$, ♀ $2\frac{6}{10}$ inches.

1 ♂, 1 ♀, Singapore (types) (*Ridley*). 4 ♀, Singapore. 1 ♂, 1 ♀, Sarawak. 1 ♀, Penang (*Flower*). 1 ♀, Java.

Was many years ago wrongly identified in the B. M. as *conspersa*, Felder, Reise Nov. Lep., pl. 98, f. 12, but has very little resemblance to it; *conspersa* is not in the B. M.

EUPROCTIS FLAVOCILIATA.

Euproctis flavociliata, Swinhoe, Ann. Mag. N. H. (6), vii, p. 465 (1901).

1 ♀, Perak (type). 1 ♂, 1 ♀, Singapore.

EUPROCTIS TRANSVERSA.

Artaxa transversa, Moore, Cat. Lep. E. I. C., ii, p. 352, pl. 9a, f. 8 (1859).
,, ,, Swinhoe, Cat. Het. Mus. Oxon., i, p. 188 (1892).
Euproctis guttistriga, Walker, Journ. Linn. Soc. Lond., vi, p. 129 (1862).

1 ♂, 3 ♀, Singapore. 3 ♀, Sumatra. 1 ♂, 1 ♀, Borneo. 2 ♀, Java, including the type.

Walker's type from Sarawak is in Mus. Oxon.

EUPROCTIS LEUCOSPILA.

Cozola leucospila, Walker, xxxii, 390 (1865).
Chærotricha leucospila, Felder, Reise Nov., pl. 98, f. 16 (1868).

1 ♀, Celebes (*Doherty*).

The types, from Celebes, are in Mus. Oxon. and coll. Rothschild.

EUPROCTIS CHIRUNDA, nov.

♀. Palpi, frons, head, and fore-part of thorax yellow; thorax and fore-wings dark chocolate brown; costal margin yellow; a patch of that colour in the middle extending to the end of the cell, where it is rounded, and contains a large black spot; a square yellow patch on the outer margin above the middle, and another at the hinder angle; abdomen black, with pale segmental lines and yellow anal tuft; hind-wings blackish-brown, yellow on the outer margin; cilia of both wings yellow; under-side, body and legs yellow, wings blackish-brown, with the yellow marginal marks much as above.

Expanse of wings $2\frac{4}{10}$ inches.

Hab. SANDAKAN.

EUPROCTIS PERPLEXA, nov.

♀. Antennæ, palpi, head, and tip of abdomen ochreous; thorax and fore-wings dark ochreous brown, the lower part of the wings the darker; a large black spot of embossed scales on a pale ochreous ground on the hinder margin a little before the middle; another just above it, the pale margins joining; abdomen black; hind-wings blackish-brown, darker than the fore-wings; cilia of both wings brown, with some ochreous hairs; underside of wings paler, margins broadly ochreous; body and legs also ochreous.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. SINGAPORE (*Ridley*).

There is another female caught apparently at the same time and place by Ridley, which differs from the above in having the apex of fore-wings tinged with ochreous, and containing a brown subapical spot with a brown dot close above it.

EUPROCTIS MAGNA.

Somena magna, Swinhoe, Trans. Ent. Soc., 1891, p. 479, ♀.
,, ,, Swinhoe, Ann. Mag. N. H. (7), xii, p. 197, ♂ (1903).

1 ♂, 1 ♀, Khasia Hills (types).

I have one male and two females from the same locality in my own collection.

EUPROCTIS BIPARTITA.

Chærotricha bipartita, Moore, Lep. Atk., p. 49, pl. 2, f. 4 (1879).

1 ♀, Darjiling.

The type from Darjiling is in coll. Staudinger.

EUPROCTIS HAMPSONI, nov. nom.

Artaxa variegata, Hmpsn., Ill. Het., viii, p. 56, pl. 140, f. 6 (1891) (preocc.).

1 ♂, Nilgiri Hills (type).

Variegata being preoccupied by Moore for *Daplasa variegata*, which is an *Euproctis*, Hampson's species must have a new name.

EUPROCTIS LUTEIFASCIA.

Artaxa luteifascia, Hmpsn., Ill. Het., viii, p. 57, pl. 141, f. 2 (1891).

1 ♂, Nilgiri Hills (type).

EUPROCTIS ATRISIGNATA, nov.

♂. Antennæ, head, thorax, and fore-wings red-brown, tinged with ochreous; fore-wings with three pairs of white spots on the outer margin, apical, medial, and on the angle; a small white dot between each; faint indications of two transverse pale lines, the first outwardly curved, the other outwardly curved above its middle; a large prominent black spot at the end of the cell; cilia with white spots; hind-wings blackish-brown, with ochreous white outer marginal border and cilia; under-side, palpi, pectus, body, legs, and wings ochreous white; fore-wings suffused with brown, except on the margins; hind-wings suffused on the abdominal half; a black spot at the end of each cell of both wings.

Expanse of wings $1\frac{2}{10}$ inches.

Hab. SINGAPORE (*Ridley*), two examples.

EUPROCTIS SCINTILLANS.

Somena scintillans, Walker, xii, 1734 (1856).
Artaxa justiciæ, Moore, Cat. Lep. E. I. C., ii, p. 352, pl. xvi, ff. 6 (larva) (1859).
Orvasca subnotata, Walker, xxxii, 502 (1865).
Euproctis moorei, Snellen, Tijd. v. Ent., xxii, p. 106, pl. 8, f. 8 and 10 (1879).
Artaxa limbata, Butler, Ill. Het., v, p. 53, pl. 90, f. 3 (1881).
Somena irrorata, Moore, Lep. Ceylon, ii, p. 87, pl. 111, f. 2 (1882).

A long series from different parts of India, Ceylon, Burma, and Singapore. I have it in my own coll. from Bombay, Poona, Karachi, and the Khasia Hills. I do not see how any of the above can be specifically separated.

EUPROCTIS SIMILIS.

Artaxa similis, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

1 ♀, Java (type). 2 ♀, Singapore.
The ♂ type I cannot find.

EUPROCTIS BIPUNCTAPEX.

Somena bipunctapex, Hmpsn., Ill. Het., viii, p. 57, pl. 140, f. 13 (1891).

2 ♀, Nilgiri Hills, including the type. 2 ♀, Kangra. 1 ♀, Burma. 1 ♂, Singapore. 7 ♂, 10 ♀, China.

EUPROCTIS OBSCURA.

Artaxa obscura, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

1 ♀, Java (type). 1 ♀, Singapore.

EUPROCTIS ATOMARIA.

Artaxa atomaria, Walker, iv, 796 (1855).
„ „ Butler, Ill. Het., v, p. 53, pl. 90, f. 2 (1881).

1 ♀, N. India (type).

EUPROCTIS APICALIS.

Arna apicalis, Walker, v, 1177 (1855).
Artaxa apicalis, Moore, Lep. Ceylon, ii, p. 85, pl. 111, f. 4, 4a, b (1883).

2 ♂, Bombay. 2 ♂, 3 ♀, Ceylon, including the type.
I cannot agree with Hampson, that this is the same as the northern form *atomaria*, which has no yellow costa.

EUPROCTIS ABJECTA.

Somena abjecta, Swinhoe, P. Z. S., 1889, p. 405, pl. 43, f. 13.

1 ♂, 4 ♀, Karachi and Kotri, Sind, including the types.

EUPROCTIS SAGROIDES.

Somena sagroides, Hmpsn., Ill. Het., viii, p. 57, pl. 140, f, 14 (1891).

1 ♂, Nilgiri Hills (type).

EUPROCTIS FLAVICOSTA.

Euproctis flavicosta, Hmpsn., Journ. Bo. N. H. Soc., xiii, p. 420, pl. B, f. 3 and pl. 2, f. 18 (1900).

1 ♂, Sikhim (type).

EUPROCTIS RENIFERA.

Euproctis renifera, Swinhoe, Trans. Ent. Soc., 1895, p. 12, ♀.
„ „ Swinhoe, Ann. Mag. N. H. (7), xii, p. 196, ♂ (1903).

1 ♂, 2 ♀, Khasia Hills (types).

EUPROCTIS MINUTISSIMA, nov.

♂. Antennæ, palpi, head, thorax, and fore-wings ochreous; fore-wings sparsely irrorated with grey atoms, and with a large black sub-apical spot near outer margin; hind-wings black, with ochreous cilia; under-side, body and legs ochreous-white, both wings covered with blackish-brown suffusion, the borders ochreous white, rather broadly so at the apex of the fore-wings.

Expanse of wings $\frac{7}{10}$ inch.

Hab. SINGAPORE (*Ridley*).

With the spot on the fore-wings as in *rubiginosa*, Snellen, from Java, Tijd. v. Ent., xx, p. 10, pl. 1, f. 3 (1877).

EUPROCTIS LINTA.

Artaxa linta, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

1 ♀, Java (type). 2 ♂, Sandakan.

EUPROCTIS KALA.

Artaxa kala, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

1 ♀, Java (type).

EUPROCTIS XANTHOPERA.

Euproctis xanthopera, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 295 (1897).

1 ♂, Khasia Hills (type).

EUPROCTIS ORMEA, nov.

♀. Palpi yellowish white, grey above; frons and pectus ochreous; antennæ and thorax greyish-ochreous; fore-wings with the ground colour whitish-ochreous, almost entirely suffused with ochreous-brown, and irrorated with black atoms, leaving some apical streaks, a longitudinal streak below on the outer margin, and the outer marginal line pale; two transverse lines also of that colour both slightly sinuous, the first a little before the middle, nearly erect, curving somewhat outwards above the middle, the other more or less dentated, starting from the middle of the hinder margin close to the first line, then well curved outwards and inwards on to the costa; a pale spot at lower end of the cell; cilia, with ochreous spots; hind-wings pale black, with ochreous cilia; abdomen and body below pale black; under-side of both wings suffused with pale black, with ochreous margins; legs yellowish-white.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. S. E. BORNEO (*Doherty*).

EUPROCTIS CERASINA, nov.

♂. Palpi white, black on the inner sides; frons, antennæ, and head ochreous; thorax and wings pale primrose-yellow; hind-wings without markings; fore-wings covered with cherry-coloured scales, irrorated sparsely with black atoms, the ground colour of the wings showing through here and there; two transverse pale lines, anti-medial and discal, both elbowed outwards above the middle, the first acutely, the second somewhat near the outer margin; the space beyond these mostly primrose-yellow, with some cherry-coloured scales and black irrorations: the marginal border with very pale pinkish markings, and a black mark on the cilia at the middle of the margin; abdomen ochreous with some brown suffusion; under-side of body and legs ochreous, tarsi whitish; wings pale primrose-yellow, nearly white, with a rather broad blackish suffused sub-costal streak on fore-wings.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. SAMBAWA (*Doherty*).

EUPROCTIS OLIVATA.

Euproctis olivata, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 295 (1897).

1 ♂, 1 ♀, Khasia Hills (types).

EUPROCTIS SUBRANA.

Artaxa subrana, Moore, Cat. Lep. E. I. C., ii, p. 351 (1859).

1 ♀, Java (type). 1 ♀, Singapore.

EUPROCTIS DISTRACTA.

Artaxa distracta, Walker, xxxii, 333 (1865).

1 ♂, Sarawak (type).

The type specimen is much rubbed and hardly recognisable.

EUPROCTIS ALBODENTATA.

Pida albodentata, Moore, P. Z. S., 1879, p. 401.

1 ♀, N. W. Himalayas (type). 1 ♀, Burma.

EUPROCTIS FACETA, nov.

♂. Palpi, frons, head, and thorax white; fore-wings greyish-olive, costa white; two transverse white lines, ante-medial and discal; the first, nearly erect, bends inwards on to the costa, consisting of two largish lunules, the lower being the outside margin of a large white spot in the interno-median interspace, and which contains a red-grey spot, while below this is the half of a similar mark on the hinder margin; the outer line is lunulate and dentate, and curves outwardly in its centre; the lunules of the inner line are bent outwards and of the outer line inwards; the cilia are white with grey marks at the ends of the veins; hind-wings and abdomen sordid ochreous white, unmarked; under-side nearly white, unmarked, except for the grey streaks below costa of fore-wings.

Expanse of wings $\frac{9}{10}$ inch.

Hab. Kapaur, New Guinea (*Doherty*).

Euproctis atripuncta.

Euproctis atripuncta, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 295 (1897).

1 ♂, 2 ♀, Khasia Hills (types).

Euproctis recraba.

Euproctis recraba, Swinhoe, Ann. Mag. N. H. (7), xii, p. 196 (1903).

1 ♂, 1 ♀, Java (types).

Euproctis alba, nov.

♂, ♀. Palpi grey, white beneath; antennæ grey; head, thorax, and wings white; fore-wings with some indistinct red scales at the end of the cell, and also at the base; some black irrorations on the lower portion of the wing, more dense in the female than in the male; hind-wings with some brown suffusion on the abdominal area in the female only; abdomen blackish above, except the base and the anal tuft, which are ochreous; under-side white without markings.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. Sambawa (*Doherty*).

Euproctis lanaria.

Terphothrix lanaria, Holland, Psyche, vi, p. 474 (1893).

2 ♂, Ogove River (*Holland*).

Euproctis variegata.

Euproctis variegata, Moore, Lep. Atk., p. 48, pl. 2, f. 24 (1879).

Daplasa variegata, Hmpsn., Moths, India, i, p. 458 (1892).

1 ♂, Sikhim (*Pilcher*).

The type from Darjiling is in coll. Staudinger.

EUPROCTIS STRIGIFIMBRIA.

Antipha strigifimbria, Walker, Journ. Linn. Soc. Lond., vi, p. 126 (1862).
Artaxa fracta, Walker, xxxii, 333 (1865).

6 ♂, Sarawak, including both types. 1 ♂, Pulo Laut.

EUPROCTIS COSTALIS.

Antipha costalis, Walker, iv, 806 (1855).
Utidava incomptaria, Walker, xxvi, 1689 (1862).
Lacida complens, Walker, xxxii, 336 (1865).
Rilia (?) *illepida*, Walker, xxxii, 436.

5 ♂, 2 ♀, Ceylon, including all the types except *complens*, which was in coll. Layard, but the collection is lost.

EUPROCTIS ANTICA.

Lacida antica, Walker, iv, 802, ♂ (1855).
Anaxila notata, Walker, iv, 919, ♀.

4 ♂, 2 ♀, Ceylon, including both types.

EUPROCTIS ANTIPHATES.

Euproctis antiphates, Hmpsn., Moths, India, i, p. 478 (1892).

1 ♂, Khasia Hills (type).

EUPROCTIS PHÆA.

Euproctis phæa, Hmpsn., Journ. Bo. N. H. Soc., xiii, p. 234 (1900).

2 ♀, Khasia Hills, including type.

Genus HAPLOPSEUSTIS, Meyr., Trans. Ent. Soc. 1902, p. 34.
Acnissa, Turner, Trans. Roy. Soc. S. Australia, 1902, p. 180.

HAPLOPSEUSTIS ERYTHRIAS.

Haplopseustis erythrias, Meyr., l. c.
Acnissa pyrrhias, Turner, l. c.

2 ♂, 2 ♀, Port Darwin, whence also Meyrick's type. The type *pyrrhias* from Townsville, Queensland.

Genus PERINA, Walker, iv, 966 (1855).

PERINA NUDA.

Bombyx nuda, Fabr., Mant. Ins., ii, p. 119 (1787).
Stilpnotia subtincta, Walker, iv, 843, ♀.
Perina basalis, Walker, iv, 966, ♂.
Euproctis combinata, Walker, xxxii, 347, ♀ (1865).

2 ♂, 3 ♀, Hong Kong, including type of *combinata*. 5 ♂, 2 ♀, Nepal, including type of *basalis*. 3 ♂, 1 ♀, Bombay. 1 ♂, Mhow. 2 ♀, Belgaum. 1 ♀, Nilgiri Hills. 1 ♂, 3 ♀, Ceylon.

The type of *subtincta* from India is in Mus. Oxon.

PERINA PURA.

Perina pura, Walker, Char. Undescr. Lep. Het., p. 17 (1869).

1 ♂, without locality (type) ex. coll. Norris. 2 ♂, 3 ♀, N. India. 1 ♀, Calcutta. 1 ♀, Cachar.

Genus DAPLASA, Moore, Lep. Atk., p. 51 (1879).

DAPLASA IRRORATA.

Daplasa irrorata, Moore, l. c., p. 52, pl. 2, f. 17.

1 ♂, Khasia Hills. 2 ♂, Omeishan.

The type from Darjiling is in coll. Staudinger.

Genus CISPIA, Walker, iv, 857 (1855).

CISPIA CHARMA.

Cispia charma, Swinhoe, Ann. Mag. N. H. (7), iii, p. 112 (1899).

3 ♂, 2 ♀, Karwar, including the types.

CISPIA PUNCTIFASCIA.

Cispia punctifascia, Walker, iv, 857 (1855).

3 ♂, 1 ♀, Sikhim, including the types. 1 ♀, Ceylon.

CISPIA VENOSA.

Cispia venosa, Walker, Trans. Ent. Soc., 1862, p. 264.

2 ♂, 2 ♀, Sikhim.

The type, marked India, is in Mus. Oxon.

Genus HERACULA, Moore, P. Z. S., 1865, p. 804.

HERACULA DISCIVITTA.

Heracula discivitta, Moore, l. c., pl. 43, f. 2.

3 ♂, 1 ♀, Sikhim.
The type is in coll. Russell.

Genus PIDA, Walker, xxxii, 399 (1865).
Locharna, Moore, Lep. Atk., p. 53 (1879).

PIDA APICALIS.

Pida apicalis, Walker, xxxii, 400.
„ „ Hmpsn., Moths, India, i, p. 457 (fig.) (1892).

1 ♂, Darjiling (type). 1 ♂, Nepal. 3 ♂, Sikhim. 1 ♂, Silhet. 1 ♂, Khasia Hills.

PIDA DECOLORATA.

Cyclidia (?) *decolorata,* Walker, Char. Undescr. Lep. Het., p. 96 (1869).

1 ♂, Khasia Hills. 1 ♂, Darjiling. 1 ♀, Subathu.
The type from Benares is in the Devon and Exeter Museum.

PIDA STRIGIPENNIS.

Locharna strigipennis, Moore, Lep. Atk., p. 53, pl. 3, f. 11 (1879).

1 ♀, Burma. 1 ♀, Shan States. 1 ♂, Omeishan. 1 ♀, Ichang. 1 ♀, Chang Yang.
The type, from the Khasia Hills, is in coll. Staudinger.

Genus FODINOIDEA, Saalm., Madag., i, p. 154 (1884).

FODINOIDEA STAUDINGERI.

Fodinoidea staudingeri, Saalm., l. c., pl. 5, f. 63, 63a.

2 ♂, Madagascar.

FODINOIDEA VECTIGERA.

Eusemia vectigera, Mab., Le Nat., ii, p. 100 (1882).
Fodinoidea maculata, Butler, Ent. Mo. Mag., xxi, p. 198 (1885).

2 ♂, Madagascar, including Butler's type.

Genus NUMENES, Walker, iii, 662 (1855).
Pseudomesa, Walker, iv, 923 (1855).

NUMENES PATRANA.

Numenes patrana, Moore, Cat. Lep. E. I. C., ii, p. 367 (1859).
Numenes partita, Walker, xxxi, 290 (1864).

1 ♂, Bhutan (type). 7 ♂, 4 ♀, Sikhim.
The type of *partita* from Darjiling is in coll. Staudinger.

NUMENES SILETTI.

Numenes siletti, Walker, iii, 663, ♀ (1855).
Pseudomesa quadriplagiata, Walker, iv, 923, ♂ (1855).

2 ♂, 3 ♀, Silhet, including both types. 2 ♀, Sikhim. 1 ♀, Cachar. 6 ♀, Burma.

NUMENES INSIGNIS.

Numenes insignis, Moore, Cat. Lep. E. I. C., ii, p. 367, pl. 10a, f. 6, ♀ (1859).
Pseudomesa læta, Walker, xxxv, 1916, ♂ (1866).

2 ♂, 4 ♀, Java, including both types.

NUMENES DISPARILIS.

Numenes disparilis, Staud., Rom. sur Lep., iii, p. 200, pl. 11, f. 2a, b (1887).
Numenes disparilis, var. *separata*, Leech, Entom., xxiii, p. 112 (1890).
Lymantria albofascia, Leech, P. Z. S., 1888, p. 629, pl. 31, f. 8, ♂.

2 ♂, 1 ♀, Chang Yang, including type of *separata*. 1 ♂, Ohoyama (type *albofascia*). 1 ♀, Chia-kow-ho. 1 ♀, Kiukiang. 1 ♀, Moupin.

NUMENES LIBYRA.

Aroa libyra, Druce, Ann. Mag. N. H. (6), xvii, p. 352 (1896).
Heteronygmia flammeola, Distant, Ann. Mag. N. H. (7), vii, p. 360 (1899).

Druce's types ♂ ♀ came from W. Africa, Distant's type ♀ from the Transvaal; the species is not in the B. M.

NUMENES HYPOXANTHA.

Heteronygmia hypoxantha, ♀, Holland, Psyche, vi, p. 416 (1893).

One female from the Ogove River, the locality where Holland's type came from ; it is closely allied to *Numenes libyra*, Druce.

Genus MARDARA, Walker, xxxii, 402 (1865).
Mahoba, Moore, Lep. Atk., p. 52 (1879).

MARDARA PLAGIDOTATA.

Cyclidia (?) *plagidotata*, Walker, xxv, 1483 (1862).

2 ♀, Darjiling, including the type.

MARDARA RUFICEPS.

Mardara ruficeps, Hmpsn., Moths, India, iv, p. 489 (1896).

1 ♂, Bhutan (type).

MARDARA CALLIGRAMMA.

Mardara calligramma, Walker, xxxii, 402 (1865).

7 ♂, 2 ♀, Darjiling, including the type. 1 ♂, Kurseyong. 1 ♂, Sikhim.

MARDARA AFRICANA.

Lepasta africana, Holland, Ent. News Phil., 1893, p. 343, pl. 15, f. 11.

1 ♂, Sierra Leone. 1 ♀, River Niger.

Genus NYCTEMERA, Hübner, Verz. bek. Schmett., p. 178.
Otroeda, Walker, ii, 402 (1854).

NYCTEMERA HESPERIA.

Geometra hesperia, Cram., Pap. Exot., iii, pl. 251, f. A, B (1780).

Otroeda hesperia, Walker, ii, 402.

14 ♂, 1 ♀, W. Africa.

NYCTEMERA JONESI.

Otroeda jonesi, Sharpe, Ann. Mag. N. H (6), vii, p. 134 (1891).

1 ♂, Congo. 4 ♂, W. Africa.

NYCTEMERA MANIFESTA, nov.

♂. Belongs to the *hesperia* group, and is closely allied to that species, but there is no sign of orange or ochreous on the hind-wings; the submarginal spots on both wings are somewhat differently placed, forming a continuous and evenly-disposed curve, the upper one the largest, lessening in size hindwards on both wings; in *hesperia* and its allies the subcostal spot of the fore-wings is displaced inwards, making the row of spots angled at its upper part, and in the hind-wings the second spot (and sometimes the fourth) runs into the white of the wing.

Expanse of wings $3\frac{1}{2}$ inches.

Hab. CONGO.

NYCTEMERA CAFRA.

Bombyx cafra, Drury, Ill. Ex. Ins., iii, pl. 5, f. i (1780).

2 ♂, Sierra Leone. 1 ♂, River Niger. 1 ♂, S. Nigeria.

NYCTEMERA OCCIDENTIS.

Otroeda occidentis, Walker, ii, 403 (1854).

1 ♂, Sierra Leone (type). 1 ♂, Cameroons. 1 ♂, R. Gaboon. 1 ♂, Rio del Rey. 1 ♂, S. Nigeria.

NYCTEMERA VESPERINA.

Otroeda vesperina, Walker, ii, 403 (1854).

2 ♂, Congo, including the type.

NYCTEMERA VARUNÆA.

Otroeda varunæa, Druce, P. Z. S., 1882, p. 780.

1 ♂, W. Africa.

The type, from Congo, is in coll. Druce.

Genus RAJACOA, nov.

♂. Antennæ bipectinated to the tips, pectinations ciliated and of moderate length; palpi upturned, very short and hairy; fore-wings with discoidal nearly straight, vein 2 from middle of cell, 4 from lower end, 3 from half-way between, 5 from below middle and somewhat curved, 6 from below upper end, 7 and 8 stalked, 9 from 10 anastomosing with 7 and 8 to form the areole, 11 from one-third before end of cell; hind-wings with lower half of the discoidal protruding, vein 2 from one-third before lower end of cell, 4 from end, 3 from half-way between, 5 from a little above end and curved, 6 and 7 on a long stalk.

Type *R. forbesi*, Druce (*Cypra*).

RAJACOA FORBESI.

Cypra (?) *forbesi*, Druce, Ann. Mag. N. H. (7), iii, p. 469 (1899).

2 ♂, Fergusson Isl. (*Meek*). 2 ♂, Milne Bay (*Meek*).

RAJACOA ANTRA.

Rajacoa antra, Swinhoe, Ann. Mag. N. H. (7), xii, p. 194 (1903).

1 ♂, Humboldt Bay, New Guinea (*Doherty*).

I have also two males in my own collection from the same locality.

Genus CIMOLA, Walker, iv, 817 (1855).

CIMOLA OPALINA.

Cimola opalina, Walker, iv, 817.
Anomæotes thymiathis, Druce, Ent. Mo. Mag., xx, p. 156 (1883).

3 ♂, Delagoa Bay. 5 ♂, Natal, including the type.

CIMOLA ELEUTERIA.

Bombyx eleuteria, Stoll, Suppl. Cram., pl. 36, f. 13 (1791).
Cypra eleuteria, Walker, iv, 816 (1855).

10 ♂, 1 ♀, Sierra Leone. 1 ♂, Ashanti. 1 ♀, Benue River.

Genus PIRGA, Aurivillius, Ent. Tidsk., xiii, p. 192 (1892).

PIRGA LASEA.

Xenosoma (?) *lasea*, Druce, Ann. Mag. N. H. (7), iii, p. 468 (1899).

2 ♂, 1 ♀, Sierra Leone.

Druce's type came from the same locality. The type of the genus is *P. mirabilis*, Auriv., described in Ent. Tidsk., xiii, p. 192, but figured in vol. xii, p. 228, pl. 2, f. 2, and put in the Family *Nyctemeridæ* = *Deilemeridæ*: Karsch, however, in Ent. Nachr., xvi, p. 351 (1900), pointed out that this genus along with *Otroeda*, Walker = *Nyctemera*, Hübn., really belongs to the *Lymantriidæ*.

Pirga magna, nov.

♂, ♀. Palpi, frons, antennæ, head, and body deep black, collar golden-orange; all the markings on the body of the same colour; a tuft on each side of the thorax, a band behind, and segmental bands on the abdomen ending on each side in bright orange-red spots, joined together on the abdomen below by thin orange-red lines; wings nearly hyaline, the veins dark brown; fore-wings pale blackish; a sordid white sub-costal streak from the base; the interior third of the interno-median space of the same colour; hind-wings sordid white, with the outer third pale blackish narrowing hindwards; under-side of body and legs black; wings as above.

Expanse of wings ♂ $2\frac{6}{10}$, ♀ 3 inches.

Hab. Kikuyu, British E. Africa (*Crawshay*).

Genus Marbla, nov.

Antennæ bipectinated to the tips, branches of male long, of female a little less than half the length of the male, minutely ciliated, each branch with two long and one short spine at its end; palpi long and porrect, last joint very short and blunt; fore-wings with the costa bent at the base, otherwise nearly straight; apex rather produced but rounded; outer margin slightly curved, two-thirds length of costa; hinder margin of the male much rounded, of the female nearly straight; discoidal bent inwards in its centre, vein 2 from one-third before end of cell, 3 from before end, 4 and 5 from end, 6 from a little below upper end, 7 and 8 on a long stalk from upper end of cell, 9 and 10 also on a long stalk arising from a little before the end, 11 from one-third before end; hind-wings with the lower end of the discoidal square and slightly projected, vein 2 from a little beyond middle of cell, 3 from before end, 4 from the end, 5 from a little above, 6 and 7 from the upper end.

Type *M. divisa*, Walker (*Eloria*).

Marbla divisa.

Eloria divisa, Walker, iv, 815 (1855).
Hylemera tenera, Holland, Ent. News Phil., iv, p. 61, pl. 3, f. 7 (1893).

Walker's type, a male, has no locality; but there are two male and seven female examples, the same as type, from Sierra Leone and Lagos: Holland's description and figure fits this species very well.

MARBLA (?) NYSES.

Cypra nyses, Druce, P. Z. S., 1887, p. 673.

1 ♂, Old Calabar.
The type from Oid Calabar is in coll. Druce.

MARBLA (?) BIGUTTA.

Soloë bigutta, Holland, Ent. News Phil., 1893, p. 62, pl. 3, f. 6.

1 ♂, 1 ♀, Ogove River (*Holland*).

Genus PANTANA, Walker, iv, 819 (1855).
Birnara, Butler, Trans. Linn. Soc. Lond. (2), i, p. 560 (1879).

PANTANA VISUM.

Liparis visum, Hübner, Zutr., iii, p. 32, f. 543, 544 (1825).
Pantana dispar, Walker, iv, 820.

1 ♂, Maulmein (type *dispar*). 5 ♂, Burma. 1 ♂, Shan States. 2 ♂, Tonkin.

PANTANA AMPLA.

Pantana ampla, Walker, iv, 820 (1855).

1 ♂, Hong Kong (type). 5 ♂, Hainan.

PANTANA BICOLOR.

Orgyia bicolor, Walker, iv, 787 (1855).
Genusa delineata, Walker, iv, 818.
Genusa circumdata, Walker, iv, 819.
Stilpnotia sordida, Walker, vii, 1732 (1856).
Genusa comparata, Walker, xxxii, 340 (1865).

1 ♂, Kangra. 1 ♂, Dharmsala. 3 ♂, N. India, including type of *circumdata*. 3 ♂, Silhet, including types of *delineata* and *sordida*. 4 ♂, 2 ♀, Sikhim. 2 ♂, 1 ♀, Khasia Hills. 1 ♂, Bhamo, Burma.
The type, marked India, is in Mus. Oxon.

PANTANA BASWANA.

Pantana baswana, Moore, Cat. Lep. E. I. C., ii, p. 336, pl. 9a, f. 1 (1859).

5 ♂, Java, including the type.

PANTANA SIMPLEX.

Pantana simplex, Leech, Trans. Ent. Soc., 1899, p. 122.

8 ♂, W. China, including the type.

PANTANA TERMINATA.

Genusa terminata, Walker, xxxii, 340 (1865).

1 ♂, India (type). 5 ♂, 1 ♀, Burma.

PANTANA NIGROLIMBATA.

Pantana nigrolimbata, Leech, Trans. Ent. Soc., 1899, p. 121.

5 ♂, 3 ♀, W. China, including the type.

PANTANA SINICA.

Pantana sinica, Moore, Ann. Mag. N. H. (4), xx, p. 92 (1877).

" " Leech, Trans. Ent. Soc., 1899, p. 121.

1 ♂, Shanghai (type). 1 ♂, Chekiang, 1 ♂, Fouchau.

PANTANA ALBIFASCIA.

Orgyia albifascia, Walker, xxxii, 325 (1865).

1 ♂, Darjiling.

The type from Darjiling is in coll. Staudinger. I have it from the Khasia Hills.

PANTANA SUBFASCIA.

Orgyia subfascia, Moore, P. Z. S., 1865, p. 803.

1 ♂, Bengal (type).

Hampson puts this with *albifascia*, but it seems to me to be a very good form; there are some examples from Sikhim in coll. Pilcher.

PANTANA INTERJECTA.

Pantana interjecta, Swinhoe, Trans. Ent. Soc., 1891, p. 478, pl. 19, f. 2.

1 ♂, Khasia Hills (type).

I have several examples from the same locality.

PANTANA LUTEICEPS.

Pantana luteiceps, Swinhoe, Ann. Mag. N. H. (6), xvii, p. 361 (1896).

1 ♂, Khasia Hills.

PANTANA PLUTO.

Gynæphora pluto, Leech, Entom., xxiii, p. 111 (1890).

2 ♂, Ichang, including the type. 1 ♂, Moupin. 1 ♂, Kwei-chow.

PANTANA EURYGANIA.

Pantana eurygania, Druce, Ann. Mag. N. H. (7), iii, p. 470 (1899).

1 ♂, Chang Yang.
The type from Szechuen is in coll. Druce.

PANTANA SEMILUCIDA, nom. nov.

Pantana bicolor, Walker, iv, 820 (1855) (preocc.).

1 ♂, without locality (type). 1 ♂, Cambogia, Siam. 2 ♂, Penang. 1 ♂, Sarawak.

PANTANA LINEOSA.

Etobema lineosa, Walker, xxxii, 389 (1865).
Birnara nubila, Butler, Trans. Linn. Soc. Lond. (2), i, p. 560 (1879).

2 ♀, Malacca, including Butler's type. 1 ♀, Singapore. 1 ♀, Sumatra.

Genus LÆLIA, Steph., Cat. Brit. Ins., ii, p. 52 (1827).
Charnidas, Walker, iv, 797 (1855).
Repena, Walker, iv, 799.
Anthora, Walker, iv, 801.
Lacida, Walker, iv, 802.
Procodeca, Walker, iv, 812.
Ricine, Walker, iv, 824.
Odagra, Walker, xxxii, 401 (1865).
Harapa, Moore, Lep. Atk., p. 47 (1879).
Lælioides, Moore, Lep. Ceylon, ii, p. 83 (1883).
Hondella, Moore, l. c., p. 144.

LÆLIA SUBROSEA.

Anthora subrosea, Walker, iv, 801.
Lælia subrosea, Schaus and Clements, Sierra Leone Lep., p. 26, pl. 1, f. 5, ♂ (1893).
Lælia subrufa, Snellen, Tijd. v. Ent., xv, p. 39 (1872).

3 ♂, 1 ♀, Sierra Leone, including the type. 1 ♀, Natal.
Snellen's type came from Lower Guinea.

LÆLIA FASCIATA.

Lælioides fasciata, Moore, Lep. Ceylon, ii, p. 84, pl. 110, f. 6 (1882).
Procodeca testacea, Moore, P. Z. S., 1872, p. 574.
Lælioides rubripennis, Moore, Trans. Ent. Soc., 1884, p. 358.

1 ♂, Bengal (type *testacea*). 1 ♂, 1 ♀, Barrackpore. 4 ♂, 2 ♀, Ceylon, including the type. 1 ♂, Burma (type *rubripennis*). 1 ♀, Tongoo, Burma.
The female type of *testacea* is in Mus. Oxon.

LÆLIA FIGLINA.

Lælia figlina, Distant, Ann. Mag. N. H. (7), iv, p. 361 (1899).

1 ♂, 1 ♀, British E. Africa.
The type from the Transvaal is in coll. Distant.

LÆLIA LILACINA.

Lælia lilacina, Moore, Trans. Ent. Soc., 1884, p. 357.

1 ♂, Nilgiri Hills (type).

LÆLIA DEVESTITA.

Odagra devestita, Walker, xxxii, 402 (1865).
Lælia pallida, Moore, Trans. Ent. Soc., 1884, p. 358.
Lælioides lactea, Moore, l. c.

1 ♀, Punjab Hills (type *lactea*). 1 ♀, Umballa. 2 ♂, Karachi. 1 ♂, Bombay.
The type from Darjiling is in coll. Staudinger.

LÆLIA PROLATA.

Lælia prolata, Swinhoe, Cat. Het. Mus. Oxon., i, p. 195 (1892)

5 ♂, N. India, including the type. 1 ♂, 2 ♀, Maulmein. 1 ♂, Kangra. 2 ♀, Borneo.
A perfectly distinct form.

LÆLIA OBSOLETA.

Bombyx obsoleta, Fabr., Ent. Syst., iii, 1, p. 463 (1793).

5 ♂, 4 ♀, Australia.
The type is in the Banksian Cabinet in the B. M.

Lælia sinensis.

Lælia sinensis, Walker, iv, 829 (1855).
Leucoma brevicornis, Walker, vii, 1729 (1856).

1 ♂, 2 ♀, Hong Kong, including both types.

Lælia candida.

Lælia candida, Leech, Trans. Ent. Soc., 1899, p. 121 (text).

3 ♂, Chang Yang, including the type.
It is a pure white form of *cænosa,* Hübner.

Lælia sangaica.

Lælia sangaica, Moore, Ann. Mag. N. H. (4), xx, p. 92 (1877).

6 ♂, 5 ♀, Japan. 1 ♂, Shanghai (type). 2 ♂, Ningpo.

Lælia suffusa.

Ricine suffusa, Walker, iv, 824, ♀ (1855).
Procodeca angulifera, Walker, iv, 919, ♂.
Lælia subrufa, Snellen, Tijd. v. Ent., xxxii, p. 105, pl. 8, f. 6 (1879).

1 ♂, Maulmein (type ♂, *angulifera*). 2 ♂, 3 ♀, Java, including the tyye ♀.

Snellen has identified this species from Celebes as the same as his African *subrufa,* but his figure represents the Island form and not the African; this form is more closely allied to *Lælia sangaica,* Moore, from China.

Lælia gigantea.

Lælia gigantea, Butler, Cist. Ent., iii, p. 117 (1885).

1 ♂, 5 ♀, Japan, including the type.

Lælia punctulata.

Lopera punctulata, Butler, Ann. Mag. N. H. (4), xvi, p. 400 (1875).

8 ♂, Natal, including the type.

Lælia setinoides.

Lælia setinoides, Holland, Psyche, vi, p. 431 (1893).

1 ♂, Ogove River (*Holland*). 1 ♂, Natal. 2 ♂, Kaniss, Brit. E. Africa. 1 ♂, Shambe.

Lælia calamaria.

Lælia calamaria, Hmpsn., Journ. Bo. N. H. Soc., xiii, p. 234, pl. B, f. 19 (1900).

3 ♂, 2 ♀, Nilgiri Hills, including the types.

Lælia umbrina.

Procodeca umbrina, Moore, P. Z. S., 1888, p. 398.
Charnidas umbrina, Butler, Ill. Het., vii, p. 36, pl. 123, f. 8 (1889).

1 ♂, Kulu (type). 1 ♂, Subathu. 2 ♂, Dharmsala. 1 ♂, Dalhousie. 2 ♂, Kangra. 1 ♂, 1 ♀, Sultanpore.

Lælia cardinalis.

Lælia cardinalis, Hmpsn., Ill. Het., ix, p. 74, pl. 158, f. 29, 30 (1893).

2 ♂, 1 ♀, Ceylon, including the type.

Lælia buana.

Phragmatobia buana, Moore, Cat. Lep. E. I. C., ii, p. 358 (1859).

1 ♂, Java (type).

Lælia fracta.

Lælia fracta, Schaus and Clements, Sierra Leone Lep., p. 26, pl. 1, f. 12 (1893).

3 ♂, 2 ♀, Sierra Leone.

Lælia venosa.

Lælia venosa, Moore, P. Z. S., 1877, p. 601, pl. 59, f. 1.

3 ♂, Andamans, including the type. 1 ♀, Singapore.

Lælia atestacea.

Lælia atestacea, Hmpsn., Moths, India, i, p. 443 (1892).
Harapa testacea, Moore, Lep. Atk., p. 47, pl. 2, f. 15, ♀ (nom. preocc.).

1 ♂, Khasia Hills.

There is a female in coll. Pilcher from Sikhim, and both sexes in my own coll. from the Khasia Hills. The type came from Darjiling, and is in coll. Staudinger; it is the largest species in the genus, even larger than *adalia*, Swinhoe.

LÆLIA LAVIA, nov.

♂. Olive-brown ; palpi with black hairs beneath ; frons, antennæ, head, and thorax dark brown ; shafts of antennæ white ; fore-wings pale olive-brown, darkest on the margins ; a discal outwardly curved row of seven black spots, and a blackish lunule at the end of the cell ; abdomen and hind-wings paler, evenly coloured ; a blackish lunule at the end of the cell ; under-side dull pale olive-grey ; a brown lunule at the end of each cell ; legs ochreous with brown stripes.

Expanse of wings $1\frac{2}{10}$ inches.

2 ♂, Lavi, Brit. E. Africa (*Betton*).

LÆLIA EXCLAMATIONIS.

Euprepia exclamationis, Kollar, Hugel's Kasch., iv, p. 469 (1844).
Repena cervina, Walker, iv, 800 (1855).
Lacida rotundata, Walker, iv, 802.
Cycnia rubida, Walker, xxxi, 297 (1864).
Lymantria disjuncta, Walker, xxxii, 366 (1865).

9 ♂, 12 ♀, from various parts of India and Ceylon, including the types of *rotundata* from Ceylon, and *disjuncta* from South India.

The type of *cervina* from India is in Mus. Oxon., the type of *rubida* from Ceylon was in Layard's lost collection.

LÆLIA ADALIA.

Lælia adalia, Swinhoe, Ann. Mag. N. H. (7), vi, p. 307 (1900).

1 ♂, 1 ♀, Jaintia Hills (types).

Put with *exclamationis* in the B. M., but it is certainly more nearly allied to *atestacea* ; it is a good and distinct form, and one of the largest of the genus. I have a nice series of both sexes.

LÆLIA TESTACEA.

Cycnia testacea, Walker, iii, 683 (1855).
Lælia uniformis, Hmpsn. (♀ only), Ill. Het., viii, p. 56, pl. 140, f. 20 (1891).
Charnidas colon, Hmpsn., l. c., f. 3, 19.

1 ♀, N. India (type). 1 ♀, Allahabad. 1 ♀, Bombay. 1 ♀, Mhow. 2 ♂, 4 ♀, Nilgiri Hills, including both of Hampson's types. 1 ♀, Travancore.

Lælia adara.

Procodeca adara, Moore, Cat. Lep. E. I. C., ii, p. 337 (1859).

1 ♀, Java (type).

Lælia juvenis.

Ptilomacra juvenis, Walker, v, 1099 (1855).
Hondella juvenis, Moore, Lep. Ceylon, ii, p. 144, pl. 137, f. 4 (1883).

2 ♂, 2 ♀, Ceylon, including the type.
A very peculiar and distinct form.

Lælia litura.

Charnidas litura, Walker, iv, 797 (1855).

2 ♂, Subathu. 1 ♂, Kangra. 1 ♂, Nepal (type). 2 ♂, Sultanpore.

Lælia furva.

Ocneria furva, Leech, P. Z. S., 1888, p. 631, pl. 31, f. 10.

1 ♂, 1 ♀, Ichang. 1 ♀, Pekin.
I cannot find the type.

Lælia heterogyna.

Lælia heterogyna, Hmpsn., Moths, India, i, p. 443 (1892).

12 ♂, 6 ♀, Dras, Kashmir, including the types.
The females have aborted wings.

Genus Dactylorhyncha, Hmpsn., Moths, India, i, p. 470 (1892).

Dactylorhyncha pallida.

Charnidas pallida, Hmpsn., Ill. Het., viii, p. 56, pl. 140, f. 10 (1891).

2 ♂, Nilgiri Hills, including the type.

Dactylorhyncha luteifascia.

Dactylorhyncha luteifascia, Hmpsn., Trans. Ent. Soc., 1895, p. 292.

1 ♂, Pauk Yaw, Burma (type).

Genus ANTHELA, Walker, iv, 853 (1855).
Darala, Walker, iv, 886.
Colussa, Walker, xxi, 288 (1860).
Leptocneria, Butler, Trans. Ent. Soc., 1886, p. 386.
Newmania, Swinhoe, Cat. Het. Mus. Oxon., i, p. 199 (1892).

ANTHELA RUBICUNDA.

Darala rubicunda, Swinhoe, Ann. Mag. N. H. (7), ix, p. 419 (1st June, 1902).
Anthela phœnicias, Turner, Trans. Roy. Soc. S. Australia (1st July, 1902), p. 182.

1 ♂, Roebourne (type). 4 ♂, Sherlock River. 1 ♂, Queensland.

Turner's type came from Roebourne.

ANTHELA PUDICA.

Darala pudica, ♂, Swinhoe, Ann. Mag. N. H. (7), ix, p. 419 (1st June, 1902).
Anthela aspilota, ♀, Turner, Trans. Roy. Soc. S. Australia (1st July, 1902), p. 182.

1 ♂, Roebourne (type). 6 ♂, 2 ♀, Sherlock River.

ANTHELA RUBESCENS.

Darala rubescens, Walker, xxxii, 370 (1865).

1 ♂, Australia (type).

ANTHELA ELIZABETHA.

Odonestis elizabetha, White, Grey, Journ. Exped. Austral. ii, p. 478 (1841).

2 ♂, King George's Sound.

ANTHELA ADRIANA.

Darala adriana, Swinhoe, Ann. Mag. N. H. (7), ix, p. 419 (1902).

3 ♂, Sherlock River, including the type.

ANTHELA PARVA.

Darala parva, Walker, iv, 892 (1855).

1 ♂, Sydney. 1 ♂, Tasmania (type). 2 ♂, 6 ♀, S.E. Australia. 1 ♀, Victoria.
Very near *ferruginosa*.

Anthela ferruginosa.

Anthela ferruginosa, Walker, iv, 854 (1855).

1 ♀, Tasmania (type). 1 ♀, S.E. Australia. 1 ♀, Sydney

Anthela addita.

Darala addita, Walker, xxxii, 372 (1865).

1 ♀, Tasmania (type).

Anthela venosa.

Colussa venosa, Rosenst., Ann. Mag. N. H. (5), xvi, p. 384 (1885).

1 ♀, S. Australia (type).

Anthela clementi.

Darala clementi, Swinhoe, Ann. Mag. N. H. (7), ix, p. 81 (1902).

3 ♂, 2 ♀, Sherlock River, including the types.

Anthela guenéi.

Teara guenéi, Newman, Trans. Ent. Soc., 1856, p. 284, pl. 18, f. 9.

Newmania guenéi, Swinhoe, Cat. Het. Mus. Oxon., i, p. 199 (fig.) (1892).

1 ♂, 2 ♀, Australia, including the type.

Anthela figlina.

Darala figlina, Swinhoe, Ann. Mag. N. H. (7), ix, p. 81 (1902).

3 ♂, Sherlock River, including the type.

Anthela binotata.

Leptocneria binotata, Butler, Trans. Ent. Soc., 1886, p. 386, pl. 9, f. 3.

1 ♂, Peak Downs (type). 1 ♂, 2 ♀, Port Darwin.

Anthela reducta.

Darala reducta, Walker, iv, 888 (1855).

4 ♂, 3 ♀, Australia, including the type ♂.

ANTHELA OCELLATA.

Darala ocellata, Walker, iv, 887 (1855).
Ommatoptera tetrophthalma, Herr.-Schäff., Ausser-Eur. Schmett., f. 506, 507 (1856).

7 ♂, 12 ♀, Australia, including the types.
It is a somewhat variable insect.

ANTHELA DENTICULATA.

Teara denticulata, Newman, Trans. Ent. Soc., 1856, p. 283.
Darala basigera, Walker, xxxii, 372 (1865).
Darala undulata, Felder, Reise Nov., pl. 98, f. 11 (1868).

1 ♂, Adelaide (type). 1 ♂, Melbourne.

ANTHELA OSTRA, nov.

♂. Antennæ black, shafts white ; palpi, frons, head, and shoulders bright ochreous ; thorax blackish-brown ; wings dark black ; fore-wings with a minute spot in the cell, a round spot at end, both yellow, as also are the costal margin, the outer half of cilia, and a sub-marginal row of dots ; hind-wings with the entire cilia yellow, and a row of larger spots near the margin, and extending into it ; abdomen dark dull orange ; under-side of body and legs bright ochreous ; fore-wings yellow, with the reniform distinct, the disc blackish, intersected by a yellow transverse line, the outer margin slightly suffused with black ; hind-wings deep black, with a yellow cell spot, and broad marginal yellow border.
Expanse of wings $1\frac{7}{10}$ inches.

Hab. ADELAIDE RIVER.

ANTHELA UNISIGNA, nov.

♂. Antennæ blackish-brown, shafts whitish ; palpi and frons blackish-brown ; thorax covered with dark bright chestnut-brown hairs, variegated with pure chestnut colour ; abdomen pale crimson, anal tuft white ; fore-wings pale ochreous-grey ; a transverse erect and straight brownish-grey band beyond the middle, in which is a prominent pure white spot ringed with blackish-brown at the end of the cell, another more attenuated similar band in the disc, followed rather closely by a broad brownish-grey marginal band ; hind-wings paler, nearly white, with a similar broad outer marginal band ; under-side of wings white, with the first band of fore-wings and cell spot, the cell itself suffused with ochreous ; hind-wings with a small brown lunular mark at upper end of cell; pectus and legs brownish-grey, with some crimson hairs; abdomen white.

Expanse of wings $2\frac{3}{10}$ inches.

Hab. Sherlock River, W. Australia (Clement).

Of the shape of *stygiana*, Butler.

Anthela stygiana.

Darala stygiana, Butler, Ann. Mag. N. H. (5), ix, p. 88 (1882).

1 ♂, Melbourne (type).

Anthela tritonea, nov.

♀. Antennæ black, shafts pale red; palpi and frons black, ochreous at the sides; head brown; thorax and abdomen covered with very dark blackish-chestnut hairs with a bronzed tint; in the female the thorax is covered with grey and white hairs; the abdomen is coloured like that of the male, but the segments are ringed with long crimson hairs; fore-wings black, minutely and very densely irrorated with grey, crossed by three black bands rather close together in the middle of the wing, the first outwardly and irregularly curved, the other two nearly erect, the last including a small pale spot at the end of the cell; another transverse black band in the disc, sinuated, almost crenulate, outwardly edged with white, and close to it a prominent white semi-dentate band, which runs from close to apex to a little in front of the hinder angle; hind-wings pale brown tinged with ochreous, especially towards the base, where there is a bunch of dark chestnut hairs in the male; a broad darker brown transverse straight band before the middle, a duplex whitish sinuated thin band before the blackish border; under-side whitish irrorated with pale black; a white spot in cell of fore-wings, another at the end, both ringed with brown; a brown even band across end of cell, and continued across both wings; a discal sinuate thinner band; an inner brown spot on hind-wings; thorax and legs dark chestnut-brown, with some crimson hairs; abdomen white.

Expanse of wings ♂ 4, ♀ 4 $\frac{6}{10}$ inches.

Hab. Queensland.

These examples were presented in 1896 by Mr. Wailley: they seem to be allied to *A. magnifica*, Lucas, Proc. Linn. Soc. N. S. W. (2), vi, p. 286, but differ in many characters from Lucas's description; they are the largest examples of the genus I think yet recorded.

ANTHELA CONNEXA.

Darala connexa, Walker, iv, 898 (1855).
Darala fervens, Walker, iv, 898.
Darala zonata, Felder, Reise Nov., pl. 99, f. 1 (1868).

5 ♂, 5 ♀, Tasmania, including types of *connexa* and *fervens*. The type of *zonata* from Australia is in coll. Rothschild.

ANTHELA POSTICA.

Darala postica, Walker, iv, 899 (1855).

1 ♀, Australia (type).

ANTHELA NICOTHOË.

Bombyx nicothoë, Boisd., Voy. de l'Astrolabe, i, p. 226 (1832).
Darala adusta, Walker, iv, 897 (1855).
Lælia australasiæ, Herr.-Schäff., Ausser-Eur. Schmett., f. 386 (1855).

9 ♂, 8 ♀, Australia, including Walker's type.

ANTHELA REPLETA.

Darala repleta, Walker, iv, 896 (1855).

1 ♂, 2 ♀, Tasmania, including type ♂.

ANTHELA CINERASCENS.

Darala cinerascens, Walker, iv, 900 (1855).

2 ♂, 1 ♀, including type ♀.

ANTHELA RUFIFASCIA.

Darala rufifascia, Walker, xxxii, 370 (1865).

2 ♂, 1 ♀, Tasmania, including type ♀.

ANTHELA FERRUGINEA.

Darala ferruginea, Walker, iv, 890 (1855).
Ommatoptera diophthalma, Herr.-Schäff., Ausser-Eur. Schmett., f. 508 (1856).

4 ♂, Tasmania, including type.

ANTHELA ACUTA.

Darala acuta, Walker, iv, 889 (1855).

3 ♂, New Holland, including the type. 5 ♀ S.E. Australia.

Anthela delineata.

Darala delineata, Walker, xxxii, 371 (1865).

1 ♂, Melbourne. 1 ♂, Australia (type).

Anthela subfalcata.

Darala subfalcata, Walker, iv, 894 (1855).

1 ♂, 2 ♀, Tasmania, including the type ♂.

Anthela hamata.

Darala hamata, Walker, iv, 895 (1855).
Darala latifera, Walker, Trans. Ent. Soc., 1862, p. 266.
Colussa uvaria, Walker, xxxv, 1576 (1866).

1 ♂, 3 ♀, Moreton Bay, including types of *latifera* and *uvaria*. 1 ♀, Sydney (type).

Anthela varia.

Darala varia, Walker, iv, 890 (1855).
Colussa odenestaria, Walker, xxi, 288 (1860).

2 ♂, New Holland, including the type. 1 ♂, S.E. Australia. 2 ♀, Australia, including the type of *odenestaria*.

Anthela simplex.

Darala simplex, Walker, iv, 891 (1855).

1 ♂, without locality (type). 2 ♂, 3 ♀, Sydney.

Anthela plana.

Darala plana, Walker, iv, 892 (1855).

1 ♂, Australia (type).

In poor condition, and without antennæ, doubtfully distinct from *simplex*.

Anthela canescens.

Darala canescens, Walker, iv, 901 (1855).
Dreata deficiens, Walker, xxxii, 374 (1865).

1 ♂, Australia (type). 1 ♂, S.E. Australia. 2 ♀, Swan River. 1 ♂, N. Australia (type *deficiens*). 1 ♂, Carnarvon, W. Australia.

They are of different shades of colour, but not more so than is common in the genus, and their markings are all identical.

ANTHELA CARNEOTINCTA, nov.

♂, ♀. Of a uniform ochreous-grey, tinged with flesh colour, the female rather darker than the male and tinged with pink; antennæ, palpi, pectus, under-side of body, and legs more or less ochreous; on the sides of the abdomen of the male there are some brown patches; on the fore-wings a brown dot in the middle of the cell and a brown spot at the end; a very indistinct, more or less crenulated grey line across the disc of both wings and even with the margins; cilia of both wings ochreous; in the female there is, in addition, an inner discal duplex band in the fore-wings and indications of a similar band in the hind-wings, and very faint indications of an inner band across both wings; the under-side is evenly coloured like the upper-side, but yellower in the male and pinker in the female, with a brown spot in the cell and another at the end in both wings, and indications of the upper transverse bands.

Expanse of wings, ♂ $2\frac{7}{10}$, ♀ $3\frac{1}{2}$ inches.

2 ♂, 1 ♀, Freemantle, bred March, 1891 (*Walker*).

ANTHELA CRENULATA, nov.

♀. Palpi brown-pink; antennæ, head, body, and wings above and below of a uniform ochreous-grey colour, with a slight shade of pink in it; fore-wings with a small brown spot in the cell, and larger spot at the end; an ante-medial transverse brown band, inside the first spot, bent outwardly in an irregular manner in the middle, and continued in a very indistinct form across the hind-wings; a discal band across both wings formed by a very evenly crenulated line; cilia of both wings ochreous; under-side with only the crenulated discal band, and a brown spot in the cell and another at the end in all the wings; fore-legs brown above.

Expanse of wings, $2\frac{8}{10}$ inches.

Freemantle, bred March, 1891 (*Walker*).

Of a beautiful tint of colour; but this colour varies much, and in two examples is more yellow, and in two others bright yellow; the markings are identical, though in some examples more distinct than in others. They were all bred at the same time and place.

ANTHELA CONSPERSA.

Darala conspersa, Walker, iv, 891 (1855).
Darala quadriplaga, Walker, Trans. Ent. Soc., 1862, p. 269.
Ennomos (?) *potentaria*, Walker, xxvi, 1519 (1862).

1 ♂, without locality (type). 1 ♀, New Holland. 1 ♀, S.E. Australia. 1 ♀, Australia (type *potentaria*).

The type of *quadriplaga* marked Australia is in Mus. Oxon.

Anthela excisa.

Darala excisa, Walker, iv, 889 (1855).

4 ♂, 1 ♀, Sydney, including the type ♂.
Very near *conspersa.*

Anthela consors.

Darala censors, Walker, xxxii, 369 (1865), (ex err. typ.).
Darala consors, Walker, xxxv, 1917 (1866).

3 ♂, S. Australia, including the type ♂. 1 ♂, S.E. Australia.

Anthela excellens.

Darala excellens, Walker, iv, 902 (1855).

1 ♂, 1 ♀, Australia, including the type ♀.

Anthela integra.

Darala integra, Walker, iv, 893 (1855).

1 ♂, New Holland (type.) 1 ♀, Australia.

Anthela limonea.

Darala limonea, Butler, Cist. Ent., i, p. 291 (1874).

1 ♂, 1 ♀, Rockhampton (types).

Anthela inornata.

Darala inornata, Walker, iv, 901 (1855).

1 ♂, Swan River (type).

Anthela flavala, nov.

♀. Of a uniform rather bright yellow colour; upper-side of palpi brown; both wings with a grey spot in the cell, and another at the end; indications of an inner outwardly curved transverse line, and a post-medial broader line, followed by two thin crenulated lines; under-side same as upper-side.

Expanse of wings, $1\frac{6}{10}$ inches.

Hab. Sherlock River, W. Australia (*Clement*).

There is also a still brighter yellow female, collected by Dr. Clement at the same place, with very similar markings (which are however very indistinct), in which the cell spots are somewhat closer together.

Anthela pinguis.

Darala pinguis, Walker, xxxii, 372 (1865).

1 ♂, 1 ♀, Australia, including the type ♀.

Anthela obscura.

Trichiura obscura, Walker, vi, 1481 (1855).

1 ♂, Australia (type).

Not a typical *Anthela,* quite a small insect ; as it is an unique example, its proper position can only be determined when more specimens are obtained.

Genus Pterolocera, Walker, iv, 883 (1855).

Pterolocera amplicornis.

Pterolocera amplicornis, Walker, iv, 884.

1 ♂, Adelaide (type). 1 ♂, Melbourne. 5 ♂, Australia.

Pterolocera insignis.

Pterolocera insignis, Herr.-Schäff., Ausser-Eur. Schmett., f. 459 (1856).

1 ♂, Australia.

Genus Aroa, Walker, iv, 791 (1855).
Baziza, Walker, xxxii, 398 (1865).

Aroa maxima.

Aroa maxima, Hmpsn., Ill. Het., ix, p. 74, pl. 159, f. 9 (1893).

1 ♂, Ceylon (type).

Aroa major.

Aroa major, Hmpsn., Ill. Het., ix, p. 74, pl. 159, ff. 3, 5 (1893).

1 ♂, 1 ♀, Pundaloya, Ceylon (types). 1 ♂, Ceylon. 1 ♂, 1 ♀, Trevandrum.

Aroa plana.

Orgyia (?) *plana*, Walker, iv, 786 (1855).
Charnidas junctifera, Walker, xxxii, 334 (1865).

1 ♂, N. India (type). 2 ♂, 2 ♀, Nilgiri Hills. 6 ♂, Trevandrum. 4 ♂, 1 ♀, Ceylon.

Aroa ochracea.

Charnidas ochracea, Moore, Lep. Atk., p. 44 (1879).

1 ♂, 1 ♀, Nilgiri Hills. 1 ♀, Calcutta (type).

Aroa sienna.

Aroa sienna, Hmpsn., Ill. Het., viii, p. 55, pl. 140, f. 29 (1891).

2 ♂, 1 ♀, Nilgiri Hills (type). 4 ♂, Ceylon.

Aroa subnotata.

Lacida subnotata, Walker, iv, 803 (1855).

5 ♂, 3 ♀, Ceylon, including the type ♂. 1 ♂, Nilgiri Hills.

Aroa flavicollis.

Crinola flavicollis, Leech, Entom., xxiii, p. 111 (1890).

6 ♂, Chang Yang, including the type ♂. 2 ♀, Chia-kou-ho, including the type ♀.

Aroa atrella.

Aroa atrella, Hmpsn., Moths, India, i, p. 439 (1892).

1 ♂, Sikhim. 1 ♂, Khasia Hills.
The type, from Margharita, is in coll. Elwes.

Aroa atrescens.

Aroa atrescens, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 294 (1897).

1 ♂, Khasia Hills (type).

Aroa cinnamomea.

Charnidas cinnamomea, Moore, Lep. Atk., p. 44 (1879).
Charnidas aurantiaca, Warren, P. Z. S., 1888, p. 296.

3 ♂, Kunawar, including the type. 1 ♂, Attock (type *aurantiaca*).

Aroa sagrara.

Aroa sagrara, Swinhoe, P. Z. S., 1885, p. 299, pl. 20, f. 13.

4 ♂, Belgaum, including the type. 2 ♂, 1 ♀, Jubbulpore. 1 ♀, Rajputana.

Aroa clara.

Aroa clara, Swinhoe, P. Z. S., 1885, p. 299, pl. 20, f. 10.

2 ♂, 2 ♀, Bombay, including the type.

Aroa simplex.

Orgyia simplex, Walker, xxxii, 325 (1865).

1 ♂, S. India (type). 2 ♂, Nilgiri Hills.

Aroa xerampelina.

Gynæphora xerampelina, Swinhoe, P. Z. S., 1885, p. 299, pl. 21, ff. 8, 9.

1 ♂, 2 ♀, Poona, including the types. 1 ♂, Deccan. 1 ♂, Bombay. 1 ♂, Nilgiri Hills.

Aroa flaveofusca.

Aroa flaveofusca, Swinhoe, Ann. Mag. N. H. (7), ix, p. 80 (1902).

1 ♂, Lawas, Borneo (type). 1 ♂, Sandakan.

Aroa mirma, nov.

♂. Orange-yellow; branches of antennæ black; head and thorax brown; fore-wings with a rather large brown spot at the end of the cell, and dark brown irrorations forming a broad band at the apex; some paler brown spaces on the costa, base, and hinder margin, the irrorations being less thick, leaving only a small place in the middle of the wing clear; hind-wings with the costal space broadly dark brown; under-side without any irrorations, except at the apices of both wings, but the brown spaces more limited on the hind-wings, there being merely a brown apical patch; body and legs pale whitish-yellow.

Expanse of wings 1 inch.

2 ♂, Sumatra (*Ericson*).

With the wings rather broad and short and the apices rounded as in *flaveofusca*, Swinhoe, from Borneo.

AROA COMETARIS.

Aroa cometaris, Butler, Ann. Mag. N. H. (5), xix, p. 223 (1887).

1 ♂, Alu (type). 2 ♂, Guadalcanar Island.

AROA DISCALIS

Aroa discalis, Walker, iv, 792 (1855).

1 ♂, S. Africa (type). 1 ♂, Kilimanjaro. 1 ♂, Zomba. 22 ♂, Natal, Mashonaland and Zululand.

Kirby, p. 463, sinks *difficilis*, Walker, to this species, but *difficilis* is a *Dasychira*.

AROA BISTIGMIGERA.

Aroa bistigmigera, Butler, P. Z. S., 1896, p. 847, pl. 42, f. 7.

3 ♂, Nyassaland, including the type. 2 ♂, Zululand. 2 ♂, Port Ugowe. 2 ♂, Basutoland. 2 ♂, Natal. 1 ♂, Transvaal. 6 ♂, Neugia, Brit. E. Africa.

AROA DREGEI.

Orgyia dregei, Herr.-Schäff., Ausser-Eur. Schmett., i, f. 114 (1854).

2 ♂, Cape.

AROA MELAXANTHA.

Orgyia melaxantha, Walker, xxxii, 324 (1865).

1 ♂, Cape (type).

AROA SUBSTRIGOSA.

Aroa substrigosa, Walker, iv, 794 (1855).
„ „ Butler, Ill. Het., v, p. 54, pl. 90, f. 5 (1886).
Aroa pyrrhochroma, Walker, xxxii, 329 (1865).

28 ♂, 5 ♀, from parts of North India and China, including both types.

Typical *pyrrhochroma* with its broad black outer marginal band looks very distinct from typical *substrigosa*, which has no band whatever, but I have received both forms and any number of intergrades from the Khasia Hills, where the species is quite common, and I am convinced that they are both one and the same very variable form.

Aroa socrus.

Gynæphora socrus, Geyer, Zutr., v, p. 12, ff. 837, 838 (1837).

4 ♂, Java.

The "East Indies," which Geyer gives as his locality, undoubtedly meant the Dutch East Indies; his figures correspond with the Javan form, which is quite different from the Indian.

Aroa risoria, nov.

♂. Antennæ black, shafts white; palpi and frons ochreous; head, body, and fore-wings pink-grey, with pale blackish-brown indistinct streaks along the interspaces above and below the cell, and near the hinder margin; hind-wings brownish-grey, paler towards abdominal margin, in one example pale yellowish-white and very uniform in tint; cilia of both wings dark brown-pink; under-side paler, both wings uniformly coloured, the apex of fore-wings with an obscure grey space; body and legs grey, strongly tinged with pink.

Expanse of wings $2\frac{2}{10}$ inches.

3 ♂, Arjuno, Java, 3000 feet (*Doherty*).

Belongs to the *socrus* group.

Aroa charax.

Neurophana charax, Druce, Ann. Mag. N. H. (6), xvii, p. 352 (1896).

1 ♂, Nyassaland.

The type from E. Africa is in coll. Druce.

Aroa ochraceata.

Aroa ochraceata, Walker, xxxii, 327 (1865).

1 ♀, Natal (type). 4 ♀, Salisbury, Mashonaland. 2 ♀, Zomba.

Aroa signata.

Aroa signata, Walker, xxxii, 328 (1865).

6 ♀, Natal, including the type. 1 ♀, Port Ogowe.

Genus Teia, Walker, iv, 803 (1855).

Teia anartoides.

Teia anartoides, Walker, iv, 804.

5 ♂, Tasmania, including the type. 2 ♂, S.E. Australia.

TEIA PUSILLA.

Teia pusilla, Butler, Ann. Mag. N. H. (5), ix, p. 88 (1882).

1 ♂, Melbourne (type). 7 ♂, Sydney. 1 ♂, S.E. Australia.

Genus ORGYIA, Ochs., Schmett. Eur., iii, p. 208 (1810).
Notolophus, Germ., Prodr., ii, p. 35 (1812).
Gynæphora, Hübner, Verz. bek. Schmett., p. 161 (1818).
Acyphas, Walker, iv, 797 (1855).
Micropterogyna, Ramb., Cat. Lep. Andalusie, p. 281 (1866).
Clethrogyna, Ramb., l. c.
Thylacogyna, Ramb., l. c.
Apterogynis, Guen., Stat. Sci. d'Eure et Loire, p. 78 (1876).

ORGYIA NIGROCROCEA.

Orgyia nigrocrocea, Walker, Journ. Linn. Soc. Lond., vi, p. 124 (1862).

4 ♂, Sarawak, including the type. 1 ♂, Matang, Borneo.

ORGYIA NIGRIPLAGA.

Orgyia nigriplaga, Swinhoe, Ann. Mag. N. H. (7), xii, p. 194 (1903).

1 ♂, N. Borneo (Fruhstorfer) (type). 1 ♂, Perissiu, Borneo.

ORGYIA TURBATA.

Orgyia turbata, Butler, Trans. Linn. Soc. Lond. (2), i, p. 560 (1879).

1 ♂, Malacca (type). 1 ♂, Province Wellesly. 1 ♂, Tenasserim. 1 ♂, Heipaw, Burma.

ORGYIA GONOSTIGMA.

Bombyx gonostigma, Fabr., Syst. Ent., p. 585 (1775).
Orgyia approximans, Butler, Trans. Ent. Soc., 1881, p. 10.

1 ♂, Tokio (type *approximans*). 1 ♂, Oiwake.
Besides many European examples.

ORGYIA NUCULA.

Orgyia nucula, Swinhoe, Ann. Mag. N. H. (6), xiv, p. 435 (1894).

Orgyia nucula, Swinhoe, Trans. Ent. Soc., 1895, p. 7, pl. 1, f. 15.

1 ♂, Khasia Hills (type). 1 ♂, Fort Stedman, Shan States.

Orgyia leechi.

Orgyia prisca, Leech, Entom., xxiii, p. 111 (1890) (preocc.).
Notolophus leechi, Kirby, Cat. Moths, i, p. 495 (1892).

2 ♂, Chang Yang, including the type. 10 ♂, various parts of Western China.

Orgyia senica.

Orgyia senica, Hmpsn., Journ. Bo. N. H. Soc., xiii, p. 234, pl. B, f. 23 (1900).

1 ♂, Chitral (type).

Orgyia thyellina.

Orgyia thyellina, Butler, Trans. Ent. Soc., 1881, p. 10, ♂.
" " Leech, P. Z. S., 1888, p. 625, pl. 31, f. 7, 7a, ♀.

1 ♂, Tokio, Japan (type). 3 ♂, Yokohama. 1 ♀, Oiwake. 5 ♂, 6 ♀, marked Japan.

Orgyia viridescens.

Acyphas viridescens, Walker, iv, 798 (1855).

2 ♂, Ceylon, including the type.

Orgyia dewara, nov.

♂. Antennæ, body, and wings dark brown-pink; branches of the antennæ black; thorax and fore-wings with many pale pinkish markings very difficult to describe; fore-wings crossed by a number of dark brown very irregular bands, and with a submarginal series of large brown spots on a pale ground, all very obscure; hind-wings without markings, of a uniform colour, much darker than the fore-wing, nearly black; cilia of both wings with ochreous-white tips; under-side much paler brown; both wings uniform in colour and without markings; palpi, body beneath, and legs dull ochreous, the legs with some dark brown stripes.

Expanse of wings $1\frac{1}{10}$ inches.

Hab. Kapaur, N. Guinea (*Doherty*).

The fore-wings are narrower than is usual in this genus.

Orgyia postica.

Lacida postica, Walker, iv, 803 (1855).
Orgyia postica, Hmpsn., Moths, India, i, p. 437 (fig.) (1892).
„ „ Pag., Zoologica, xxix, p. 40 (1900).
Orgyia ceylanica, Nietner, Ed. New Phil. Journ., xv, p. 34 (1862).
Orgyia ocularis, Moore, Lep. Atk., p. 44 (1879).
Orgyia ludekingii, Snellen, Tijd. v. Ent., xxii, p. 104, pl. 8, f. 5 (1879).

One from Hong Kong, 1 Formosa, 2 Calcutta, including Moore's type of *ocularis*, 5 Ceylon, 1 Maulmein (type), 1 Sarawak, 5 Java, 1 New Guinea, 1 Yorubaland, all males.

Orgyia australis.

Orgyia australis, Walker, iv, 787, ♀ (1855).
Orgyia canifascia, Walker, xxxii, 325, ♂ (1865).

2 ♂, 1 ♀, Australia, including both types.

Orgyia tisdala, nov.

♂. Brown, with a slight pink tinge; palpi on the inner sides, body beneath, and legs very pale, nearly white; wings with the veins brown, rather prominent, rather thinly clothed, the costal and outer marginal spaces of fore-wings dark brown; a large dark brown spot at the end of the cell.

Expanse of wings $\frac{8}{10}$ inch.

3 ♂, Arjuno, Java (including type), (*Doherty*). 2 ♂, Sumatra (*de Nicéville*).

A very small example of the genus; the outer margins of fore-wings much rounded.

Genus Lachana, Moore, P. Z. S., 1888, p. 397.

Lachana ladakensis.

Lachana ladakensis, Moore, l. c., p. 398.
„ „ Butler, Ill. Het., vii, p. 30, pl. 121, f. 6 (1889).

1 ♂, Ladak (type). 1 ♂, Skardo.

Genus Icta, Walker, iv, 922 (1855).

Icta fulviceps.

Icta fulviceps, Walker, iv, 922.

2 ♂, Australia, including the type.

Genus VARMINA, Moore, P. Z. S., 1888, p. 405.

VARMINA INDICA.

Gluphisia (?) *indica*, Walker, v, 1039 (1855).

1 ♂, Simla. 2 ♂, 1 ♀, Kangra. 1 ♂, 1 ♀, Dharmsala. 1 ♂, 1 ♀, Umballa.
The type marked India is in Mus. Oxon.

Genus CASAMA, Walker, xxxii, 611 (1865).

CASAMA VILIS.

Euproctis vilis, Walker, xxxii, 348, ♂.
Casama indeterminata, Walker, xxxii, 611, ♀.

1 ♂, 1 ♀, S. India (types ♂ ♀). 1 ♂, Nilgiri Hills. 2 ♂, Ceylon. 1 ♂, 2 ♀, Muscat, Arabia. 1 ♂, Somaliland. 1 ♂, Abyssinia.
Hind-wings with costal and sub-costal nearly touching at the middle, 3 and 4, and 6 and 7 stalked.

Genus THIACIDAS, Walker, v, 1027 (1855).

THIACIDAS POSTICA.

Thiacidas postica, Walker, v, 1028, ♂.
Drymonia (?) *denotata*, Walker, xxxii, 414, ♀ (1865).
Heterocampa (?) *nigroscripta*, Walker, xxxii, 423 ♀.
Cnethocampa (?) *curvata*, Walker, xxxii, 429, ♂.
Cnethocampa (?) *basifurca*, Walker, xxxii, 430.

12 ♂, 11 ♀, from various parts of India, including all the types.
Costal and sub-costal touching close to base, 3 and 4, and 6 and 7 from the angles of the cell.

Genus DASYCHIRA, Steph., Ill. Brit. Ent. Haust., ii, p. 58 (1829).
Psalis, Hübn., Zutr., ii, p. 19 (1823) (non descr.).
Olene, Hübn., l. c. (non descr.).
Arestha, Walker, iv, 805 (1855).
Melia, Walker, iv, 808 (preocc.).
Anaxila, Walker, iv, 810.
Argila, Walker, iv, 811.
Nioda, Walker, v, 1069 (1855).
Dediama, Walker, v, 1074.
Rilia, Walker, v. 1075.

Phinεca, Walker, vii, 1746 (1856).
Ilema, Moore, Cat. Lep. E. I. C., ii, p. 341 (1859) (preocc.).
Anthyneura, Felder, Sitz. Akad. Wiss. Wien., xliii, p. 331 (1861).
Janassa, Walker, Journ. Linn. Soc. Lond., vi, p. 135 (1862).
Thelde, Walker, l. c., p. 139.
Boreconia, Walker, xxxii, 460 (1865).
Turriga, Walker, Char. Undescr. Lep. Het., p. 15 (1869).
Tearosoma, Felder, Reise Nov., pl. 100, f. 6 (1868) (non descr.).
Cadrusia, Moore, Lep. Atk., p. 54 (1879).
Calliteara, Butler, Trans. Ent. Soc., 1881, p. 12.
Eudasychira, Mösch, Abh. Senck. Ges., xv., p. 75 (1889).
Pseudonotodonta, Mösch., l. c., p. 76.
Œcura, Holland, Psyche, vi, p. 389 (1893).
Euproctidion, Holland, l. c., p. 414.
Notohyba, Holland, l. c., p. 434.
Thamnocera, Holland, l. c., p. 454.
Bathmochtha, Karsch, Ent. Nachr., xxi, p. 368 (1895).

SECTION I, WITHOUT DORSAL TUFTS ON ABDOMEN.

Dasychira securis.

Psalis securis, Hübner, Zutr., iii, p. 9, ff. 291, 292 (1823).
Arestha antica, Walker, iv, 805 (1855).
Rigema falcata, Walker, xxxii, 437 (1865).
Rigema tacta, Walker, xxxii, 438.
Anticyra approximata, Walker, xxxii, 440.

14 ♂, 13 ♀, from many parts of India, Ceylon, Java, Australia, and Africa, including all Walker's types.

Dasychira olearia.

Olene olearia, Swinhoe, P. Z. S., 1885, p. 297, pl. 20, ff. 14, 15.

1 ♂, 1 ♀, Poona (types). 5 ♀, Nilgiri Hills.

Dasychira fusca.

Anthora fusca, Walker, iv, 918, ♂ (1855).
Boreconia subviridis, Walker, xxxii, 460, ♀ (1865).

1 ♂, 1 ♀, South Africa (types ♂ ♀). 1 ♂, Cape. 4 ♂, 1 ♀, Knysna.

The type example of *subviridis* is a female, not a male as stated by Walker.

DASYCHIRA CŒRULEIFASCIA.

Thamnocera cœruleifascia, Holland, Psyche, vi, p. 469 (1893).

1 ♀, Ogove River (*Holland*). 6 ♂, 2 ♀, River Niger (*F. W. Sampson*).

Holland's type, a female, came from the Ogove River.

DASYCHIRA ROBUSTA.

Acyphas (?) *robusta*, Walker, iv, 799 (1855).

1 ♂, Sierra Leone (type).

DASYCHIRA DELICATA.

Notolophus delicata, Holland, Psyche, vi, p. 451, pl. 18, f. 4 (1893).

1 ♂, Ogove River (*Holland*).

The type from Ogove River is in coll. Holland.

DASYCHIRA CITANA.

Ulibana (?) *citana*, Schaus and Clements, Sierra Leone Lep., p. 26, pl. i, f. 10 (1893).

1 ♂, Sierra Leone.

DASYCHIRA PUNCTIFERA.

Erastria (?) *punctifera*, Walker, xii, 809 (1857).

1 ♂, Congo (type).

DASYCHIRA PECULIARIS.

Mardara (?) *peculiaris*, Butler, Ann. Mag. N. H. (5), iv, p. 240 (1879).

1 ♂, Madagascar (type).

DASYCHIRA BASISTRIGA.

Phineca basistriga, Walker, vii, 1747 (1856).

1 ♀ without locality (type).

DASYCHIRA ANTICA.

Dediama antica, Walker, v, 1074 (1855).
Bathmochtha albilunulata, Karsch, Ent. Nachr., xxi, p. 368, pl. 4, f. 12 (1895).

1 ♂, without locality (type).
Karsch's type came from the Cameroons.

DASYCHIRA LIGNEA.

Nioda lignea, Butler, Ann. Mag. N. H. (5), iv, p. 241 (1879).

1 ♂, Madagascar (type).

SECTION II, WITH DORSAL TUFTS ON ABDOMEN.

DASYCHIRA MENDOSA.

Olene mendosa, Hübner, Zutr., ii, p. 19 ff. 293, 294 (1823).
Antipha basalis, Walker, iv, 806 (1855).
Nioda fusiformis, Walker, v, 1070 (1855).
Rilia lanceolata, Walker, v, 1075.
Dasychira sawanta, Moore, Cat. Lep. E. I. C., ii, p. 340, ♂ (1859).
Dasychira divisa, Walker, xxxii, 363, ♂ (1865).
Dasychira basigera Walker, xxxii, 363, ♂.
Rilia distinguenda, Walker, xxxii, p. 435, ♂.
Olene basivitta, Walker, xxxii, 436 ♀.
Turriga invasa, Walker, Char. Undescr. Lep. Het., p. 15, ♂ (1869).

9 ♂, 13 ♀, from various parts of India and Ceylon, including the types of *lanceolata*, *fusiformis*, and *basivitta*. 1 ♂ Singapore, 1 ♂ 1 ♀ Borneo, 2 ♂ 1 ♀ Java, including the type of *savanta*; 1 ♂ Christmas Isl., 4 ♂ 6 ♀ Australia, including the types of *basalis*, *divisa*, *invasa*, *distinguenda* and *basigera*.

DASYCHIRA BASALIS.

Argila basalis, Walker, iv, 811 (1855).

1 ♂, Sierra Leone (type).

DASYCHIRA ORIMBA.

Olene orimba, Swinhoe, Ann. Mag. N. H. (6), xiv, p. 435 (1894).

1 ♂, 1 ♀, Khasia Hills (types).

Dasychira invaria.

Repena (?) *invaria*, Walker, vii, 1724 (1856).
Dasychira inclusa, Walker, vii, 1737.
Thelde patula, Walker, Journ. Linn. Soc. Lond., vi, p. 140 (1862).
Dasychira dalbergiæ, Moore, P. Z. S., 1888, p. 399.

1 ♂, Philippines (type). 8 ♂, 8 ♀, Java, including type ♂ of *inclusa*. 2 ♀, Sambawa. 2 ♂, 3 ♀, Dharmsala, including type ♂ of *dalbergiæ*. 2 ♂, Bengal. 1 ♀, Hong Kong.

Dasychira asvata.

Dasychira asvata, Moore, Cat. Lep. E. I. C., ii, p. 340 (1859).

1 ♂, 1 ♀, Java (types). 1 ♂, Dinding Isl., Malaya.

Dasychira flavimacula.

Dasychira flavimacula, Moore, P. Z. S., 1865, p. 804.

1 ♂, Bengal (type). 4 ♂, 2 ♀, Darjiling. 1 ♂, 1 ♀, Yatong, Thibet.

The Yatong examples are not quite typical; the markings are practically the same, but the fore-wings are shorter and the outer margin rounder, especially in the female, the wings not being elongated, with a very oblique outer margin, as in the Sikhim and Bengal examples.

Dasychira rendalli.

Dasychira rendalli, Distant, Ann. Mag. N. H. (6), xx, p. 203 (1897).

3 ♂, Mashonaland. 1 ♂, Natal.

The type from the Transvaal is in coll. Distant.

Dasychira municipalis.

Lælia municipalis, Distant, Ann. Mag. N. H. (6), xx, p. 200, ♂ (1897).
Lacipa diffusa, Distant, l. c., ♀.

13 ♂, 6 ♀, Cape. 1 ♀, Natal. 2 ♀, Nyassaland.

The types from the Transvaal are in coll. Distant.

Dasychira extorta.

Dasychira extorta, Distant, Ann. Mag. N. H. (6), xx, p. 203 (1897).

Lymantria hera, Druce, Ann. Mag. N. H. (7), i, p. 209 (1898).

1 ♂, Brit. E. Africa. 1 ♂, Natal. 5 ♂, 1 ♀, Mashonaland.

The type from the Transvaal is in coll. Distant, and the type of *hera* from British E. Africa in coll. Druce.

DASYCHIRA NUBIFUGA.

Notohyba nubifuga, Holland, Psyche, vi, p. 451, pl. 18, f. 33 (1893).

♂, Ogove River (*Holland*).

The type from the Ogove River is in coll. Holland.

DASYCHIRA MISERATA.

Ilema miserata, Holland, Psyche, vi, p. 471, pl. 17, f. 3 (1893).

1 ♂, Ogove River (*Holland*). 1 ♀, Lokoja.

The type from Ogove River is in coll. Holland.

DASYCHIRA OCELLIFERA.

Occura ocellifera, Holland, Psyche, vi, p. 454, pl. 18, f. 5 (1893).

1 ♂, Ogove River (*Holland*).

The label on this example has got on it *Notopriota ocellifera*, Holland, co-type, but I can find no reference to any such genus, except on Holland's plate; the genus does not seem to have been described. The type from the Ogove River is in coll. Holland.

DASYCHIRA MALIGNA.

Parorgyia maligna, Butler, Cist. Ent., iii, p. 17 (1882).

1 ♂, Madagascar (type).

DASYCHIRA PHASIANA.

Parorgyia phasiana, Butler, Cist. Ent., iii, p. 17 (1882).

1 ♂, Madagascar (type).

DASYCHIRA CHALANA.

Dasychira chalana, Moore, Cat. Lep. E. I. C., ii, p. 339 (1859).

Lacida costiplaga, Walker, Journ. Linn. Soc. Lond., vi, p. 126 (1862).

4 ♂, 3 ♀, Java, including the type ♀.
The type of *costiplaga* ♂ from Sarawak is in Mus. Oxon.

Dasychira misana.

Dasychira misana, Moore, Cat. Lep. E. I. C., ii, p. 340, pl. 9a, f. 2 (1859).

2 ♂, Java, including the type.

Dasychira whitei.

Œcura whitei, Druce, Ann. Mag. N. H. (7), i, p. 209 (1898).

1 ♂, Old Calabar. 2 ♂, Natal. 1 ♂, Durban.
The type from W. Africa is in coll. Druce.

Dasychira goodii.

Œcura goodii, Holland, Psyche, vi, p. 390, pl. 9, ff. 3, 4 (1893).

1 ♂, Ogove River (*Holland*). 3 ♀, Sierra Leone.
The types from the Ogove River are in coll. Holland.

Dasychira costalis.

Melia costalis, Walker, iv, 808 (1855).

3 ♂, 7 ♀, Java, including the type ♀. 1 ♂, Heipaw, Burma.

Dasychira cromptoni, nov.

♂. Antennæ grey, shafts white; palpi, frons, and thorax greyish-ochreous; fore-wings ochreous fawn colour; two black subbasal marks, a brown obscure spot in the cell, a white lunule at the end with a white dot above and another below it, an antemedial semi-dentate erect brown line, a postmedial brown band from centre of hind margin straight to the costa one-fourth from apex, where it curves in; within this band there is a very fine semi-dentate blackish line with pale points; an oblique row of blackish-brown spots parallel to the second line; the lower portion of the space between the first line and the band brighter ochreous than the rest of the wing; hind-wings pale ochreous-grey, without markings; under-side of wings uniform ochreous-grey, with an oblique grey line in the disc of each wing; body and legs ochreous; tarsi with black spots.

Expanse of wings $1\frac{3}{10}$ inches.

1 ♂, Old Calabar (*Crompton*) (type). 2 ♂, River Niger (*Sampson*).
The Niger examples are without any ochreous tinge, but the markings are identical.

DASYCHIRA TENEBROSA.

Dasychira tenebrosa, Walker, xxxii, 361 (1865).

1 ♂, 1 ♀, Dalhousie. 5 ♂, Yatong, Thibet. 4 ♂, 3 ♀, Darjiling, including the type. 5 ♂, W. China.

DASYCHIRA BHANA.

Dasychira bhana, Moore, P. Z. S., 1865, p. 804.

4 ♂, Darjiling, including the type.

The same size as *tenebrosa*, but can at once be distinguished by its large dull ochreous spot at the end of the cell of fore-wings, instead of the black stigma of that species.

DASYCHIRA NIGRITULA.

Dasychira nigritula, Walker, xxxii, 360 (1865).

1 ♂, 2 ♀, N. India, including the type.

Much larger than the two preceding forms, the ochreous spot at the end of the cell very large, in some examples in the form of a patch, prominent in fresh examples.

DASYCHIRA FEMINULA.

Mardara feminula, Hmpsn., Ill. Het., viii, p. 58, pl. 141, ff. 1, 7 (1891).

6 ♂, 7 ♀, Nilgiri Hills, including the type.

This is the South India form of the *bhana* group; the great difference in the female is quite enough to differentiate it; the male is as large as *nigritula*, and the ochreous markings on the transverse bands of the fore-wings are more distinct and conspicuous.

DASYCHIRA CHINENSIS, nov.

♂, ♀. Greyish-brown; palpi black above; antennæ with whitish shafts; fore-wings variegated with greyish-white in both sexes, more especially on the outer half; four transverse, indistinct, brown lines, subbasal and medial both sinuous, discal dentated and recurved, submarginal line lunular, followed by a marginal row of lunules with whitish inner parts, and brown spear-shaped marks pointing inwards; hind-wings brown, with indications of a darker discal band; cilia of both wings ochreous with brown patches; under-side pale olive-grey; a double discal thin brown band across both wings; a large brown lunular mark at the end of the cell of hind-wings, cilia as above.

Expanse of wings ♂ 44 mm., ♀ 56 mm.

1 ♂, 1 ♀, Moupin (types). 1 ♂, 1 ♀, Ta-chien-lu, 10,000 feet (*Pratt*). 1 ♂, Kwei-chow.

Belongs to the *bhana* group, but is different from any of the Indian forms; its coloration is peculiar, and the transverse lines on fore-wings are differently shaped.

Dasychira magnalia.

Dasychira magnalia, Swinhoe, Ann. Mag. N. H. (7), xii, p. 198 (1903).

1 ♂, 1 ♀, Khasia Hills (types).

Dasychira nigra.

Dasychira nigra, Hmpsn., Journ. Bo. N. H. Soc., xiii, p. 416, pl. 2, f. 19 (1900).

1 ♀, Sikhim (type).

Dasychira gwelila, nov.

♂. Antennæ black; palpi, frons, and head brown; body and fore-wings very dark grey, nearly black, caused by very minute black irrorations closely packed on a grey ground colour; veins more or less prominent; faint indications of antemedial, postmedial, and discal transverse bands, and a submarginal series of more prominent black spots close to the outer margin; hind-wings white, without markings; under-side of fore-wings grey, becoming white hindwards; hind-wings white, with no markings; body and legs whitish, the latter with some brown stripes.

Expanse of wings $1\frac{3}{10}$ inches.

Hab. Gwelil, Brit. E. Africa (*Betton*).

Dasychira albibasalis.

Ilema albibasalis, Holland, Psyche, vi, p. 470 (1893).

1 ♂, Ogove River (*Holland*).

The type from Ogove River is in coll. Holland.

Dasychira gabunica.

Euproctidion gabunica, Holland, Psyche, vi, p. 414, pl. 10, f. 19 (1893).

1 ♂, Ogove River (*Holland*).

The type from the Ogove River is in coll. Holland.

Dasychira gonophora.

Ilema gonophora, Holland, Psyche, vi, p. 470, pl. 17, f. 1 (1893).
Lælia curvivirgata, Karsch, Ent. Nachr., xxi, p. 372, pl. 4, f. 6 (1895).

1 ♂, Ogove River (*Holland*). 1 ♀, Cameroons.
The type from the Ogove River is in coll. Holland.

Dasychira albinotata.

Thamnocera albinotata, Holland, Psyche, vi, p. 469 (1893).

1 ♂, Ogove River (*Holland*).
The type from the Ogove River is in coll. Holland.

Dasychira striata.

Notohyba striata, Holland, Psyche, vi, p. 452, pl. 17, f. 28 (1893).

1 ♂, Ogove River (*Holland*).
The type from the Ogove River is in coll. Holland, very close to if not identical with *albinotata*.

Dasychira brunneicosta.

Ilema brunneicosta, Holland, Psyche, vi, p. 471, pl. 17, f. 10 (1893).

1 ♂, Ogove River (*Holland*).
The type from the Ogove River is in coll. Holland.

Dasychira horrida, nov.

♂. Dark brown; thorax blackish-brown in front; abdomen with the first and last two segments smeared with white; fore-wings tinged with olive; an inner, outwardly curved, transverse, rather sinuous blackish-brown line; a lunule at the end of the cell; a nearly straight and erect discal line; marginal spots black, flecked with white; hind-wings a little paler; marginal line dull ochreous, otherwise without markings; under-side uniform pale brown; a lunule at the end of each cell, a discal thin even band across both wings, and indications of a similar band between that and the margin.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. Old Calabar (*Crompton*).

Dasychira plagiata.

Anaxila plagiata, Walker, iv, 810 (1855).

1 ♂, without locality (type).

Dasychira varia.

Dasychira varia, Walker, iv, 868 (1855).
„ „ Swinhoe, Cat. Het. Mus. Oxon., i, p. 219, note (1892).
Dasychira maruta, Moore, Cat. Lep. E. I. C., ii, p. 339 (1859).

1 ♀, Darjiling (type *maruta*). 1 ♀, Subathu. 6 ♂, Dalhousie.

Dasychira lunulata.

Dasychira lunulata, Butler, Ann. Mag. N. H. (4), xx, p. 403 (1877).
„ „ Butler, Ill. Het., ii, pl. 24, f. 8, ♂ (1878).
Dasychira solitaria, Staud., Rom. sur Lep., iii, pl. 12, f. 1, ♀ (1878).
Dasychira acronycta, Oberth., Étud. d'Ent., v, p. 35, pl. 5, f. 7, ♂ (1881).

3 ♂, 6 ♀, Japan, including the type ♂.

Dasychira albescens.

Dasychira albescens, Moore, Lep. Atk., p. 59 (1879).

3 ♂, 1 ♀, Darjiling.
The type from Darjiling is in coll. Staudinger.

Dasychira cinctata.

Dasychira cinctata, Moore, Lep. Atk., p. 59 (1879).

1 ♂, 1 ♀, Darjiling.
The type from Darjiling is in coll. Staudinger.

Dasychira ampliata.

Dasychira ampliata, Butler, Ann. Mag. N. H. (5), ii, p. 460 (1878).

1 ♀, Madagascar (type).

Dasychira angulata.

Dasychira angulata, Hmpsn., Trans. Ent. Soc., 1895, p. 292.

1 ♂, Sikhim (type). 1 ♀, Upper Burma. 1 ♂, 2 ♀, Khasia Hills.

I put the Khasia Hill specimens very doubtfully with this form; they are white instead of dull ochreous, and the lines seem to be different; but the lines are not very distinct in the type, and we must await more Sikhim examples.

DASYCHIRA PSEUDABIETIS.

Calliteara pseudabietis, Butler, Cist. Ent., iii, p. 118 (1885).
Calliteara abietis, Leech, P. Z. S., 1888, p. 631.
Dasychira pryeri, Butler, l. c., p. 119.
Dasychira pudica, Staud., Rom. sur Lep., iii, p. 204 (1887).
Dasychira modesta, Kirby, Cat. Moths, i, p. 483 (1892).

6 ♂, 4 ♀, Japan, including both of Butler's types. 1 ♂, 1 ♀ from Amur.

Staudinger's type came from the Amur; the name *pudica* was preoccupied in the genus, and therefore Kirby re-christened it *modesta*; but the Amur and Japan examples are not separable.

DASYCHIRA POSTFUSCA.

Dasychira postfusca, Swinhoe, Trans. Ent. Soc., 1895, p. 9, pl. 1, f. 12.

1 ♂, Khasia Hills (type).

DASYCHIRA THWAITESI.

Dasychira thwaitesi, Moore, Lep. Ceylon, ii, p. 98, pl. 116, f. 1, 1a, b (1883).
Dasychira pudica, Moore, l. c., iii, p. 538 (1887).

1 ♂, 1 ♀, Ceylon (types). 1 ♂, 1 ♀, Trevandrum. 1 ♀, Nilgiri Hills.

The type of *pudica* is a dwarf female.

DASYCHIRA GROTEI.

Dasychira grotei, Moore, Cat. Lep. E. I. C., ii, p. 338 (1859).
Dasychira kausalia, Moore, P. Z. S., 1879, p. 401.
Dasychira varia, ♀ only, Walker, iv, 868 (1855).

1 ♂, Kasaoli (type *kausalia*, ♂). 1 ♂, Subathu. 1 ♂, 1 ♀, Dharmsala. 1 ♂, 1 ♀, Kangra. 1 ♀, N. India (type). 1 ♀, Himalayas. 2 ♀, Darjiling. 1 ♀, Calcutta. 1 ♀, Moupin, W. China.

DASYCHIRA HORSFIELDII.

Arctia horsfieldii, Saunders, Trans. Ent. Soc., 1851, p. 162, pl. 12, ff. 1, 2.
Dasychira arga, Moore, Cat. Lep. E. I. C., ii, p. 339 (1859).
Dasychira longipennis, Walker, Journ. Linn. Soc. Lond., vi, p. 13 (1862).
Dasychira nilgirica, Hmpsn., Ill. Het., viii, p. 58, pl. 114, ff. 13, 14 (1891).

1 ♂, 2 ♀, Nilgiri Hills, including Hampson's types. 3 ♂, 2 ♀, Ceylon. 4 ♂, 1 ♀, Java, including Moore's types. 1 ♂, 2 ♀, Singapore.

Saunders' and Walker's types should be in Mus. Oxon., but I have been unable to find them ; Walker's type was a female, and his description well agrees with this form.

DASYCHIRA GEORGIANA.

Dasychira georgiana, Fawcett, Trans. Zool. Soc., xv, p. 314, pl. 49, ff. 19, 20, 21 (1900).

2 ♂, 1 ♀, Natal. 1 ♀, Transvaal.

DASYCHIRA CERIGOIDES.

Janassa cerigoides, Walker, Journ. Linn. Soc. Lond., vi, p. 135 (1862).
" " Swinhoe, Cat. Het. Mus. Oxon., i, p. 297, pl. 7, f. 5 (1892).

1 ♂, Borneo.

The type ♂ from Sarawak is in Mus. Oxon.

DASYCHIRA GRANDIDIERI.

Calliteara grandidieri, Butler, Cist. Ent., iii, p. 14 (1882).

1 ♂, Madagascar (type).

DASYCHIRA VIBICIPENNIS.

Dasychira vibicipennis, Butler, Ann. Mag. N. H. (5), iv, p. 239 (1879).

1 ♂, 1 ♀, Madagascar (types).

DASYCHIRA GENTILIS.

Dasychira gentilis, Butler, Ann. Mag. N. H. (5), iv, p. 239 (1879).

2 ♀, Madagascar, including the type.

DASYCHIRA ACRISIA.

Deiopeia (?) *acrisia*, Plotz, Stett. Ent. Zeit., xli, p. 83 (1880).
Dasychira acrisia, Kirby, Cat. Moths, i, p. 484 (1892).
Dasychira crausis, Druce, P. Z. S., 1884, p. 228, pl. 17, f. 5, ♀.

1 ♂, Accra. 1 ♂, Old Calabar.

The type came from W. Africa, the type of *crausis* from the Lower Niger.

DASYCHIRA ELEGANS.

Calliteara elegans, Butler, Cist. Ent., iii, p. 13 (1882).

1 ♂, Madagascar (type).

DASYCHIRA MŒRENS.

Calliteara mœrens, Butler, Cist. Ent., iii, p. 14 (1882).

1 ♂, 1 ♀, Madagascar (types).

DASYCHIRA PUMILA.

Calliteara pumila, Butler, Cist. Ent., iii, p. 16 (1882).

2 ♂, Madagascar, including the type.

DASYCHIRA ARGENTATA.

Dasychira argentata, Butler, Trans. Ent. Soc., 1881, p. 12.

5 ♂, 1 ♀, Japan, including the type ♂.

DASYCHIRA ASPERSA.

Tearosoma aspersa, Felder, Reise Nov., pl. 100, f. 6 (1868).

2 ♀, Natal.

Felder's type, a female without locality, is in coll. Rothschild.

DASYCHIRA ROTUNDATA.

Teara rotundata, Walker, iv, 851 (1855).

1 ♂, Tasmania (type). 1 ♂, Australia. 1 ♂, Moreton Bay.

DASYCHIRA SUBLUTESCENS.

Dasychira sublutescens, Holland, Psyche, vi, p. 433 (1893).

1 ♀, Ogove River (*Holland*).

The types ♂ ♀ from the Ogove River are in coll. Holland.

Dasychira subflava.

Anaxila subflava, Walker, iv, 918 (1855).

1 ♂, Ashanti (type).

The type has a female body put on it wrong side forward; it is a mere fragment, but was evidently once a *Dasychira*.

Dasychira difficilis.

Aroa difficilis, Walker, xxxii, 328 (1865).

3 ♀, Natal, including the type.

Walker described this type example as a male.

Dasychira enos.

Aroa (?) *enos*, Druce, Ann. Mag. N. H. (6), xvii, p. 353 (1896).

1 ♀, Sapele, Niger River.

The type, a female, from Old Calabar, is in coll. Druce.

Dasychira strigata.

Dasychira strigata, Moore, Lep. Atk., p. 58 (1879).
„ „ Hmpsn., Moths, India, i, p. 449 (1892).
„ „ Swinhoe, Ann. Mag. N. H. (7), xii, p. 197 (1903).

Dasychira niveosparsa, Butler, Ill. Het., v, p. 59, pl. 91, f. 7 (1881).

1 ♀, Masuri (type). 1 ♀, Darjiling (Butler's type). 1 ♂, Khasia Hills.

I have it also from the last-named locality; the male does not differ much from the female; the transverse duplex bands on the fore-wings are less sinuous, and the abdomen and hind-wings are more ochreous. Expanse of wings $2\frac{1}{10}$ inches.

Dasychira viola.

Callitcara viola, Butler, Ann. Mag. N. H. (5), iv, p. 240 (1879).

2 ♂, Madagascar, including the type.

Dasychira chloroptera.

Dasychira chloroptera, Hmpsn., Moths, India, i, p. 450 (1892).

1 ♂, Khasia Hills (type).

Dasychira virescens.

Cadrusia virescens, Moore, Lep. Atk., p. 54, pl. 3, f. 16 (1879).
Dasychira virescens, Hmpsn., Moths, India, i, p. 451 (1892).

2 ♀, Darjiling, including the type.

Dasychira mascarena.

Dasychira mascarena, Butler, Ann. Mag. N. H. (5), ii, p. 294 (1878).
Dasychira cangia, Druce, P. Z. S., 1887, p. 674.
" " Holland, Psyche, vi, p. 567, pl. 10, f. 12 (1893).

1 ♂, 1 ♀, Madagascar (types).
The types ♂ ♀ of *cangia* from Delagoa Bay are in coll. Druce: I do not see how they can be separated from Butler's species.

Dasychira pastor.

Calliteara pastor, Butler, Cist. Ent., iii, p. 15 (1882).

1 ♂, 1 ♀, Madagascar (types).

Dasychira catocaloides.

Mardara catocaloides, Leech, Trans. Ent. Soc., 1899, p. 126.

1 ♂, Moupin (type). 1 ♂, Ta-chien-lou.

Dasychira prasina.

Calliteara prasina, Butler, Cist. Ent., iii, p. 16 (1882).

2 ♂, Madagascar, including the type.

Dasychira baruna.

Somena baruna, Moore, Cat. Lep. E. I. C., ii, p. 346 (1859).
" " Kirby, Cat. Moths, i, p. 55 (1892).
Dasychira viridis, Druce, Ann. Mag., N. H. (7), iii, p. 470 (1899).

3 ♀, Java (*Horsfield*), including the type. 1 ♂, Penang (*Flower*).
The type of *viridis* came from Perak and is in Mus. Druce.

Dasychira gnava, nom. nov.

Pseudonotodonta virescens, Möschler, Abh. Senck. Ges., xv, p. 77, f. 6 (1889) (preocc.).

1 ♂, Old Calabar (*Sampson*).

Möschler's type, a female, came from Aburi on the Gold Coast: it cannot be generically separated from *Dasychira*.

Dasychira infima.

Somera infima, Holland, Psyche, vi, p. 479, pl. 17, f. 29 (1893).

1 ♂, Ogove River (*Holland*).

The type ♂ from Ogove River is in coll. Holland.

Dasychira remota.

Dasychira (?) *remota*, Druce, P. Z. S., 1887, p. 675.

4 ♀, Niger River.

The type, a female, from Gambia is in coll. Druce.

Dasychira variegata.

Dasychira variegata, Holland, Psyche, vi, p. 568, pl. 18, f. 13 (1893).

1 ♀, Ogove River (*Holland*).

The types ♂ ♀, from the Ogove River are in coll. Holland.

Section III, abdomen clothed with long hair and without dorsal tufts.

Dasychira complicata.

Dasychira complicata, Walker, xxxii, 365 (1865).
Trisula pustulifera, Walker, xxxii, 576.

4 ♂, 2 ♀, Darjiling. 1 ♂, Sikhim. 2 ♂, N. India (types).

Section IV, abdomen smoothly scaled, without dorsal tufts; wings very broad; female with branches of antennæ unusually long.

Dasychira lineata.

Lymantria lineata, Walker, iv, 875 (1855).

1 ♀, Silhet, including the type. 1 ♀, N. India.

The type was described as a male; but the male of this species is unknown to me.

Genus MUNYCHRYIA, Walker, xxxii, 395 (1865).

MUNYCHRYIA SENICULA.

Munychryia senicula, Walker, xxxii, 396.

1 ♂, Moreton Bay (type).

Genus ANEPA, nov.

Palpi porrect, slightly bent downwards; frons, head, and thorax covered with long hair; abdomen with dorsal tufts on each segment; antennæ bipectinate to the tips, the branches long, ciliated, and with bristles at their ends; wings shaped as in *Dasychira* of the *Olene* group; fore-wings with veins 7, 8, and 9 stalked, 10 and 11 coincident and form the cell; hind-wings with veins 6 and 7 on a long stalk; hind-legs with two pairs of spurs.

Type *A. fusca*, Walker (*Acyphas*).

ANEPA FUSCA.

Acyphas fusca, Walker, iv, 798 (1855).
" " Kirby, Cat. Moths, i, p. 472 (1892).

2 ♂, Australia, including the type. 1 ♂, Tasmania.
Kirby has left out from his genus *Acyphas* the type of the genus *viridescens*, Walker, from Ceylon, which is an *Orgyia*.

ANEPA FULVICEPS.

Charnidas fulviceps, Walker, iv, 797 (1855).

4 ♂, Tasmania, including the type.

Genus UROCOMA, Herr.-Schäff., Ausser-Eur. Schmett., i, p. 82 (1855).

UROCOMA LIMBALIS.

Urocoma limbalis, Herr.-Schäff., l. c., f. 389.

4 ♂, 1 ♀, Sydney.

UROCOMA BALIOLALIS.

Urocoma baliolalis, Swinhoe, Cat. Het. Mus. Oxon., i, p. 215, pl. 6, f. 7 (1892).

1 ♂, Moreton Bay. 1 ♂, 2 ♀, Australia. 1 ♀, Sydney.
The type ♂ from Australia is in Mus. Oxon.

UROCOMA MARGINALIS.

Trichetra marginalis, Walker, iv, 845 (1855).

1 ♂, Tasmania (type), 1 ♂, Australia.

Genus ABYNOTHA, nov.

♂. Antennæ bipectinated to the tips, the branches long, with cilia and with spines at their ends; palpi upturned, thickly clothed, the last joint short; fore-wings with vein 3 a little before end of cell, 4 from end, and 5 from a little above it; 6 from the upper angle; 7, 8 stalked, 9 from 10, anastomosing with 7 and 8 to form the areole; hind-wings with veins 3, 4, and 5 as in fore-wings, 6 and 7 from upper angle of cell.

Types *A. preussi*, Mab. (*Liparis*).

ABYNOTHA PREUSSI.

Liparis (?) *preussi*, Mab., Vuill. Nov. Lep., i, p. 57, pl. 9, f. 5 (1892).
Lymantria (?) *preussi*, Aurivillius, Ent. Tidsk., xiii, p. 194, (fig.) (1892).
Phægorista (?) *preussi*, Kirby, Cat. Moths, i, p. 918 (1892).

4 ♂ from the Cameroons.

Genus PACHYCISPIA, Butler, Cist. Ent., iii, p. 11 (1882).

PACHYCISPIA PICTA.

Pachycispia picta, Butler, l. c., p. 12.

3 ♂, Madagascar, including the type.

Genus CIFUNA, Walker, v, 1172 (1855).
Baryaza, Moore, Lep. Atk., p. 45 (1879).

CIFUNA LOCUPLES.

Cifuna locuples, Walker, v, 1173.

1 ♀, Silhet (type). 1 ♂, N.E. Bengal. 2 ♂, Khasia Hills. 6 ♂, 3 ♀, Japan. 1 ♂, Gensan. 1 ♂, Chang Yang. 4 ♂, 1 ♀, Amur.

The Amur examples are very dark.

CIFUNA BIUNDULANS.

Cifuna biundulans, Hmpsn., Journ. Bo. N. H. Soc., xi, p. 294 (1897).

1 ♂, Khasia Hills (type).

Genus HETERONYGMIA, Holland, Psyche, vi, p. 414 (1893).

HETERONYGMIA RHODAPICATA.

Heteronygmia rhodapicata, Holland, l. c., p. 416, pl. 10, f. 15.

1 ♀, Ogove River (*Holland*).

The type ♂ from the Ogove River is in coll. Holland.

HETERONYGMIA CHISMONA, nov.

♂. Palpi covered with crimson hairs; antennæ grey; head, thorax, and fore-wings pale fawn colour, covered with very minute grey atoms; three very indistinct transverse grey upright bands; hind-wings white, without markings; abdomen above and below pale crimson; under-side of wings white without markings; pectus and legs yellowish-grey.

Expanse of wings $1\frac{8}{10}$ inches.

2 ♂, Aburi, Gold Coast, 1880 (*Carter*).

Genus LOMADONTA, Holland, Psyche, vi, p. 417 (1893).

LOMADONTA ERYTHRINA.

Lomadonta erythrina, Holland, l. c., pl. 10, f. 1.

1 ♂, Ogove River.

The types ♂ ♀ from the Ogove River are in coll. Holland.

LOMADONTA JOHNSTONI, nov.

♂. Antennæ ochreous; palpi, frons, head, and thorax with the ground colour covered with crimson hairs; fore-wings ochreous, washed with crimson, the costal and outer margins dark red; two semi-hyaline indistinct whitish spots in the lower disc; the entire wing covered with well-separated red striæ; a brownish line from the costa a little beyond the middle to the upper whitish spot, where it is outwardly angled, then straight down to the hinder margin; a submarginal line of brown lunules; hind-wings white tinged with crimson, especially towards the outer margin, which is dull crimson; cilia of fore-wings purplish, of the hind-wings crimson; under-side whitish ochreous, crimson-tinged, with the marginal lines dark; a dark lunule at end of cell of fore-wings, a spot at end of cell of hind-wings; pectus and fore-legs covered with crimson hairs.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. CONGO FOREST, July, 1900 (H. H. Johnston).

Allied to *L. erythrina*, Holland, the type of the genus from Ogove River.

Genus LÆLAPIA, Butler, Ann. Mag. N. H. (5), iv, p. 238 (1879).

LÆLAPIA NOTATA.

Lælapia notata, Butler, l. c.

6 ♂, 1 ♀, Madagascar, including the type ♀.

Genus ACLONOPHLEBIA, Butler, P. Z. S., 1898, p. 428.

ACLONOPHLEBIA FLAVINOTATA.

Aclonophlebia flavinotata, Butler, l. c., pl. 32, f. 8.

2 ♂, Brit. E. Africa, including the type.

Genus NUMENOIDES, Butler, Ann. Mag. N. H. (5), iv, p. 238 (1879).

NUMENOIDES GRANDIS.

Numenoides grandis, Butler, l. c.

2 ♀, Madagascar, including the type.

Genus MALACHITIS, Hmpsn., Trans. Ent. Soc., 1895, p. 291.

MALACHITIS MELANOCHLORA.

Malachitis melanochlora, Hmpsn., l. c.
,, ,, Dudgeon, Journ. Bo. N. H. Soc., xiii, p. 413, pl. 1, f. 7 (1900).

1 ♂, Bhutan (type).

Genus ENOME, Walker, iv, 883 (1855).

ENOME AMPLA.

Enome ampla, Walker, iv, 883.

4 ♂, Ceylon, including the type. 3 ♂, Calcutta. 1 ♂, Malabar. 3 ♀, Bangalore. 1 ♂, Burma.

ENOME INCERTA.

Lymantria incerta, Walker, iv, 880 (1855).

1 ♂, N. India (type). 2 ♂, Kangra. 1 ♂, Jubbulpore. 5 ♂, Nilgiri Hills.

I cannot find the type of *Lymantria aryama*, Moore, from Canara, which Hampson puts as a synonym to this species.

Enome detersa.

Lymantria detersa, Walker, xxxii, 365 (1865).
Enome detersa, Swinhoe, P. Z. S., 1885, p. 300, pl. 21, ff. 3, 4.
Lymantria costalis, Walker, xxxii, 365.

2 ♂, S. India (types of both.) 7 ♂, 1 ♀, Mhow. 9 ♂, Poona. 1 ♂, Belgaum.

The locality for *detersa* in Walker's Catalogue is entered as Mauritius, the insect from the Entomological collection; but this is a mistake: the example came from the East Indian Museum, and the locality label on it is India. This form belongs entirely to South India: I have bred many specimens from larvæ in Poona.

Enome obfuscata.

Lymantria obfuscata, Walker, xxxii, 367 (1865).

1 ♀, N. India (type). 2 ♂ N.W. Himalayas. 9 ♂, Murree. 1 ♂, Kangra. 1 ♂, Campbellpore, Punjab. 1 ♀, Kulu. 1 ♂, Sultanpore. 2 ♂, Kiris, Cashmir. 1 ♂, Skardo.

Genus Lymantria. Hübner Verz. bek. Schmett., p. 160 (1818).

Liparis, Ochs., Schmett. Eur., iii, p. 186 (1810) (preocc.).
Porthetria, Hübner, l. c.
Hypogymna, Steph., Ill. Brit. Ent. Haust., ii, p. 55 (1828).
Psilura, Steph., l. c., p. 57.
Pegella, Walker, xxxv, 1922 (1866).
Nagunda, Moore, Lep. Atk., p. 53 (1879).
Barhona, Moore, l. c., p. 55.

Lymantria mœrens.

Dasychira (?) *mœrens*, Felder, Reise Nov., pl. 99, f. 4 (1868).

1 ♂, 1 ♀, Ceylon.

The type from Ceylon is in coll. Rothschild.

Lymantria dispar.

Bombyx dispar, Linn. Syst. Nat., x, p. 501 (1758).
Porthetria umbrosa, Butler, Trans. Ent. Soc., 1881, p. 10.

2 ♂, 3 ♀, Japan, including Butler's types.

Many examples from different parts of Europe.

LYMANTRIA JAPONICA.

Liparis dispar, var. *japonica*, Motsch., Étud. d'Ent., 1860, p. 31.

Porthetria hadina, Butler, Trans. Ent. Soc., 1881, p. 11.

8 ♂, 5 ♀, Japan, including Butler's types. 4 ♂, 1 ♀, Kwei-chow.

Though closely related to *dispar* it is a uniformly distinct form.

LYMANTRIA EURYDICE.

Porthetria eurydice, Butler, Cist. Ent., iii, p. 118 (1885).

Dasychira amata, Staud., Rom. sur Lep., iii, p. 206, pl. 12, f. 2 ♀ (1887).

1 ♂, Choyama (type). 1 ♂, 1 ♀, Japan.

Staudinger's type came from the Amur.

LYMANTRIA ATLANTICA.

Liparis atlantica, Ramb., Faune Ent. Andal., ii, pl. 15, f. 7 (1842).

1 ♂, N. Africa.

LYMANTRIA FUMIDA.

Lymantria fumida, Butler, Ann. Mag. N. H. (4), xx, p. 402 (1877).

„ „ Butler, Ill. Het., ii, pl. 24, f. 4 ♀ (1878).

Lymantria sinica, Moore, P. Z. S., 1879, p. 403.

4 ♂, 4 ♀, Japan, including the types. 1 ♂, N. China (type *sinica*). 2 ♂, Formosa.

LYMANTRIA RHODINA.

Lymantria rhodina, Walker, xxxii, 366 (1865).

„ „ Swinhoe, Cat. Het. Mus. Oxon., i, p. 222 (note) (1892).

1 ♂, India (type).

LYMANTRIA CEREBOSA, nov.

♂, ♀. Antennæ orange-ochreous; palpi and frons dark brown with some white hairs; head, body, and fore-wings dark olive-grey, irrorated with white atoms; markings darker grey and very indistinct; a lunular double line at end of cell, and four transverse duplex lines, more or less sinuous but erect, subbasal, antemedial, discal, and submarginal; whitish lunules on the outer margin; hind-wings dirty white or pale greyish-white; a grey spot at the end of the cell; under-side pale grey; a lunular mark at the end of each cell; an indistinct and incomplete grey discal straight band across both wings; tarsi with whitish spots.

Expanse of wings, ♂ $1\frac{7}{10}$, ♀ 2 inches.

Hab. Solon, Simla (*Reed*).

Lymantria moesta, nov.

♂, ♀. Palpi and antennæ brown; head, thorax, and fore-wings dark grey; two transverse darker grey lines on the fore-wings, one ante-medial, angled outwards above the middle and crenulated, the other discal, even with the margin, rather close to it, and semi-dentate; a grey lunular mark at the end of the cell; all these very indistinct; abdomen and hind-wings paler grey, tinged with pink, without markings; under-side uniform pale grey, no markings.

Expanse of wings, ♂ $1\frac{1}{2}$, ♀ $1\frac{7}{10}$ inches.

1 ♂, Kasaoli (*Reed*). 1 ♀, Kangra Valley (*Dudgeon*).

Lymantria furva.

Ocneria furva, Leech, P. Z. S., 1888, p. 631, pl. 31, f. 10.

5 ♂, 6 ♀, Japan, including the type. 1 ♂, 2 ♀, W. China.

Lymantria dissoluta, nov.

♂, ♀. Antennæ, palpi, frons, and head brown; thorax and fore-wings dark brownish-grey; transverse sinuous lines brown, first antemedial, angled outwards above the middle, second discal slightly recurved, dentated in parts, third submarginal; a large angled dark brown mark on the discoidal vein; cilia grey with blackish-brown patches; hind-wings and both wings on the under-side of a uniform paler grey colour, without markings; on the upper-side the wing is slightly darker towards the outer border in some specimens; abdomen pale dull crimson.

Expanse of wings, ♂ $1\frac{1}{2}$, ♀ 2 inches.

1 ♂, 2 ♀, Hong Kong (*Walker*).

Belongs to the *obsoleta* group.

Lymantria turneri, nov. nom.

Lymantria aurora, Walk. (?), Turner, Trans. Roy. Soc. S. Australia, 1902, p. 181.

1 ♂, Cape York.

Butler in Ann. Mag. N. H. (4), [xx, p. 403 (1877) described a *Lymantria aurora* from Japan; the name *aurora* for this form cannot therefore stand. The history of this name is rather curious: on this insect, which was purchased from Mrs. Higgins in 1867, is a label with the following, "*Lymantria aurora*, W., n. s. named on a spec. of Mr. Chapman." Some one must have taken a specimen to Australia which had been named from Mrs. Higgins' Cape York example, and ever since this insect has been called *Lymantria aurora*, Walker, in Australian collections; but where the writer of the label containing the name *aurora*, Walker, got it from it is impossible to say; certainly Walker never published any description of this form. Turner has well described it; there are several examples in coll. Druce from Cooktown. It is, however, only a form of *antennata*, Walker, differing merely in colour.

Lymantria antennata.

Lymantria antennata, Walker, iv, 881 (1855).

1 ♂, Richmond River (type). 2 ♂, Moreton Bay.

Lymantria obsoleta.

Lymantria obsoleta, Walker, iv, 880, ♂ (1855).
Lymantria bhascara, Moore, Cat. Lep. E. I. C., ii, p. 345, ♀ (1859).
Lymantria vinacea, Moore, P. Z. S., 1879, p. 403, ♀.

2 ♀, Hong Kong. 1 ♂, 2 ♀, Formosa. 1 ♂, N. India (type). 2 ♀, Silhet. 1 ♀, N. India (type *bhascara*). 2 ♂, Calcutta. 1 ♂, 1 ♀, Bombay. 1 ♀, Poona. 1 ♀, Madras. 2 ♀, Trevandrum. 1 ♂, Ceylon.

This is a South Indian form, and I doubt the localities of Silhet and N. India on the old examples; I have never got it from any northern locality; I cannot find the type ♀ *vinacea* from Canara.

Lymantria albolunata.

Lymantria albolunata, Moore, P. Z. S., 1879, p. 405.

1 ♂, 1 ♀, Dharmsala (type ♂). 1 ♀, Simla (type). 4 ♂, 1 ♀, Dalhousie. 3 ♂, Subathu.

The northern form of *obsoleta*, but easily separable: there are two diminutive examples from Omeishan and Moupin in the National Collection, which come very near to this form.

LYMANTRIA SOBRINA.

Lymantria sobrina, Moore, P. Z. S., 1879, p. 402.

1 ♂, Dharmsala (type). 1 ♀, N. India (type).

Quite distinct I think from *obsoleta*, where it is put in the B. M. collection; I do not consider it to be near enough allied to that species, even to put it in the form of what is called a sub-species.

LYMANTRIA SEMICINCTA.

Alope semicincta, Walker, iii, 620 (1855).
Nagunda semicincta, Butler, Ill. Het., v, p. 54, pl. 90, f. 7 (1881).

1 ♀, N. India (type). 3 ♀, Darjiling.

I do not know the male of this form.

LYMANTRIA MONACHA.

Bombyx monacha, Linn., Syst. Nat., x, p. 501 (1758).

4 ♂, 5 ♀, Japan.

Many examples from European localities.

LYMANTRIA CONCOLOR.

Lymantria concolor, Walker, iv, 876, ♀ (1855).
„ „ Butler, Ill. Het., v, p. 55, pl. 90, ff. 8, 9 (1881).
Lymantria superans, Walker, iv, 876, ♀.
Lymantria micans, Felder, Reise Nov., pl. 99, f. 2, ♀ (1868).
Lymantria carnecolor, Moore, P. Z. S., 1888, p. 399.

1 ♂, Simla. 1 ♂, Dalhousie. 1 ♂, 2 ♀, Dharmsala. 3 ♂, 3 ♀, Kangra, including type ♂ *carnecolor*. 1 ♂, 1 ♀, Sultanpore. 1 ♀, Abbottabad. 1 ♀, Manipur. 4 ♂, 4 ♀, Sikhim, including both of Walker's types. 1 ♂, Kujiar. 1 ♂, Jawai Hills.

This form is common in the Khasia Hills, from whence I have received many examples of both sexes; Felder's type from Silhet is in coll. Rothschild.

LYMANTRIA TODARA.

Lymantria todara, Moore, P. Z. S., 1879, p. 402, pl. 33, f 6.

2 ♂, 2 ♀, Nilgiri Hills, including the types ♂ ♀. 1 ♀, Shevaroy Hills. 1 ♀, Travancore. 1 ♀, Malabar.

LYMANTRIA SIMILIS.

Lymantria similis, Moore, P. Z. S., 1879, p. 402, ♂.
Lymantria cara, Butler, Ill. Het., v, p. 56, pl. 90, f. 13, ♀ (1881).

1 ♂, Calcutta (type). 1 ♂, Bengal. 1 ♀, Bhotan (type *cara*).

I think it may be fairly assumed that these are conspecific, though the examples do not come from the same locality; the differences in the sexes are similar to those usually occurring in the *concolor* group, and the double band on the hind-wings is similar in both sexes.

LYMANTRIA BEATRIX.

Bombyx beatrix, Stoll, Suppl. Cram., pl. 40, f. 2 (1791).

1 ♀, Java.

Stoll's figure is excellent; I have three females from Java in my own collection, all identical with the B. M. example and with Stoll's figure, and have seen many others; it appears to me to be very distinct from the Indian forms put under it in the B. M.

LYMANTRIA GANAHA, nov.

♀. Fore-wings, upper-side of a uniform purplish-grey colour, slightly tinged with pink, and with a glazed appearance; markings and hind-wings the same as *beatrix*; in *beatrix* the fore-wings are pure white.

Expanse of wings $2\frac{2}{10}$—3 inches.

4 ♀, Java. 1 ♀, Kuching, Borneo.

A form of *beatrix*. I have 3 ♀ in my own collection from Java and 3 ♂, and there are three Javan males in the B. M.; but without breeding I do not think it is possible to say whether they belong to this form or to *beatrix*, but they are quite different from the males of various Indian forms sunk under *beatrix*.

LYMANTRIA MARGINATA.

Lymantria marginata, Walker, iv, 877 (1855).
Lymantria pusilla, Felder, Reise Nov., pl. 99, f. 3 (1868).
Lymantria nigra, Moore, P. Z. S., 1888, p. 399.

1 ♂, Bengal. 1 ♀, Silhet (type). 2 ♀, Sikhim. 1 ♀, Burma. 3 ♂, 3 ♀, Kangra (including Moore's types). 2 ♀, Masuri. 2 ♂, 2 ♀, Sikhim.

The males vary much in size, but are quite different from the Javan males; they vary also much in shade of colour, but none of them have any tinge of yellow; the females vary in the width and intensity of the medial band of the fore-wings; their hind-wings are always pure white, with a black border; I have this form in my own collection from Dharmsala, Sikhim, and the Khasia Hills.

LYMANTRIA FULIGINOSA.

Lymantria fuliginosa, Moore, P. Z. S., 1883, p. 17.

5 ♂, 2 ♀, Bombay, including the types. 1 ♀, Ceylon.

I have it also from Bombay where I have bred this form; there is a general yellow tinge in the male; it is nearer to the Javan form than any of the other Indian forms; the hind-wings are always more or less yellow; the hind-wings of the female are always entirely suffused with black; I have never seen an exception. The type of Moore's *umbrina* I have not seen, it is also included by Hampson under *beatrix* without any mention of the differences between the forms, just as if they ran into each other, but this they do not do.

There are 1 ♂, 3 ♀ from Moupin, and 1 ♀ from Chang Yang, and 1 ♂, 2 ♀ from Penang which appear to represent two more forms, and I have no doubt that there are many other forms of this species, or group, still unknown. To call them all *beatrix* is very misleading.

LYMANTRIA VELUTINA.

Orgyia (Dasychira) velutina, Mab., Bull. Soc. Zool. Fr., iii, p. 90 (1878).

1 ♂, Madagascar.

LYMANTRIA AURORA.

Lymantria aurora, Butler, Ann. Mag. N. H. (4), xx, p. 403 (1877).
,, ,, Butler, Ill. Het., ii, pl, 24, f. 5 (1878).
Lymantria aurora, var. *fusca*, Leech, P. Z. S., 1888, p. 629.

1 ♂, 1 ♀, Japan (types). 1 ♂, 1 ♀, Yesso. 4 ♂, Nagahama, including type *fusca*.

Sunk to *mathura* in the B. M. collection, but it is a distinct form, the male being uniformly blackish-brown. Butler's male type example is an old worn and faded specimen; whether his female type is really the female of this form is I think very doubtful.

LYMANTRIA MATHURA.

Lymantria mathura, Moore, P. Z. S., 1865, p. 806.

1 ♂, N. India (type). 1 ♂, 1 ♀, Kangra. 1 ♀, Dehra Doon. 2 ♂, 1 ♀, Sikhim. 1 ♀, N.E. Himalayas. 3 ♂, 1 ♀, Loo Choo Islands. 1 ♀, Chefoo, China. 2 ♀, Omeishan. 2 ♂, 3 ♀, Japan.

LYMANTRIA VIOLA.

Lymantria viola, Swinhoe, P. Z. S., 1889, p. 406.

1 ♂, 9 ♀, Thanna, Bombay, including the types. 2 ♂, Jubbulpore.

LYMANTRIA GRANDIS.

Lymantria grandis, Walker, iv, 874, ♀ (1855).
" " Butler, Ill. Het., v, p. 57, pl. 91, ff. 1, 2 (1881).
Lymantria maculosa, Walker, iv, 881, ♂ (1855).
Lymantria metarhoda, Walker, xxxii, 365, ♂ (1865).

1 ♂, 2 ♀, Ceylon, including the type. 1 ♂ marked N. S. W.

The type of *metarhoda* from Ceylon is in Mus. Oxon.

LYMANTRIA SUBROSEA, nom. nov.

Lymantria rosea, Hmpsn., Ill. Het., ix, p. 76, pl. 158, f. 28 (1893).

1 ♂, Ceylon (type).

Butler's *Lymantria rosea* from Madagascar (1879) antedates this.

LYMANTRIA LUCESCENS.

Porthetria lucescens, Butler, Trans. Ent. Soc., 1881, p. 11.

1 ♂, Hakodate, Japan (type). 1 ♂, Tokio. 2 ♂, Oiwake.

LYMANTRIA MANICATA.

Lymantria manicata, Aurivill., Ent. Tidskr., xiii, p. 193, ♀ (1892).

2 ♀, Old Calabar. 1 ♀, Sapele, River Niger.

The type from Cameroons is in Mus. Stockholm.

Lymantria xylina, nov.

♂. Antennæ black; palpi brown, white on the inner sides; head, body, and wings creamy white; some crimson hairs at the base of the antennæ; collar crimson; fore-wings with a blackish-brown subcostal dot near the base, a small spot on the middle of the costa, a red-brown, rather pale, sinuous, erect transverse thin band beyond the middle; hind-wings with some brown suffusion on the costal space; both wings with brown marginal dots between the veins; under-side dirty white, with indications of a transverse band on both wings, extending to lower end of cell on hind-wings, and some brownish suffusion in and near cell of fore-wings; face, pectus, body, and legs crimson.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Formosa.

Lymantria galinara, nov.

♂. Antennæ ochreous-grey; palpi black, white inside; body and wings white; thorax with three black spots; abdomen with blackish segmental bands; fore-wings with five transverse, upright, more or less sinuous bands, similar to those in the fore-wings of *L. lepcha*, Moore, from India; hind-wings with a grey submarginal band and some slight pinkish suffusion near abdominal margin; under-side white, without markings; face black; body and legs white.

♀. Antennæ ochreous-grey; palpi brown; head, body, and wings dull white; fore-wings rufous grey, irrorated with white atoms; indications of central, discal, and submarginal rufous grey transverse bands; a ringed lunular mark at the end of the cell, and submarginal whitish lunules; hind-wings and under-side of both wings, body, and legs dull white without markings.

Expanse of wings ♂ $2\frac{4}{10}$, ♀ $3\frac{8}{10}$ inches.

1 ♂, 1 ♀, Singapore (*Ridley*) (types). 1 ♂, Bali, low country (*Doherty*). 1 ♂, Tambak, Borneo.

I have both sexes from Java, and a very large female from New Mecklenburgh measuring $5\frac{8}{10}$ inches in expanse. Semper records it from the Philippines under the name of *Lymantria lepcha*, Moore; and the female at p. 460 of Het. Philippines he doubtfully identifies as the female of *Dasychira grossa*, Pagenstecher.

Lymantria lepcha.

Porthetria lepcha, Moore, Lep. Atk., p. 54, ♂ (1879).
Barhona carneola, Moore, l. c., p. 56, ♀.

3 ♂, 6 ♀, Sikhim, including both types.

LYMANTRIA BRUNNEIPLAGA, nov.

♂. Palpi black with white thick hairs at the tips; antennæ brown, shafts white at the base; head, thorax, and fore-wings white; costa with four brown spots, the first and second large, third small, fourth composed of two streaks; a large brown patch on the middle of the hinder margin; some brown dots near the base: two dentated transverse brown lines across the middle; another submarginal; some rather large brown spots on the outer margin; abdomen pink, with a dorsal row of brown spots; hind-wings grey; a slightly darker marginal border and white cilia; under-side, pectus brown; legs white with black spots; fore femora crimson and some crimson hairs on the white thorax.

♀. With wings shaped as in the female of *lepcha*; head and thorax chocolate brown; fore-wings chocolate grey, the central and submarginal transverse dentated lines of the fore-wings as in the male, also the large brown patch on the middle of the hinder margin and the brown spots on the outer margin, which however are on both wings; the hind-wings of a pale grey colour.

Expanse of wings ♂ $1\frac{8}{10}$, ♀ $2\frac{8}{10}$ inches.

1 ♂, 1 ♀, Java (types). 2 ♂, Borneo. 1 ♂, Sumatra. 1 ♀, Penang.

Unfortunately in describing *cara*, Butler queried these Bornean males as probably the males of his species, and consequently these examples have remained over the *cara* label ever since, and so stand in many collections; but they have no connexion with *cara*, which Hampson was perfectly justified in putting as the female of *similis*.

LYMANTRIA LUNATA.

Bombyx lunata, Stoll, Pap. Exot., iv, pl. 369, f. C (1782).
Pegella ichorina, Butler, Ann. Mag. N. H. (5), xiii, p. 201 (1884).

2 ♂, 2 ♀, Amboina, including Butler's type. 1 ♂, Celebes. 1 ♀, Aru.

I have it also from Celebes, Amboina, New Guinea, and East Java.

LYMANTRIA CURVIFERA.

Pegella curvifera, Walker, xxxv, 1922 (1866).
Lymantria curvifera, Swinhoe, Cat. Het. Mus. Oxon., i, p. 223 (note) (1892).
Lymantria lunata, Semper, Het. Philipp., p. 461, pl. X, ff. 5, 7 (larva and pupa) (1898).

1 ♂, 1 ♀, Philippines, including Walker's type ♀, which Walker described as a male.

I have it from Gilolo and Batjan under Staudinger's MS. name *batjana*. There are apparently two forms of *lunata* on all the different islands: the large typical male with well-marked wings, and the small form like the Philippine male of *curvifera*, the bands in which are straighter and all the markings ill-defined; the breadth of the middle transverse bands on the fore-wings of the female is very variable in both forms; sometimes it is a mere line, often broad and sometimes extended inwards on the hinder margin.

Lymantria plumbalis.

Lymantria plumbalis, Hmpsn., Trans. Ent. Soc., 1895, p. 292.

1 ♂, Tinlin-Yaw, Burma (type).

Lymantria ascetria.

Lymantria ascetria, Hübner, Samml. Exot. Schmett., ii, ff. 1–4 (1818).
Dasychira antica, Walker, vii, 1739, ♀ (1856).
Lymantria pramesta, Moore, Cat. Lep. E. I. C., ii, p. 344, pl. 9a, f. 3 (1859).

1 ♂, Maulmein. 1 ♀, Thyetmyo. 6 ♂, 7 ♀, Java, including the types of *antica* and *pramesta*.

Lymantria narindra.

Lymantria narindra, Moore, Cat. Lep. E. I. C., ii, p. 342 (1859).
" " Kirby, Cat. Moths, i, p. 479 (1892).
Lymantria hilaris, Voll., Tijd. v. Ent., vi, p. 143, pl. 10, ff. 2, 3 (1863).

1 ♂, 1 ♀, Java, including the female type.

I have in my own collection a female from Java and a male from Sumatra (where Vollenhoven's types ♂ ♀ came from); the two names undoubtedly belong to the same species.

Lymantria grisea.

Lymantria grisea, Moore, Lep. Atk., p. 55, pl. 3, f. 5 (1879).

1 ♂, N.E. India. 1 ♀, Darjiling (type). 1 ♂, N. Chin Hills, Burma.

Lymantria silca.

Lymantria silca, Swinhoe, Ann. Mag. N. H. (7), xii, p. 197 (1903).

1 ♂, 1 ♀, Fergusson Isl. (types). 1 ♂, Fergusson Isl. 1 ♂, Milne Bay. 1 ♂, 1 ♀, Kapaur, New Guinea.

Lymantria ganara.

Lymantria ganara, Moore, Cat. Lep. E. I. C., ii, p. 344 (1859).

4 ♂, 2 ♀, Java, including the type ♂. 1 ♀, Sumatra. 5 ♂, Borneo. 1 ♂, Singapore. 2 ♂, Burma.

Lymantria bivittata.

Pegella bivittata, Moore, Lep. Atk., p. 57 (1879).

1 ♀, Darjiling (type). 1 ♀, Silhet.
I do not know the male of this form.

Lymantria vacillans.

Lymantria vacillans, Walker, iv, 873 (1855).

1 ♂, Congo (type).

Lymantria dulcinea.

Lymantria dulcinea, Butler, Cist. Ent., iii, p. 12 (1882).

1 ♂, 2 ♀, Madagascar (types).

Lymantria rosea.

Lymantria rosea, Butler, Ann. Mag. N. H. (5), iv, p. 239 (1879).

1 ♂, 1 ♀, Madagascar (types).

Lymantria lugardi, nov.

♀, ♂. Palpi brown, under-side yellow; antennæ black; frons brown; thorax chestnut-brown; abdomen crimson; fore-wings purple brown, in the female almost purplish slate colour; some dark brown, irregular and wavy, transverse bands; one at the base; a very broad one in the middle, with very irregular sides, and containing a large nearly white irregular square with its upper edge against the costa, and in the middle of it a black spot at the end of the cell; a pale sinuous discal line, and some pale yellowish elongated spots in the disc; all these markings more or less obscure and contracted in the male, prominent in the female; cilia yellow with brown spots; hind-wings ochreous without markings.

Expanse of wings ♂ $1\frac{3}{10}$, ♀ $1\frac{8}{10}$ inches.

2 ♂, 3 ♀, N'Gami Country (*Lugard*).

LYMANTRIA BANANÆ.

Lymantria bananæ, Butler, P. Z. S., 1896, p. 848, pl. 42, f. 9.

1 ♂, Nyassaland (type).

LYMANTRIA TOTTEA, nov.

♂. Palpi with the lower and under parts white, tips and last joints black, and a tuft of black hairs immediately below; antennæ grey; frons brown, with the edges greyish-ochreous; head and thorax greyish-ochreous; fore-wings pale brownish-grey with a tinge of yellow; a broad whitish band divided by the veins into eight square-shaped large spots, and a large square spot at the end of the cell, divided from the band by a thin band crossing the discoidal vein; a small round spot in the middle of the disc outside the band; abdomen pale greyish-yellow; hind-wings white tinged with yellow; under-side white without markings; pectus and fore-legs ochreous; legs white with black tips.

Expanse of wings $1\frac{8}{10}$ inches.

Hab. OLD CALABAR.

Allied to *bananæ* with which I found it, but very different, except superficially.

LYMANTRIA MOSERA.

Lymantria mosera, Druce, Ann. Mag. N. H. (7), i, p. 208 (1898).

1 ♂, 1 ♀, Delagoa Bay. 2 ♂, 1 ♀, Natal. 1 ♂, Rhodesia.

LYMANTRIA EDDELA, nov.

♂. Antennæ black, shafts white; frons, head, thorax, and fore-wings pale pinkish buff; a black spot at base of fore-wings, and three other spots close to it; antemedial and discal transverse lines of black spots, erect but slightly sinuous; three black spots at the end of the cell; abdomen orange with a dorsal row of black spots; hind-wings paler than the fore-wings, nearly white; a broad marginal black band; under-side of body and legs blackish; both wings of the colour of the fore-wings above; fore-wings with an apical and outer marginal grey band, which narrows hindwards; hind-wings with a broad black band as above.

Expanse of wings $1\frac{6}{10}$ inches.

Hab. Fwambo, Tanganyika.

Lymantria carriala, nov.

♀. Frons, antennæ, thorax, and fore-wings pale blackish-brown; two white spots on the thorax; fore-wings with a large white patch on the middle of the hinder margin, with a white spot immediately above it, and with four small black spots inside it almost in the form of a square; two or three indistinct pale spots in the upper disc; hind-wings pale pink; a rather broad apical pale blackish-brown band, which stops abruptly half-way down the outer margin; abdomen yellow, with dorsal and lateral black spots; under-side, wings as above, very thinly clothed; body and legs blackish.

Expanse of wings $1\frac{7}{10}$ inches.

Hab. Angola.

Belongs to the group of *L. mosera*, Druce, from Natal.

Lymantria gondona.

♀. Thorax and fore-wings pale grey, nearly white, the latter with four darker grey transverse bands, limited by brown lines; the first basal, the second before the middle and broad, the limiting lines rather sinuous, the third discal, a little narrower than the second, bent outwards above the middle, the limiting lines semi-dentate, the fourth apical; the inner margin very sinuous; hind-wings white without markings; cilia with pale brown spots; abdomen pink.

Expanse of wings $1\frac{1}{2}$ inches.

Hab. Sabaki Valley, Brit. E. Africa.

Genus Dura, Moore, Lep. Atk., p. 56 (1879).

Dura alba.

Dura alba, Moore, l. c.

1 ♀, Darjiling (type). 2 ♂ without locality.
The type ♂ from Darjiling is in coll. Staudinger.

Dura albicans.

Dasychira albicans, Walker, vii, 1739 (1856).

1 ♀, Celebes (type). 4 ♂, Borneo. 1 ♂, Singapore.

Genus Imaus, Moore, Lep. Atk., p. 54 (1879).

Imaus mundus.

Lymantria munda, Walker, iv, 875 (1855).

1 ♂, 4 ♀, Sikhim. 1 ♀, Silhet (type). 2 ♀, Java.

Genus Pyramocera, Butler, Journ. Linn. Soc. Lond., xv, p. 85 (1880).

Pyramocera fuliginea.

Pyramocera fuliginea, Butler, l. c. (fig.).

1 ♂, 1 ♀, Madagascar (types).

Genus Polymona, Walker, iii, 768, ♂.
Morasa, Walker, iv, 859 (1855).
Sarothropyga, Felder, Reise Nov., pl. 100, f. 23, ♂ (1868) (undescr.).

Polymona rufifemur.

Polymona rufifemur, Walker, iii, 768, ♂.
Morasa lorimeri, Butler, P. Z. S., 1878, p. 387, ♀.

1 ♂, Africa (type). 2 ♀, Natal, including Butler's type. 1 ♂, Rhodesia. 1 ♂, Nyassaland. 1 ♀, Mashonaland.

Polymona modesta.

Morasa modesta, Walker, iv, 859 (1855).
Sarothropyga rhodopepla, Felder, Reise Nov., pl. 100, f. 23, ♂ (1868).

1 ♀, S. Africa (type). 5 ♂, 8 ♀, Natal.

Genus Nataxa, Walker, v, 1179 (1855).
Diercagra, Felder, Reise Nov., pl. 100, f. 2 (1868) (undescr.).

Nataxa flavescens.

Perna (?) *flavescens*, Walker, v, 1128.
Nataxa flavifascia, Walker, v, 1179.
Diercagra ochrocephala, Felder, l. c.

1 ♂, Australia (type). 1 ♂, Tasmania (type *flavifascia*). 1 ♂, 1 ♀, Melbourne. 5 ♀, S.E. Australia.

NATAXA RUBIDA.

Nataxa rubida, Walker, xxxii, 512 (1865).

1 ♂, Australia (type).

It differs from *flavescens* in having no central band, only a yellow spot on the costa where the band commences in the other form.

The following genera have been removed from the *Lymantriidæ* in the National collection, but I have been unable to find them. The numbers are those of the genera in Kirby :—

44. *Comana*, Walker, xxxii, 495.
90. *Xanthodura*, Butler, Ann. Mag. N. H. (5), v, p. 384.
103. *Œnosandra*, Newman, Trans. Ent. Soc., 1856, p. 286.
112. *Marcipa*, Walker, iv, 807.
156. *Epipyrops*, Westw., Proc. and Trans. Ent. Soc., 1876, pp. xxiv, 522.
163. *Sarsina*, Walker, iv, 800.

Genera in Kirby's Catalogue wrongly included in the *Lymantriidæ* :—

1. *Geodena*, Walker, vii, 1691 .	Belongs to the		*Aganaidæ*.
2. *Soloë*, Walker, ii, 557 . .	,,	,,	,,
3. *Isine*, Walker, ii, 545 = *Chionæma*, Herr.-Schäff., Ausser-Eur. Schmett., p. 20 . .	,,	,,	*Lithosiidæ*.
13. *Lerna*, Walker, xxxiii, 805 = *Castulo*, Walker, ii, 562 .	,,	,,	,,
27. *Cypra*, Boisd., Voy. de l'Astrolabe, p. 201	,,	,,	*Boarmiidæ*.
28. *Deroca*, Walker, iv, 822 . .	,,	,,	*Drepanulidæ*.
41. *Trichetra*, Westw., Mod. Class. Ins. Gen. Syn., p. 92 . .	,,	,,	*Eupterotidæ*.
42. *Marane*, Walker, xxxii, 397 .	,,	,,	,,
43. *Apina*, Walker, iii, 756 . .	,,	,,	*Noctuidæ*.
51. *Phiala*, Wallengr., Wien. Ent. Mon., iv, p. 165 . . .	,,	,,	*Eupterotidæ*.
72. *Raphipeza*, Butler, Ann. Mag. N. H. (5), v, p. 386 . .	,,	,,	*Lasiocampidæ*.
73. *Chrysopsyche*, Butler, l. c. p. 387.	,,	,,	,,

75. *Trisula*, Moore, Cat. Lep. E. I. C., ii, p. 420 . .	Belongs to the *Noctuidæ.*
76. *Trisuloides*, Butler, Ann. Mag. N. H. (5), vii, p. 36 . .	" " "
86. *Rhanidophora*, Wallengr., Œfvers. Vet. Akad. Forh., xv, p. 213	" " "
98. *Amsacta*, Walker, iv, 804 .	" " *Arctiidæ.*
104. *Teara*, Walker, iv, 846 = *Aglaosoma*, Scott, Austral. Lep., p. 14	" " *Eupterotidæ.*
105. *Ochrogaster*, Felder, Reise Nov., pl. 94, f. 5	" " "
106. *Sitina*, Walker, iv, 854 . .	" " *Lasiocampidæ.*
107. *Callia*, Walker, vi, 1482 . .	" " "
118. *Amana*, Walker, iii, 661 . .	" " *Uraniidæ.*
145. *Vunga*, Walker, xxxii, 453 = *Smyriodes*, Guen., Phal., i, p. 223	" " *Boarmiidæ.*
151. *Beralade*, Walker, iv, 852 .	" " *Lasiocampidæ.*
155. *Cebysa*, Walker, ii, 486 . .	" " *Tineidæ.*
159. *Castulo*, Walker, ii, 561 . .	" " *Lithosiidæ.*
160. *Cluaca*, Walker, xxxi, 268 .	" " "
167. *Lecriolepis*, Butler, Ann. Mag. N. H. (5), v, p. 385 . .	" " *Lasiocampidæ.*
170. *Laganda*, Walker, xxxii, 389	" " *Bombycidæ.*
173. *Ticilia*, Walker, xxxii, 394 .	" " *Drepanulidæ.*
180. *Cosmethis*, Hübner, Verz. Schmett, p. 179 = *Arycanda* Walker, vii, 1775 . .	" " *Boarmiidæ.*

OCTOBER 5TH, 1903.

XX. *On the antennæ of* Hepialidæ—Lepidoptera Jugatæ. By Ambrose Quail, F.E.S.

[Read October 7th, 1903.]

Plate XIX.

The characters which separate *Jugatæ* from other Lepidoptera in the imago stage are well known to be definite and constant, being essentially the structure of the wings, which have nervures more numerous than prevails with other Lepidoptera, and a "jugum" or lobe near the base of the fore-wings which may be noted among Neuroptera, Diptera, and Hymenoptera, but not elsewhere among Lepidoptera. The Hepialid group have neither maxillary palpi nor tibial spurs, which characters are well developed among other *Jugatæ*.

The species which comprise the well-defined *Hepialidæ* have great diversity of antennal structure, which I have examined, so far as my material permits, to observe whether *inter se* there is evidence indicating which is the older and more primitive form; I believe the subject will interest others. To properly examine the antennal structure one must remove and mount in balsam, or other media; for this reason one is confined to insects in one's own collection, and in consequence many of my otherwise perfect specimens are minus antennæ.

In my previous paper I did not note the presence of scales on the Hepialid antenna, having devoted attention to the pectination *per se*; the scaling, however, is very obvious. The large proximal joint (scape) is invariably scaled more or less completely, the scales are long—often overlap one or more further segments—striated, slender, attenuated throughout when viewed sideways, and look very like a hair; in fact, as Bodine puts it, "the scale is a hair flattened out." The segment next the scape (pedicel) is smaller and sometimes clothed with scales similar to those of the scape, but usually with shorter and broader scales approximating to the scales of the wings, and this kind of scale prevails on the other (clavola) segments of the antenna.

On the surface of the segments there are minute "hairs," which may be sparsely scattered as on the scape, or closely cover the surface of the segment as on the clavola; those of the scape are perhaps more bristle-like, and remind one of the minute hairs on the Hepialid wing membrane. One cannot help thinking that these are the original antennal "hairs," antecedent to all other hairs and scales on the Lepidopterous antenna; those which we find on the clavola segments everywhere, scaled or not, are, I take it, these "primary" hairs, perhaps somewhat modified; they serve probably the function of protection.

Amongst the "primary" hairs others arise which are longer and tapering, not rigid, usually fine but sometimes stout with socket rims at base; these are probably "sense" hairs, and appear to be in some way associated with reduced scaling. The sensory hairs appear to be confined to the clavola segments. One has, however, some diffidence in deciding whether some forms of "sense" hairs are not bristles. There are short, pointed, socket-rimmed bristles at the base of both scape and pedicel, and scattered among the scales are longer bristles; there are always bristles on the clavola segments. The transition from pale-coloured, fine scape bristles to red-tinted, robust, rigid clavolar bristles, I have demonstrated on the antenna of *Porina fuscomaculata.* The bristles on the antenna of one species may resemble the "sense" hairs on the antenna of another species, but all the "sense" hairs on any given antenna differ from the bristles of that antenna.

There appear to be good reasons for believing the primitive form of Lepidopterous antenna to have been one closely covered with scales—such forms one finds among the lower groups of Lepidoptera—the scales afterwards replaced by "sense" hairs, but amongst the scales there were semi-erect bristles, and, it may be remarked, similar bristles, whatever their functions, occur on different parts of the "scale-covered" wings. The bristle is probably older therefore than "sense" hairs.

The scape and pedicel retain comparative rotundity with remarkable constancy throughout the *Hepialidæ* known to me, with the exception of *Oncoptera* (*intricata*), in which the scape is remarkably elongate. The scape and pedicel are never pectinate in the *Hepialidæ.*

The segments of the clavola vary greatly in number, form, and dimensions in *Hepialidæ.* The proximal joint is usually smaller than succeeding segments, being as it were a transition between the pedicel and clavola, each with its definite functions; this joint has usually only rudimentary appendages on antennæ with pectinations; rarely is true pectination developed, and never does it attain proportional length. The proximal joint of the clavola, at least, lags behind the others in the onward march of specialization.

The sexes on the whole agree as to number of clavola segments per species, for instance *Hepialus humuli*, ♂, ♀, and var. *Hethlandica*, have an equal number; sometimes a variation in number occurs, but such has been noticed mostly in the female sex. It is an interesting fact that sometimes segments are partially or wholly coalesced, the sutures being obliterated, but hairs, bristles, etc., are normal. I have noted this in *Charagia virescens*, *C. daphnandræ*, *Hepialus argenteo-maculata*, *Cibyra sylvinus*. The division of the clavola into more or less segments does not seem of first importance, their functions being collective. As far as possible several specimens of each of the following species have been examined, to arrive at the probable typical number of clavola segments.

HEPIALUS = unpectinate antennæ.

humuli. 20 clavola segments, a few scales on five basal segments.

velleda. 23 clavola segments, a few scales on first basal segment.

lupulinus. 24 clavola segments, one or two scales on first basal segment, also single scales per segment on apical thirteen.

hectus ♂. 12 clavola segments, one or two scales on first and second basal segments.

Subg. STHENOPIS = unpectinate antennæ.

argenteo-maculata. 21 clavola segments, a few scales on six basal segments.

Subg. CHARAGIA = unpectinate antennæ.

daphnandræ. 28 clavola segments, numerous scales on four basal segments and dorsal scales on next five segments ♂; dorsal scales on nine basal segments ♀.

virescens. 39 clavola segments, numerous dorsal scales on six basal segments ♂; few dorsal scales on six basal ♀.

eximia.	28 clavola segments, dorsal scales on four basal segments.
ramsayi.	35 ,, ,, ,, ,,
lignivora.	24 clavola segments, few dorsal scales on four basal segments.
Subg. CIBYRA =	latero-ventral enlargement of antennal segments.
sylvinus.	23 clavola segments, dorsal scales from base to tip of antenna.
ONCOPTERA =	unpectinate antennæ.
intricata.	17 clavola segments, numerous scales on nine basal segments, with dorsal scales on others to apical segment.
(?) =	ventral enlargement of antennal segments.
bacotii.	50 clavola segments, devoid of scales.
GORGOPIS =	bipectinate antennæ.
libania.	41 clavola segments, devoid of scales.
HECTOMANES =	bipectinate antennæ.
fusca.	30 clavola segments, dorsal scales from base to tip of antenna.
simulans.	34 ,, ,, ,, ,,
crocea.	34 clavola segments, dorsal scales on basal thirteen segments.
PORINA =	semi-tripectinate antennæ.
cervinata.	36 clavola segments, devoid of scales.
despecta.	36 ,, ,, ,,
umbraculata.	38 clavola segments, one or two dorsal scales on three basal segments.
signata.	40 clavola segments, devoid of scales.
enysii ♂.	49 clavola segments, one or two dorsal scales on four basal segments.
,, ♀.	45 clavola segments, a few dorsal scales on six basal segments.
fuscomaculata ♂.	56 clavola segments, one or two dorsal scales on first basal segment.
TRICTENA =	tripectinate antennæ ♂, unipectinate ♀.
labyrinthica.	71 clavola segments, dorsal scales on four basal segments.
PIELUS =	ventral enlargement of ♀ antennal segments.
hyalinatus.	54 clavola segments, few dorsal scales on seven basal segments.

Eriocrania admitted on other grounds—embryological and imaginal—to be more ancient than *Hepialidæ,* and accepted as such by Bodine and Chapman in respect to antennal structure, has (*subpurpurella*) elongated scape and fully-scaled clavola—forty-one segments in number—the scales bidentate, alignment not definite, the outer row of scales overlap base of next segment; the segments are circular in transverse section, and are clothed with a growth of primary hairs, the apical segment an elongated cone with scales, "primary" hairs and numerous bristles. An associated genus *Mesarchæa* (*hamadelpha*) furnishes a form with short scape, fully-scaled clavola, the scales bidentate, overlapping. *Palæomicra* (*chalcophanes*) furnishes a form with short scape curiously swollen at both ends, the clavola having on each segment a few remarkable broad leaf-like scales placed in pairs, one of each almost covering its fellow; on the segments bristles rise from beneath, between and beyond the scales. We have the support of our authorities in selecting the eriocranid form of antenna as being probably the most generalized.

Examining our material among the *Hepialidæ, Oncoptera* arrests our attention. Two or three basal segments are not unlike the eriocranid in shape, circular in transverse section, apparently fully scaled on all aspects; the segments beyond gradually become less eriocranid-like, shorter, broader, and developing towards the apical segment a ventral ridge. Completely scaled as are the basal segments with typical flat, striated, bidentate scales, alignment not definitely two rows,* the outer scales overlapping next segment, localization of hairs commences on a ventral area of the third clavola segment, where there are only "primary" hairs and one or two bristles, gradually the scales are replaced on a larger ventral area, "sense" hairs develop, the scales becoming dorsal only. We find associated with the scaled clavola of *Oncoptera* an elongate scape; we suspect that with fuller material others would be found with elongate scape and somewhat fully-scaled clavola; meanwhile we look upon these as primitive characters retained by *Oncoptera*, which has, however, somewhat specialized on the other clavola segments.

The clavola segments of *Hepialus* and *Charagia* are circular in transverse section, and the apical segment of some species, like *Eriocrania*, is an elongate cone; *H. humuli*

* I cannot detect alternate lines of scales and hairs, there appear to be only scales except for occasional bristles.

is typical in this respect. The majority of species of *Charagia* have only a few dorsal scales on not more than half-a-dozen basal segments, the scales of the antenna like those of the wing being green in colour, striated, not dentate, and the segments have numerous pits bearing superficial resemblance to sockets of long-lost scales. *C. daphnandræ* preserves some basal segments scaled dorsally and laterally, with "primary" and "sense" hairs and bristles located on a ventral unscaled area; the segments beyond are devoid of scales, "sense" hairs are not numerous on the dorsum, they are so, however, both laterally and ventrally, with bristles on all aspects at the distal end of the segments. *C. lignivora* has gone a long way ahead, the scales having almost completely vanished, and "sense" hairs are numerous on all aspects.

European *Hepialus* have likewise gone a long way towards complete loss of clavola scales. *H. lupulinus* retains single scales per segment curiously enough on the apical half of the clavola, the scales are not dentate and are longer than ordinary clavolar scales; one finds here "sense" hairs on the dorsum as on other aspects. The antennal scales of *H. lupulinus* suggest that *Hepialus*, which now so generally have only a few clavolar scales, somewhere in the past had antennæ scaled from base to tip. The subgenus *Cibyra* preserves exactly this condition, and must have separated from *Hepialus* when the antennæ were scaled to tip; it is not in the least likely that *Cibyra* has since developed scales after *Hepialus* once lost them. *Cibyra* then retains this character, but has developed latero-ventral enlargement—the beginnings of pectination—thereby increasing the "sensory" area, which indeed is wholly covered with "primary" and "sense" hairs, there being none of the latter on the scaled dorsum.

The latero-ventral enlargement of *Cibyra* is not properly unipectination although in profile it appears to be so, it is a widening and ventral lengthening of the segment as a whole. Definite ventral unipectination does exist elsewhere among Lepidoptera (*Incurraria muscalella*), and may be observed among Diptera (*Tipulidæ*).

Among the latero-ventrally enlarged forms known to me the clavola segments of *bacotii* (*Gorgopis* ?) are most specialized; "sense" hairs completely cover the segments on all aspects together with "primary" hairs, even the bristles are reduced in size, so that the clothing of the segments is remarkably uniform. We have here a form of Hepialid antenna answering the Jordan requirements of an antenna covered with hairs and devoid of scales; this form, however, from our standpoint is reached by specialization, and therefore is not primitive. Indeed it seems abundantly evident that the tendency in the *Hepialidæ* has been to completely get rid of the clavola scales. This seems at first sight somewhat at variance with the tendency shown by the majority of the Lepidoptera, which generally preserve the dorsal scales; but *Hepialidæ* are a very distinct and somewhat isolated group, moreover the antennæ are admitted to be "sense" organs, and it seems only reasonable to conclude that on the antennæ and on the wings the function of scales is identical, and it can hardly be as aiding any special sense, such as we believe to be centred in the antennæ, for similar sense can hardly be supposed to exist in the wings. It is not illogical to believe that when the primitive Lepidopteron developed scales—however far back we may have to go, the development commenced somewhere, and has since extended and become a permanent and characteristic feature of the Lepidoptera—the scales spread over the several organs, proving to be an encumbrance on the antennæ, although of some utility to many groups of Lepidoptera, since not only are scales retained on the dorsum of the shaft, but they are spread over the dorsa of pectinations; but the effects of elimination can be traced everywhere in the localization of the scales instead of their general distribution over the clavola segments, which is to be observed among the very primitive groups, as for instance the eriocranid already discussed. Complete loss of scales by elimination has been the ultimate result on the antennæ of many *Hepialidæ*.

Hectomanes have bipectinate antennæ generally scaled from base to tip on the dorsum of the clavola, the scales not dentate, with "primary" hairs, ventral "sense" hairs, and numerous ventral pits. The pectinations of *Hectomanes* are essentially lateral extensions, short and curved; one can hardly say whether highly specialized or no, judging from the scales they are not. The bipectinate, unscaled antenna of *Gorgopis* (*libania*) is a very highly-specialized form. The pectinations are long slender *appendages*, provided with "primary" hairs, "sense" hairs on the inner side, and bristles on the outer side; on the dorsum of the shaft the "primary" hairs are modified or replaced by sharp-pointed spines, of which I do not know the like elsewhere among *Hepialidæ*. I erred in placing *bacotii* in the genus *Gorgopis*; although both are highly specialized, as regards the antennæ the structure is so different.

The antennæ of *Porina* are interesting. Viewed from the side clavola segments are apparently uniform, with slight ventral extension, "sense" hairs encircling the anterior rim of the segment, and others gathered over a ventral posterior area; a transverse view shows the segments are somewhat quadrangular with posterior appendages; viewed from above, the lateral angles of the quadrangular figure appear now to be the tips of lateral bipectination, and the shaft of the segment is small and constricted. The appearance of pectination is greater beyond the middle of the antenna, where the shaft is smaller and the lateral elongations are longer, still however preserving the quadrangular form transversely; the apical segment presents a much-specialized structure.

Porina fuscomaculata has an antenna which in the ♂ has complete bipectination, which supports our view of the specialized form being like *Gorgopis*; on the ventral surface there is, however, a "sensory" tubercle which brings this definitely bipectinate *Porina* in line with the other species of the genus. The bristles appear to be always placed irregularly on the different segments of the clavola in *Hepialidæ*, and *P. fuscomaculata* is a convenient species to examine in this connection. On the dorsum of 1st clavola segment are some half-dozen bristles (slender); 2nd has several slender and one large bristle on dorsum, and one large bristle on one of the pectinations; 3rd, four slender bristles on dorsum, two large bristles on one pectination; 4th, two slender, two large bristles, on dorsum; 5th, one slender bristle middle of dorsum, one near pectination, three large bristles at intervals on pectination, and two ditto on opposite pectination; 6th, two slender bristles on dorsum, four large on pectination, one on opposite pectination; 7th, one slender bristle in front, one large one at middle of dorsum, three large on one pectination, one on opposite. In addition to large bristles placed irregularly on the pectinations, succeeding segments have on the dorsum of shaft, one large bristle on 8th; next has two large bristles, then three segments have one bristle each; next has two bristles; thirteen consecutive segments have one bristle each; next has two; next one;

next one; next two; four segments have one each; next two, and so on. Not only is the irregularity in number and position interesting, but the transition from slender bristles to stout ones is also.

Nowhere in *Porina* do we find the ventral "sensory" area develop into a definite appendage, but the centring of "sense" hairs on a ventral area which is a feature of *Porina* antennal structure, suggests that such ventral development might occur, and that we find such in *Trictena* is most interesting.

The female antenna of *Trictena* (*labyrinthica*) is remarkable in the appendage—distinctly ventral—being very much larger than the shaft of the segment; this antenna presents a very near approach to unipectination in the remarkable slender appendage. The swollen area above is, however, the rudiment of lateral pectinations, which we find highly developed in the male, which has probably the most specialized Hepialid antennæ. Decidedly the male of *Trictena*, with its tripectinate antenna, is more highly specialized than the female. We may then regard a laterally-pectinated antenna as specialized, and look back consistently, touching *Porina* by the way, to the latero-ventral forms—*Pielus, bacotii*, *Cibyra,* thence to *Hepialus* and *Oncoptera.* We suggest divergence in several directions from some such form as *Oncoptera* (but not *Oncoptera* itself). It is unlikely there has been convergence from a number of points represented by several forms of pectinated antennæ, and some others.

We can indeed corroborate to some extent the conclusions arrived at from a study of the antennæ, by examination of the wing neuration. *Oncoptera, Hepialus, Charagia, Gorgopis, bacotii, Trictena,* are of one pattern; from a previous paper I make the following quotation—"It is as nearly certain as anything of the sort can be that the *Hepialus-Trictena* pattern of neuration is a generalized pattern, from which the wing patterns of *Hectomanes, Palpiphorus,* and of *Hepialiscus,* and *Porina,* have been derived."

Explanation of Plate XIX.

Fig. 1.	*Eriocrania subpurpurella.*	Scape, pedicel, first clavola segments × 200.
,, 2.	,, ,,	Clavola segment × 200
,, 3.	*Palæomicra chalcophanes.*	,, ,, ,,
,, 4.	*Oncoptera intricata.*	Scape, pedicel, two clavola segments × 100.
,, 5.	,, ,,	Clavola segment × 200
,, 6.	*Charagia virescens.*	Scape, pedicel, first clavola segment × 50.
,, 7.	,, ,,	Base of scape showing bristles × 200.
,, 8.	*Cibyra sylvinus.*	Clavola segment lateral view × 200.
,, 9.	,, ,,	Clavola segment transverse × 200.
,, 10.	,, ,,	Clavola segment terminal × 200.
,, 11.	*Porina cervinata.*	Clavola segment lateral view × 200.
,, 12.	,, ,,	Clavola segment transverse × 200.
,, 13.	,, ,,	Clavola segment beneath × 200.
,, 14.	,, ,,	Clavola segment terminal × 200.
,, 15.	,, *fuscomaculata.*	Clavola segment × 50.
,, 16.	*Hectomanes crocea.*	,, ,, × 200.
,, 17.	*Gorgopis libania.*	,, ,, × 50.
,, 18.	,, ,,	Spines on dorsum of shaft × 200.
,, 19.	? *bacotii.*	Clavola segments lateral view × 200.
,, 20.	? ,,	Clavola segments transverse × 200.
,, 21.	*Pielus hyalinatus.*	Clavola segments lateral view × 100.
,, 22.	,, ,,	Clavola segments transverse × 100.
,, 23.	*Trictena labyrinthica.*	Clavola segments ♂ × 50.
,, 24.	,, ,,	,, ,, ♀ × 50.

Magnification quoted is approximate.

XXI. *On the* Laparostict Lamellicorn *Coleoptera of Grenada and St. Vincent* (*W. Indies*). By Gilbert J. Arrow, F.E.S.

[Read October 7th, 1903.]

In 1900 I published a paper in these Transactions dealing with the Pleurostict Lamellicornia collected by Mr. H. H. Smith in the islands of St. Vincent and Grenada. The present paper contains an enumeration of the remainder of the Lamellicornia of the same collection. The total number of species of the Laparostict families is 22, making in all 40 species of Lamellicorns now known from the islands. Of the present 22 species, 9 are known as inhabitants of the mainland of America, 2 more have been described from other islands of the Antilles, and 10 are here described as new. One of the latter, *Atænius tenebrosus*, is also a widely-distributed form and, with the exception of 3 represented by single specimens and 3 by two specimens, only 3 of the whole number did not occur in both islands; and two of these three occur elsewhere. The families dealt with in my previous paper therefore differ curiously from those now under consideration in the localization of their species.

The fauna of St. Vincent has assumed a very special interest since the volcanic catastrophe from which the island has so recently suffered, and which can hardly have failed to produce a permanent effect upon its fauna and flora. It is fortunate that so excellent a collection was brought from the island before the event, so that future comparisons will be possible which should throw valuable light upon biological problems.

I have also characterized in this paper a few Central American allied forms, as to which confusion has previously existed.

Copridæ.

Chœridium illæsum, Harold.

This insect was found in decaying fruit and other vegetable *débris*. It was very common in St. Vincent, Grenada, and Mustique in the Grenadines. It has only previously been recorded from Mexico, but will no doubt be found in other West Indian islands.

Pseudocanthon chlorizans, Bates.

A specimen was found in Mustique, and another in Union Island, in the Grenadines. This species also has only so far been known from Mexico. The green tinge is exceedingly faint, as in the specimens from Yucatan, and traceable only on the head and thorax. The elytra are quite black in all known examples except the type, found in Juquila.

The angulate inner edge of the front tibia of the male is the only substantial distinction between this genus and Canthon, the parallel-sided thorax mentioned by its author being only an optical effect produced in a particular position of the specimen.

Uroxys Vincentiæ, sp. n.

Parum elongatus, cupreo-niger, nitidus, capite polito, sat crebre punctato, oculis supra angustis, clypei margine setoso, medio bidentato ; prothorace lævissime punctato, lateribus valde angulatis, profunde sulcatis, sulco ad basin attingente ; elytris extus carina integra apice paulo depressa circumdatis, striatis, striis haud perspicue punctatis ; pygidio polito convexo, basi profunde bi-impresso ; tibiis anticis gracilibus, tridentatis, dentibus omnibus multo post medium positis.

Long. 3–4 mm.

Hab. St. Vincent, Cumberland.

Two specimens of this minute species were found beneath rubbish on a damp rock near the sea. It has the form and size of *U. pygmæus*, Harold, but the upper division of the eyes is narrow, and there are no supplementary teeth on the margin of the clypeus. The disk of the latter is without any trace of transverse wrinkles. The slight depression at the suture of the carina surrounding the elytra suggests the origin of the apical processes which form such a remarkable feature of some of the larger species of this genus.

Onthophagus Antillarum, sp. n.

Fusco-niger, opacus, supra parce brevissime setosus, pygidio femoribusque 4 posterioribus plerumque flavis, elytris basi nonnunquam flavo-maculatis ; clypeo integro, leviter punctato-rugoso, maris vertice cornubus 2 intus curvatis, cum carina connectiva circulum fere formantibus, armato; prothorace minute sat regulariter punctato, antice utrinque profunde impresso, lobo crasso antico formante, postice medio leviter canaliculato, margine angulato; elytris subtiliter striatis, striis haud punctatis, interstitiis minutissime et disperse punctulatis, punctis setiferis, elytris nonnunquam minus nigris, basi vage rufo-flavo-maculatis; pygidio, abdominis lateribus, femoribusque 4 posterioribus plerumque flavis, pedum reliquis fusco-castaneis, tibiis anticis acute 4-dentatis.

Long. 6·5 mm.

Hab. St. Vincent; Grenada, Balthazar, Mt. Gay Estate.

The armature is described from the best-developed male, in which the horns are about as long as the head and, with the connecting ridge, form three-quarters of a circle. The female is similar, but the head bears only two transverse ridges, and the thorax shows only vestiges of the anterior depressions. *O. Antillarum* is allied to *O. marginicollis*, Harold, which is similar in size and form, while the traces of yellow marking often present in the new species also point to this affinity. It is less shining, however, the striæ are not punctured, and the horns of the male, although not longer, are more slender.

Aphodiidæ.

Aphodius luridus, Olivier.

A single specimen of this almost universally distributed species was found on the Leeward side of Grenada.

Aphodius cuniculus, Chevrolat.

This was found in numbers in St. Vincent, Grenada, and Mustique, and is no doubt distributed throughout the Antilles. It also occurs on the American mainland.

Atænius strigicauda, Bates.

This widely-distributed species was found in numbers in St. Vincent and Grenada, and a specimen was also brought from Becquia Island. It generally occurred beneath rubbish in swampy places.

Atænius frater, sp. n.

A. strigicaudæ forma et magnitudo, sed differt capite crebre punctato, haud ruguloso, elytrorum interstitiis minus convexis, sparsissime punctulatis, metasterno femoribusque omnibus disperse et grosse punctatis.

Long. 5–5·5 mm.

Hab. St. Vincent, South end; Grenada, Leeward side.

At first sight this species is indistinguishable from *A. strigicauda*, but a close examination reveals slight differences which in combination sufficiently establish its distinctness. The punctures on the head are very fine, and, though not uniformly distributed, are everywhere distinct, and do not change into wrinkles anteriorly as in *A. strigicauda*. The elytral interstices show lateral striæ behind, as in that species, but unlike it the interstices are strewn with minute punctures. The evenly-punctured surface of the metasternum and middle and hind femora perhaps constitute the most evident difference between the two, these in *A. strigicauda* being smooth except for clusters of about half-a-dozen punctures on each side of the median furrow of the metasternum and at the distal extremities of the femora.

This appears to be a very local species, but considerable numbers were found at the southern end of St. Vincent and a few specimens in Grenada (Grand Etang Lake and Mount Gay Estate). It occurred under the same conditions as the allied form, but in different places.

Atænius terminalis, Chevrolat.

Numerous specimens were found in Grenada of the form referred to by Chevrolat as inhabiting most of the Antilles. Its apparent absence from St. Vincent is rather remarkable. All our specimens have the yellow border extending round the elytra from shoulder to shoulder.

Atænius tenebrosus, sp. n.

Niger, opacus, griseo-vestitus, latus, parum convexus, capite densissime rugose punctato; prothorace creberrime sed distincte punctato; elytris striatis, striis haud profunde punctatis, interstitiis subcarinatis, haud setosis; prothoracis lateribus medio fere rectis, angulis omnibus arcuatis.

Lat. 2 mm. Long. 4·5 mm.

Hab. GRENADA; TRINIDAD; BRAZIL, Marajo, etc.

A single specimen was found by Mr. Smith in a marshy place on Mount Gay Estate, Grenada. It agrees with a specimen in the British Museum from Trinidad and others from Brazil bearing the unpublished name *tenebrosus*, Reiche. The species is very near *A. imbricatus*, Melsh., which has been recorded from Cuba by Harold under the name of *A. sordidus*. *A. tenebrosus*, however, is a broader insect, more finely and densely punctured on the head and thorax, and without visible setæ upon the elytral costæ.

Atænius Vincentiæ, sp. n.

Valde elongatus, nigro-piceus, opacus, clypeo, prothoracis margine antica pedibusque rufis; clypeo bidentato, dentibus minutis, capite antice nitido, transversim rugato, postice crebre punctato; prothorace minute, fere confluenter, punctato, angulis omnino obliteratis, sulca obsoleta media postice impresso; elytris anguste carinatis, ubique punctato-rugoso.

Long. 3·3 mm.

Hab. ST. VINCENT, Leeward side and South end.

This was always found near the sea, beneath vegetable *débris*. It is a species closely allied to *A. scalptifrons*, Bates, and *A. Steinheili*, Harold—especially the former. It is more elongate, however, the posterior angles of the thorax are completely obliterated, and the head is more coarsely sculptured and shining.

Atænius polyglyptus, Bates.

A number of specimens agreeing with the variety *jalapensis* of Bates occurred both in St. Vincent and Grenada. They were also found under rubbish, but generally beside forest streams at an elevation of 250—1000 feet.

Atænius gracilis, Melsh.

Several specimens were found at Balthazar and Mount Gay Estate in Grenada, and one in St. Vincent. The species occurs throughout the Western Hemisphere.

Atænius, sp.

A single specimen from Mustique Island of a species near *A. polyglyptus*, but probably new.

Psammobius parvulus, Chevr.

This minute insect was very commonly found on the wing at sunset in both St. Vincent and Grenada. The species was described from a single Cuban specimen which I have not been able to trace, but M. Oberthür has kindly sent me specimens from Cuba which there is no reason to doubt belong to Chevrolat's species, and I am not able to distinguish our series from these. The *Psammobius* from Mexico and Guatemala identified by Bates as *P. parvulus*, although closely related, is not the same, and the Amazonian specimens also ascribed to it by him, and which I have seen in M. Oberthür's collection, represent a third species.

For the sake of clearness it may be well to re-name the Central American form shortly described by Bates, which I will call *P. Batesi*. This is generally larger than *P. parvulus* and considerably stouter, the width of the elytra together being greater than that of the thorax, whereas they are of equal width in Chevrolat's species, producing a very characteristic linear form. The head and prothorax are less markedly darker than the elytra in *P. Batesi*, and the thoracic puncturation is sparser.

Saprosites grenadensis, sp. n.

S. parallelo affinis sed paulo minor, minus grosse punctatus. Rufopiceus, capite prothoraceque magis rufescentibus, prothorace haud crebre sed irregulariter punctato, elytris profunde striatis, striis fundo punctatis, metasterno late canaliculato, segmentis abdominalibus subtus minutissime punctatis; tibiis anticis extus minute serratis, dentibus tribus majoribus.

Long. 4 mm.

Hab. Grenada, Grand Etang (1900 feet).

A single specimen only was found under the bark of a decaying log. Its colour is distinctly red on head and prothorax, but this is probably not a constant specific feature. It differs from *S. parallelus*, Harold, of Central and South America, by its smaller size and finer puncturation. The elytral striæ are deeper, and the punctures of which they are formed less distinctly traceable. The abdomen, which is smooth in *S. parallelus*, is very thickly and finely punctured. As in the other species, there is a minute tooth between the two upper of the three large teeth of the anterior tibia.

ORPHNIDÆ.

Ægidium vincentiæ, sp. n.

Parum elongatum, nigro-piceum, capite crebre punctato, clypeo antice leviter acuminato, prothorace grosse punctato, (♂, medio longitudinaliter excavato, minus dense punctato) lateribus valde arcuatis, grosse crenulatis, setigeris, postice perspicue marginato; scutello lævi, modice elongato; elytris vix quam capite et prothorace longioribus, lateribus ubique curvatis, haud costatis, dense strigose punctatis, punctis setigeris.

Long. 11 mm.

Hab. ST. VINCENT, La Souffrière Volcano, Petit Bordelle Valley, 1000—2500 feet.

Two specimens, one of each sex, were found under logs. The male is probably almost at the minimum development. The species is near *Æ. parvulum*, Westw., but rather more elongate, although considerably shorter than *Æ. colombianum*, Westw. The elytral costæ have almost entirely vanished. The sides of the prothorax are much more distinctly and regularly crenated than in *Æ. parvulum*, and the flattened hind margin is broader.

It must be noted here that the Central American insects described by Bates as varieties of *Æ. colombianum* are quite distinct specifically from that form. Both sexes are smaller and relatively shorter, much more strongly punctured, especially upon the head and metasternum, and with a less narrow and parallel-sided scutellum. In the male the thorax is almost rugosely punctured, whereas in Westwood's species it is polished and shining. Although in the latter there are large scattered punctures in the dorsal cavity, they are of a different nature, and do not interfere with the smoothness of the surface.

Æ. colombianum seems to inhabit Western South America as far south as Chili, from which country there are two female specimens in our collection which cannot be distinguished from it. The Central American species ranges from Nicaragua to Bogota. It should be called *Æ. cribratum*, that name having been given to the typical specimen figured by Bates as a variety of *Æ. colombianum.*

It is curious that a remarkable sexual characteristic of these insects has been overlooked, although Westwood has figured the structure of the genus in such detail. The front tibia of the female has three external teeth and a very strong short spine internally. In the male this spine is wanting, but is replaced by a supplementary tooth anterior to the others and directed internally, so that the tibia becomes a broad digging instrument, recalling the same member in the mole-cricket.

Hybosoridæ.

Cœlodes nigripennis, sp. n.

Castaneo-rufus, elytris nigris; clypeo breve, fere rugoso, fronte polito, paulo tumido; prothorace minutissime et sparsissime punctato (♂ antice medio leviter excavato); scutello polito; elytris lineato-punctatis, lineis haud perspicue geminatis, linea suturali profunde impressa; pedibus corporeque subtus flavo-rufis, tibiis anticis parum longis, extus haud copiose denticulatis, dentibus tribus majoribus, quorum medio maximo.

Long. 4·5 mm.

Hab. St. Vincent, Leeward side.

The species of *Cœlodes* are very much alike in their general form and appearance, and require careful examination to distinguish them. *C. nigripennis* is a small species about the size of *C. parvulus*, Westw., but besides the difference in the colour of the elytra these are rather more finely and uniformly punctured, the rows of punctures being less evidently paired. The clypeus is short, not much narrowed anteriorly, and shining, but not smooth. The anterior tibia is not elongated, the apical tooth is short and rounded, and the minute denticulations are few.

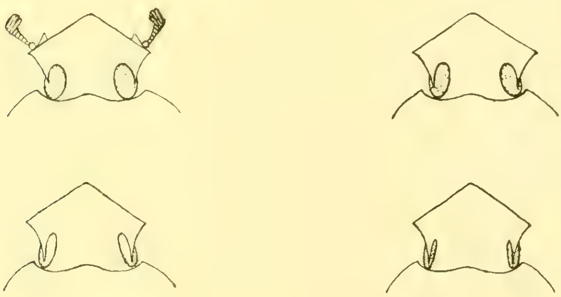
Trogidæ.

Trox suberosus, Fab.

Specimens of this were brought from St. Vincent by Mr. Smith, who has noted it as occurring commonly in fungi. It is strange that it was not found in Grenada, as it is a very common species distributed over the greater part of the New World.

Acanthocerus relucens, Bates.

The recorded range of this species is from Jalapa, in Mexico, to Panama, but it will probably be found to have a much wider distribution. Five specimens were brought by Mr. Smith from St. Vincent agreeing with the type in all essentials. The lines of punctures upon the elytra are exceedingly faint, and the marginal line of the thorax is rather further from the anterior edge at the angles. But the species is in certain respects very variable. A remarkable peculiarity of this genus, which has not previously been noticed, is the extreme variability in size of the division of the eye situated upon the upper part of the head, which in this species diminishes from a large, almost circular disc to a mere narrow vestige, and in a larger series would probably be found to vanish altogether, as it has done in some specimens of *Acanthocerus vicarius*, Bates, which I have examined. To show how remarkable



is this peculiarity I have sketched the heads of a series of four specimens of *Acanthocerus relucens,* brought respectively from St. Vincent, Mexico, Guatemala and Honduras. As far as our materials show, individuals from the same place are similar, but there is no real segregation into geographical races, nor is the variation in the eyes correlated with the variation in other respects to which the species is subject. All the specimens of *A. relucens* from St. Vincent have the eyes well developed above. These specimens were found in different parts of the island and at different times of year.

Clæotus rufopiceus, sp. n.

Paulo elongatus, rufo-piceus, nitidus, capite strigoso-rugoso, medio leviter elevato, clypeo antice late arcuato, medio vix angulato; prothorace crebre strigoso-punctato, undique marginato, angulis anticis productis, posticis late arcuatis; scutello parce punctato; elytris omnino punctato-striatis, postice multo profundius; pedibus læte rufis, tibiis anticis acute serratis, dentibus tribus apicalibus majoribus, tibiis intermediis et posticis latis, supra politis, subtus longitudinaliter striatis, tarsis omnibus subtus dense fulvo-pilosis.

Long. 5 mm.*

Hab. St. Vincent, Chateaubelair, Petit Bordelle Valley; Grenada, Grand Etang (1900 feet).

This species has about the size and shape of *C. brunnipes* and *C. bidens*, but is more strongly punctured. Its non-metallic deep red colour distinguishes it from all the other species known to me.

It occurred under bark and on brushwood.

Clœotus crassicollis, sp. n.

Niger, nitidus, prothoracis lateribus pedibusque rufopiceis, capite tumido, rugoso, medio sulca transversa curvata lævi impresso, clypeo transverse strigoso, margine arcuato; prothorace irregulariter punctato, marginibus lateralibus (postice nonnihil extensis) valde incrassatis, linea marginali impressa completa demarcatis, margine posteriori medio fere angulato, angulis anticis et posticis curvatis; scutello parvo, polito, epimeris mesosternalibus supra vix perspicuis; elytris conjunctim exacte hemisphæricis, lineato-punctatis, punctis elongatis, setas albas decumbentes ferentibus, interstitiis postice et lateraliter fortiter et acute elevatis, costas interruptas formantibus, humeris tuberculiferis; tibiis quatuor anterioribus paulo longis, anticis extus minute serratis, singulo apice dentibus duobus majoribus approximatis, intermediis leviter incurvatis (♂, intus apice fortiter curvato-producto), posticis paulo brevioribus, subcompressis, posterioribus quatuor longitudinaliter striatis.

Long. 6 mm.

Hab. St. Vincent, Morne à Garon (1500 feet).

Two specimens of this, apparently representing the two sexes, were found in rotten wood. It is a very well-marked form, which may be compared with *C. posticus*, Germ., although not closely related to that or any other known species. It is of similar colour and form to *C. posticus*, although rather larger, and the elytral costæ are similar, but much more prominent, and extending over half the total area of the elytra. The lines of punctures are fewer, and each puncture contains an elongate white scale. The most distinctive feature, however, is the

* As these insects have been measured sometimes in the rolled-up and sometimes in the extended condition, it is necessary to say that I have given measurements of them in the condition of normal extension.

conspicuous submarginal thickening of the pronotum extending on each side from the anterior angle to about a quarter of the length of the base.

While dealing with Tropical American species of *Clœotus*, I may conveniently point out that Bates has wrongly recorded *C. metallicus*, Har., from Central America. In the Biologia Cent.-Americana he has referred a specimen from Panama and another from Costa Rica to that species, but the two are not conspecific, nor is either *C. metallicus*. The latter was described from specimens collected by Bates at Ega, of which a series is in the British Museum. It is distinguished from both the other forms by the serrate humeral margins of the elytra, the three acutely-raised interstices at their apical end, and the narrower and more curved intermediate tibiæ, which have three or four striæ on their lower face.

The specimen from Bugaba, Panama, agrees with another from the same locality referred by Bates to his *C. viridipennis*, of which all true examples are from Chiriqui. The distinctive characters of this undescribed species are shortly diagnosed as follows:—

Clœotus bugabensis, sp. n.

C. viridipenne valde affinis, differt magnitudine paulo minore, colore magis cupreo, prothoracis disco impunctato, linea marginali antice medio interrupto, tarsisque anticis tenuioribus.

Long. 5 mm.

Hab. PANAMA, Bugaba.

The Brazilian species which appears to have been mistaken by Bates for *C. metallicus*, Har., and from which I cannot distinguish the Costa Rican specimen mentioned above, is also characterized here:—

Clœotus acutipes, sp. n.

C. metallico et *viridipenne* valde affinis, sed tibiis anticis fortiter dentatis, dentibus tribus apicalibus majoribus: tibiis intermediis paulo latis, subtus lævibus, prothorace prope lateribus solum leviter punctato; elytrorum marginibus humeralibus haud serratis, interstitiis apicalibus leviter haud acute elevatis.

Long. 7 mm.

Hab. BRAZIL, Rio de Janeiro; COSTA RICA, Irazu.

This is no doubt a widely-distributed species.

In conclusion I describe, supplementary to my previous paper, a Pleurostict species belonging to a genus of Melolonthidæ not hitherto recorded from the West Indian Islands, a single representative having been found in Mr. Smith's collection since the publication of my enumeration of the Pleurostict Lamellicornia.

Faula insularis, sp. n.

Ferruginea, prothorace nigro-maculato, elytris paulo infuscatis, capite supra granuloso, clypeo arcuato; prothorace punctato-rugoso, macula magna media duabusque parvis lateralibus nitidis, media nigra ad margines antice et postice fere attingente, postice dilatata, pronoti lateribus valde angulatis, angulis posticis acutis, margine postica spina acuta medio instructa; scutello fere circulari, grosse punctato, antice profunde indentato; elytris ad humeros quam prothorace paulo latioribus, deinde leviter ampliatis, ante medium usque ad apices angustatis, punctato-rugosis, dense breviter erecte pilosis, vage costatis, humeris prominentibus, nitidis; pedibus gracilibus, rufis, tibiis anticis tridentatis, dente superiori ad medium posito.

Long. 10 mm. Lat. max. 5 mm.

Hab. St. Vincent, Leeward side (500 feet).

A single female specimen of this species was found. It is easily recognizable by the smooth black area shaped like a vine-leaf occupying the centre of the prothorax. In the shape of the scutellum and the sharp tooth in the middle of the hind margin of the thorax, which fits into the deep notch in the former, it resembles *Ceraspis* and *Ancistrosoma*, but it has the typical form and size of *Faula* as well as the entire claws distinctive of that genus.

XXII. *Note on the habits of* Chironomus (Orthocladius) sordidellus. By THOMAS HAROLD TAYLOR, M.A., F.E.S.

[Read October 7th, 1903.]

THE larva of this insect lives submerged in brisk streams. It has the usual structure of a bloodworm, but like other surface-feeding Chironomus-larvæ, it is greenish in colour, and lacks the ventral gills on the last segment but one. When full-grown it measures 7 mm. in length. This larva constructs for its abode a hollow cylindrical tube, one end of which it attaches to the surface of a stone, leaving the other end free and open. The material of the tube is furnished by the secretion of the salivary glands without any admixture of foreign substances. Within the long and flexible silken tube the larva may be seen creeping to and fro, or, if stationary, bending its body up and down in the undulations often practised by tube-dwelling larvæ, as a means of renewing water which has been vitiated by respiration. Pure water is admitted by special inlets, which may be either mere slits or roundish holes. The food of the larva consists of unicellular and filamentous algæ. Although these grow in abundance on the stones around, the strength of the current, and the incessant oscillations of the tube make it a matter of some difficulty for the larva to browse upon them. But since the tube itself soon becomes overgrown with diatoms and other microscopic algæ, the larva, thrusting its head out of the terminal opening and holding on by its anal feet, is able to search the exposed surface of its own tube. The range of its body is of course very small, but the tube is flexible, and admits of being bent upon itself or even doubled in two. By reaching out, the larva can draw up to its mouth any part of the surface of its tube, which thus not only affords lodging, but board as well.

When the larva is full-grown, it transforms the old tube into a pupal case. It retains the free end for its abode, and converts the rest into an anchoring strand by drawing the sides together with threads of silk. The free end becomes dilated into an oval chamber, the terminal aperture of which is somewhat more narrowed than in the larval dwelling. The last thing the larva does before pupation is to make a new aperture at the fixed end, which may be distinguished as the front opening. This aperture is seldom single; generally two, three or even four small circular holes are arranged in a ring around the attachment of the stalk. The advantage of several small holes over one large one is obvious; they do not weaken the strand so much, nor are they so liable to be torn by the force of the stream. When all is ready the larva pupates; the old larval skin is usually allowed to float out of the tube, for it is seldom seen afterwards.

The pupa of this species of Chironomus has minute prothoracic horns in which no apertures are visible, and an effective tail-fin. It lies in the chamber with its head towards the attached end, that is, pointing up-stream. It maintains an undulatory movement with its body, which causes water to be drawn in at the front opening and passed out behind. As the front opening looks up-stream and the hinder down-stream, it follows that the course of the respiratory current is parallel to and in the same direction as the flow of the stream. When, in the course of a few days, the fly is ready to emerge, the pupa, by means of the hooks on its body, forces a way through the front opening. It then rises to the surface of the water, when the skin at once splits open along the back and allows the fly to escape.

It frequently happens that while the pupa is still within its case, the six-legged larva of a water-mite is found attached to its body, generally on the upper part of the thorax.

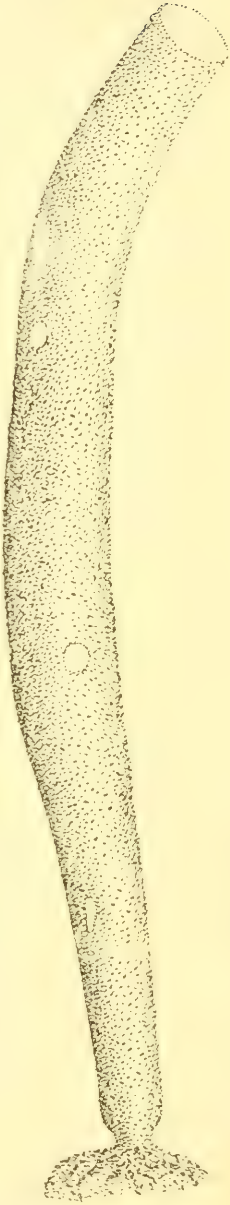


Fig. 1. Larval tube of *Chironomus* (*Orthocladius*) *sordidellus* × 8.

Its colour, which is bright red, renders the mite conspicuous even through the wall of the tube. The mite does not appear to do any injury to its host, even when, as sometimes occurs, two are present on the same pupa. It has not been seen upon the larva. When the pupa is extricating itself from its chamber, the mite occasionally becomes dislodged, and is left behind, evidently ill at ease, as its agitated movements show. Generally, however, the mite is carried up to the surface of the water together with the pupa itself. And then an unexpected thing happens. One might imagine that when the fly emerges, the mite would remain attached to the pupal skin; but such is not the case. When the pupa rises to the surface, the mite is apparently aware of what is going on, and, all alert, at the very moment when the old skin cracks, it releases its hold and transfers itself to the body of the half-extricated fly. It is interesting to watch the mite, hitherto perfectly passive, execute this rapid and sudden movement. Thus when the fly leaves the water and rises into the air, the mite, still a six-legged larva, is borne along with it. The ultimate fate of the mite can only be guessed at.

My best thanks are due to Professor Miall for his valuable assistance during the preparation of this note.

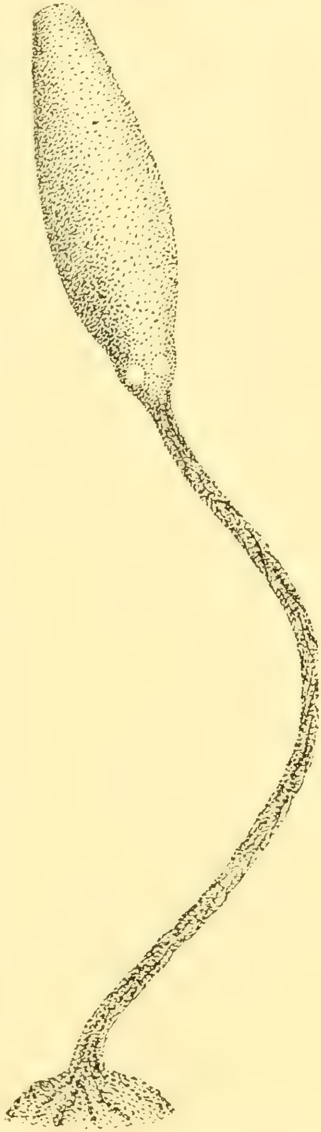


Fig. 2. Pupal tube of *Chironomus (Orthocladius) sordidellus* × 8.

XXIII. *Additions to the* Rhynchotal *fauna of Central America.* By W. L. Distant, F.E.S.

[Read October 7th, 1903.]

My last contribution to our knowledge of the Rhynchotal fauna of Central America appeared in the pages of our Transactions for 1900 (p. 687). The following descriptions and notes refer to a small collection recently sent me by Prof. P. Biolley, and which was made in Costa Rica. It contained three new species, and two others not enumerated in the "Biologia Centrali Americana."

HETEROPTERA.

Family PENTATOMIDÆ.

CYDNINÆ.

Cyrtomenus vestigiatus, sp. n.

Piceous, corium more or less piceous-brown ; legs, antennæ and rostrum, pale castaneous ; head broad, rounded, lateral lobes somewhat transversely rugose, lateral margins of the central lobe strongly defined, lateral lobes not meeting in front of central lobe, and thus cleft at their apices ; pronotum with a strong transverse impression near middle, this impression and the lateral and anterior margins, sparingly, strongly, linearly punctate, a few coarse punctures on anterior disk of posterior lobe ; scutellum very sparingly but very coarsely punctate, its apex impunctate, and distinctly posteriorly depressed ; corium somewhat thickly and finely punctate ; membrane pale ochraceous, longly passing abdominal apex ; rostrum reaching the intermediate coxæ, its apex piceous ; intermediate and posterior femora with a few coarse lateral punctures ; tibiæ with outer series of strong piceous spines, inwardly longly hirsute.

Long. 8 to 9 millim.

Hab. Costa Rica, San José (Biolley).

Taken at electric lamps.

Allied to *C. mirabilis*, Perty, from which it differs by its shorter and more robust form, and its more sparsely and deeply punctate scutellum.

PENTATOMINÆ.

Edessa cervus.

Edessa cervus, Fabr., Mant. Ins., 11, p. 283 (1787).

Hab. Costa Rica, Surubres, near San Mateo (Biolley). Not previously recorded from Central America.

Family LYGÆIDÆ.

APHANINÆ.

Gonatas costaricensis, sp. n.

Piceous-brown; head, anterior lobe of pronotum, scutellum, and body beneath, piceous; veins and lateral margins of corium, rostrum, antennæ, and tibiæ, luteous; antennæ with the first, second, and third joints hirsute, fourth pilose, second joint longest; head glabrous with a few long hairs at apex; pronotum with the lateral margins longly pilose, anterior lobe glabrous, posterior lobe sparingly punctate and somewhat obscurely pilose, lateral posterior angles slightly nodulose; scutellum long, triangular, foveately discally depressed, a few scattered hairs on posterior half, anterior half glabrous; corium distinctly ochraceously pilose, and punctate between the veins, margins of clavus, luteous; intermediate and posterior tibiæ somewhat longly setose; membrane subhyaline.

Long. 5 millim.

Hab. Costa Rica, Surubres, near San Mateo (Biolley).

Allied to *G. diversus,* Dist., but differing by the glabrous head, anterior pronotal lobe, and anterior half of scutellum; corium shining, punctate, without spots, veins and lateral margins luteous; pronotum shorter, etc.

HOMOPTERA.

Family CICADIDÆ.

Odopœa biolleyi, sp. n.

♂. Body dark chocolate-brown; vertex of head—excluding a few obscure spots, lateral and posterior margins of pronotum and two oblique discal spots at both anterior and posterior margins, two discal linear posteriorly broadly angulated spots, bordered on each side by a curved oblong linear spot, and some obscure linear markings to mesonotum, basal cruciform elevation, sternum, opercula and a broad basal annulation to tibiæ, obscure olivaceous-green;

abdomen beneath thickly, ochraceously, very finely pilose. Tegmina pale dull ochraceous, semihyaline; costal membrane and veins, brownish-ochraceous, or very obscure olivaceous, apical two-thirds somewhat thickly spotted with fuscous, the spots almost entirely situate on the veins; wings a little paler and subhyaline, the veins brownish-ochraceous, but unspotted.

Long. excl. tegm. ♂ 32 millim. Exp. tegm. 85 millim.

Hab. COSTA RICA, Cerro Carisia (Biolley).

Allied to *O. medea*, Stål.; body much longer and more robust; tegmina pale ochraceous and with the apical two-thirds of venation somewhat thickly spotted; opercula much more truncated interiorly, and therefore more widely separated; colour altogether darker, etc.

Carineta postica.

Carineta postica, Walk., Ins. Saund. Hom., p. 23 (1858).

Hab. COSTA RICA, Cariblanco, Sarapiqui (Ch. Lankester); COLOMBIA.

Not previously recorded from Central America.

XXIV. *Notes on some Central and South American* Erycinidæ, *with descriptions of new species.* By Frederick Du Cane Godman, D.C.L., F.R.S., etc.

[Read October 7th, 1903.]

Plates XX, XXI, XXII, and XXIII.

This paper includes descriptions of various South American *Erycinidæ* that have been accumulating for many years in my collection. The opportunity is also taken to correct certain synonymy, and of figuring a few forms of which one sex only was previously known, or which had been figured from specimens in bad condition.

Mr. Schaus [Proc. U.S. Nat. Mus. xxiv, pp. 397–406 (1902)] has recently described twenty-six species of this group from Central or South America. One of these (*Eurygona tarinta*) I had already characterized in MS., and a figure of this insect and three others are added in the accompanying plates.

Mesosemia phace, sp. n. (Plate XX, fig. 1, ♂.)

♂. Alis nigro-fuscis, anticis ocello nigro ad cellulæ finem albo tripunctato, lineis quatuor transversis, una ad basin, secunda et tertia ultra eam ocellum includentibus, quarta arcuata latiore a costa ante apicem ad angulum analem extendente, viridibus (aut cæruleis); posticis lineis angustis septem transversis coloris ejusdem; subtus griseis, anticis ocello ut supra sed linea ochracea circumcincta, lineis undulatis fuscis per alarum medium, altera latiore margini exteriori propiore; posticis lineis angustis variis undulatis coloris ejusdem, anticis et posticis macula in medio marginis externi nigra, illa in posticis multo majore.

Hab. British Guiana, Roraima, Quonga (*Whitely*).

Four specimens from Guiana, all males, three from Roraima and one from Quonga. The stripes crossing the wings seen in certain lights are of an emerald green colour, while in other positions they are of a dark blue. Allied to *M. bella*, Sharpe, but may be distinguished by having more transverse bands on the upper side.

MESOSEMIA THERA, sp. n. (Plate XX, fig. 2, ♂.)

♂. Alis nigro-fuscis, anticis ocello indistincto ad cellulæ finem nigro, albo-punctato, fasciis tribus submarginalibus communibus exteriore angustissima, costa anticarum et ad alarum basin cæruleis; subtus griseo-fuscis, anticis ocello sicut supra, sed punctis tribus albis notatis et lineis obscurioribus incertis circumcinctis, fascia lata submarginali coloris ejusdem; posticis lineis angustis undulatis variis fuscis, puncto nigro in cellula ornatis.

Hab. BRAZIL, Chapada (*H. H. Smith*).

A single male much resembling *M. orbona* described below. It may, however, be readily distinguished from that species by the ocellus in the primaries being smaller and less conspicuous; the blue stripes, too, on both wings are much narrower.

MESOSEMIA ORBONA, sp. n. (Plate XX, fig. 3, ♂.)

♂. Alis nigro-fuscis, anticis ocello magno ad cellulæ finem nigro albo-pupillato et cæruleo circumcincto, fasciis duabus communibus submarginalibus, tertia prope basin (in posticis angustissima) et ad basin ipsam cæruleis; subtus griseo-fuscis, anticis ocello sicut supra sed albo-tripunctato, lineis duabus obscurioribus circumcinctis, fascia latiore margini propiore coloris ejusdem; posticis lineis variis angustis undulatis (marginem versus latioribus) obscuris, puncto in cellula nigro.

Hab. SURINAM, Paramaribo (*ex Semper*).

Dr. Semper sent us some years ago a single male example of this species in bad condition, under the name of *M. ephyne*, Cram., but it does not agree with the figure of that insect. It is not very unlike the Colombian *M. thetis*, G. and S., but the arrangement of the bands is different, those towards the outer margins especially being much wider and of a brighter colour. *M. orbona* also resembles *M. bella*, Sharpe, from Brazil, but the blue at the base of the wings on the upper-side is interrupted by a dark transverse band, and it is likewise different beneath.

CREMNA MALIS, sp. n. (Plate XX, fig. 4, ♂.)

♂. Alis fuscis maculis albis transversis notatis, anticis exterioribus lunulatis; posticis maculis submarginalibus valde angulatis, aliis irregularibus interioribus albis, inter lineas et in margine exteriore squamis cæruleo-griseis indutis; subtus pallidioribus, colore albo magis extenso et dimidio basali maculis nigro-limbatis.

Hab. W. COLOMBIA, San Pablo, Rio San Juan (*ex Staudinger*).

Very like *C. beltiana*, Bates, from North Brazil (of which the female only is known), but the white spots on the upper-side are much smaller, the marginal ones being obsolete; and the posterior wings towards the anal angle are clothed with bluish-grey scales, which show a tendency to form a band between the two submarginal white lines.

HYPHILARIA ORSEDICE, sp. n. (Plate XX, fig. 5, ♀.)

♀. Alis pallide flavis, anticis costa et triente distali fuscis, linea submarginali ad costam in maculas fracta, ad angulum analem angustissima, notata; posticis margine externo late fusco, lineis duabus (exteriore angustissima) pallide flavis; subtus sicut supra sed anticis prope marginem externum maculis variis quoque flavis notatis.

Hab. VENEZUELA (*Mus. Brit.*); BRITISH GUIANA, Roraima (*Whitely*).

Similar to *H. nicias* (Stoll), but without the transverse bands crossing the wings at the end of the cell. Two specimens in our collection and one in the British Museum.

EURYGONA AURANTIACA.

Eurygona elmira, Hew., Ent. Monthly Mag. vi, p. 226 (1870).

In the "Biologia" we omitted to note that Hewitson had described *E. aurantiaca*, Godm. and Salv., under the name of *E. elmira*; the former, however, has two years' priority.

EURYGONA LICINIA, sp. n. (Plate XX, fig. 6, ♀.)

♀. Alis fuscis, posticis litura magna alba rotundata prope marginem externum ad angulum analem extendente; subtus griseis, posticis dimidio distali fere albo, linea communi a costa anticarum ultra cellulam ad medium marginis interni extendente ferruginea, ultra eam in anticis fascia transversa obscura, posticis macula ad medium marginis externi, aliisque minutis angulum analem versus, margine externo ipso flavo limbato.

Hab. BRITISH GUIANA, Roraima (*Whitely*).

On the under-side this insect closely resembles the corresponding sex of *E. mys*, H. S., but the large white patch occupying nearly half the upper-side of the secondaries at once separates it from that species. I have a very long series of both sexes of *E. mys*, but none of them show any white on the upper-side. *E. effinia*, Hew., from Ecuador, somewhat resembles *E. licinia* above, but is quite different beneath. One specimen.

Eurygona authe, sp. n. (Plate XX, fig. 7, ♂.)

♂. Alis fuscis, anticis litura magna infra cellulam ad marginem internum extendente rufo-aurantia, hinc ad basin ferruginea; posticis fere eodem modo notatis, sed litura aurantia ultra (nec infra) cellulam posita; subtus pallide fuscis, fascia communi a cellula anticarum ad marginem internum prope angulum analem posticarum extendente alba, intus linea fusca limbata; posticis punctis in serie submarginali nigris albo circumcinctis, illo in medio maximo.

Hab. Brazil, Chapada (*H. H. Smith*).

Very like *E. cubule*, Feld., from Central America, but with the orange colour on the secondaries not extending to the outer margin. On the under-side, too, there is a broad white transverse band nearly crossing both wings.

Eurygona rhodogyne, sp. n. (Plate XX, figs. 8, ♂; 9, ♀.)

♂. Alis nigro-fuscis cæruleo tinctis, anticis fascia obliqua prope costam ultra cellulam fere ad medium marginis externi extendente rufo-aurantiaca; subtus rufo-griseis, fascia ferruginea communi a costa anticarum ultra cellulam ad medium marginis interni posticarum extensa, altera sinuata (in anticis fere obsoleta) exteriore, anticis margine interno grisescentiore; posticis ocello parvo, extus albo notato, in medio marginis externi, aliisque minimis in serie angulum analem versus.

♀. Majore et multo pallidiore, fascia anticarum multo latiore.

Hab. Colombia (*Wheeler*).

One pair, not very unlike *E. euhemerus*, Hew., from the Amazons, of which the female only has been described; it differs, however, in having the band on the primaries longer and less graduate, and in the female reaching the costal margin; the markings, too, on the under-side are more distinct. The blue colour on the upper surface is only visible in certain lights, and is entirely wanting in the female. Of *E. euhemerus* I have two females obtained by Bates at Para.

EURYGONA TARINTA. (Plate XX, fig. 10, ♂.)

Eurygona tarinta, Schaus, Proc. U. S. Nat. Mus. xxiv, p. 398 (1902).

Hab. COLOMBIA.

I now have three males of this species, two sent by Dr. Staudinger and one by Wheeler, the latter being labelled as coming from the neighbourhood of Bogota. It is allied to *E. cupepla,* G. and S.,* but differs in having the blue lustre on the upper-side brighter and on the primaries confined to the outer half. This colour is seen only when the insect is held in a certain light. The female is probably of a pale fuscous colour with a broad white band crossing both wings, as in *E. cupepla.*

EURYGONA FABIA, sp. n. (Plate XX, fig. 11, ♂.)

♂. *E. tarintæ* similis sed dimidio anticarum et margine externo posticarum purpurascentioribus; subtus magis ferrugineis, fascia externa fere obsoleta, posticis ocello ultra lineam albam absente.

Hab. E. PERU, Pebas (*ex Staudinger*), Sarayacu (*Buckley*).

Of this insect I have three males, and have seen others from San Paulo in the late Dr. Staudinger's collection. *E. fabia* is a very close ally of *E. cupepla,* from which it differs in having the blue of the fore-wing less extended, and on the under-side it is of a more ferruginous colour, the ocellus of the hind-wing, too, is not edged with white externally.

MESENOPSIS PULCHELLA, sp. n. (Plate XX, fig. 12, ♀.)

♀. Alis nigris, litura lata mediana a basi extensa (ultra cellulam albo-terminata) rufo-aurantia; posticis quoque litura mediana a basi fere ad marginem externum extendente; subtus sicut supra sed ciliis ad angulum analem posticarum albis; corpore supra nigro; palpis et pedibus ochraceis; capite, collo et ad abdominis basin aurantiacis.

Hab. AMAZONS, Massauary (*ex Staudinger*).

A very close ally of *M. melanochlora,* G. and S., from Central America, but differs from it in having the broad

* Mr. Schaus quotes this insect under the name of *E. eupiola,* Hew. This is doubtless an error, as Hewitson described no such species.

median streak on the primaries less extended outwardly and in being white beyond the cell; the streak on the secondaries, too, does not reach the outer margin. One specimen.

CHAMÆLIMNAS PANSA, sp. n. (Plate XX, fig. 13, ♂.)

♂. Alis nigrescentibus, anticis fascia angusta obliqua a vena subcostali vix ad marginem externum prope angulum analem extendente pallide flava; subtus sicut supra, sed anticis margine interno paulo pallidiore; collo flavo.

Hab. BRAZIL, Chapada (*H. H. Smith*).

I have five males of this insect from Chapada and a bad specimen from Semper's collection. The species is very like Felder's figure of *C. tircis*, from Bahia, but the transverse band of the primaries extends almost across the wing. From the Amazonian *C. iæris*, Bates, it differs in having a longer and paler band on the primaries.

CHAMÆLIMNAS JOVIANA. (Plate XX, fig. 14, ♂.)

Chamælimnas joviana, Schaus, Proc. U. S. Nat. Mus. xxiv, p. 401 (1902).

Of this species, which I take the opportunity of figuring, I have numerous specimens from both Bolivia and Brazil; some of these were sent by Staudinger under the name of *Isapis joviana*. *C. similis*, Schaus, which occurs with *C. joviana* at the same locality (Bueyes in Bolivia), appears to be only an extreme form of it, with the orange band on the secondaries obsolete. Mr. Schaus's types of both insects were from Peru.

SISEME PEDIAS, sp. n. (Plate XXI, fig. 1, ♂.)

♂. Alis nigro-fuscis, fascia communi in cellula anticarum angulum analem posticarum versus (sed non attingente) extensa alba, altera ultra eam cærulea; posticis plaga aurantia ad angulum analem; subtus fere ut supra, sed colore cæruleo, præsertim in anticis multo latiore et ad basin regionis costalis extenso.

Hab. COLOMBIA (*Wheeler*).

This species differs from all others known to me belonging to the genus in having the outer blue band crossing both wings. It is somewhat faintly shown on the upper-side, but beneath, especially on the primaries, it is very brilliant, and occupies the space beyond the white band, extending nearly to the outer margin.

RIODINA (?) THEODORA, sp. n. (Plate XXI, figs. 2, ♂; 3, ♀.)

♂ Alis fuscis, anticis macula (interdum duabus) in cellula et fascia transversa subapicali albidis aut flavescentibus, duabus infra cellulæ finem, aliis duabus subquadratis in margine externo ochraceis; posticis fascia interrupta a costa prope apicem ad marginem internum extendente, maculis duabus prope marginem externum, ochraceis; subtus fere ut supra, sed maculis anticarum majoribus; posticis fascia transversa pallidiore et magis distincta, maculis marginalibus absentibus; ciliis anticarum fuscis et albis; capite et collo ferrugineis.

♀. Mari similis, sed maculis duabus infra cellulam anticarum et fascia transversa posticarum obsoletis; subtus posticis immaculatis.

Hab. BRAZIL, Chapada (*H. H. Smith*).

This and the following species probably do not properly belong to the genus *Riodina*, but they can be included in it for the present; both have much longer palpi than the type of *Riodina*—*R. lysippus* (Linn.). *R. luctus*, Berg, and *R. lysistratus*, Burm., too, may have to be removed from it. Three specimens.

RIODINA (?) ALBOFASCIATA, sp. n. (Plate XXI, fig. 4, ♂.)

♂. Alis fuscis, anticis macula ad cellulæ finem, altera majore transversa apicem versus, tertia (interdum quarta) infra cellulæ finem, albidis; posticis fascia venis interrupta, a costa prope apicem ad cellulæ finem extendente, alba; subtus fere ut supra, sed fascia communi venis divisa a costa anticarum ad marginem internum posticarum extendente alba; collo aurantio; ciliis anticarum albis.

♀. Mari similis, sed posticis fascia alba obsoleta.

Hab. ARGENTINE REPUBLIC, Corrientes (*Perrens*), Cordoba (*Berg, in Mus. Brit.*); PARAGUAY (*Coll. Crowley, in Mus. Brit.*).

I have long had numerous males of this peculiar species, but have hitherto been unable to identify them. There are specimens of it from Cordoba and also from Paraguay in the British Museum; the former have the common white band beneath broader than it is in our examples. *R. albofasciata* is undoubtedly a close ally of *R. theodora*, but is much smaller and differently marked.

ANTEROS CARUS, sp. n. (Plate XXI, fig. 5, ♂.)

♂. Alis fusco-nigris, anticis ad basin et posticis (nisi apicem versus) pilis cæruleis indutis, anticis maculis duabus, una ad cellulæ finem, altera margini exteriori propiore, albo-hyalinis; posticis punctis apicem versus fere obsoletis coloris ejusdem; subtus læte castaneis, anticis flavo, albo et fusco maculatis, posticis disco griseo irroratis, basin versus et ad angulum analem flavo maculatis, fascia communi angusta submarginali strigis et maculis variis interioribus metallicis; ciliis alterne flavis et fuscis; cruribus pallide castaneis.

Hab. COLOMBIA, Bogota (*Wheeler*); BOLIVIA, Tanampaya (*Garlepp*).

Dr. Staudinger sent me some years ago two specimens of this species from Bolivia under the MS. name of *A. carus*, and I have two others from Colombia in my collection, all males. The Bolivian insects differ from the others in having a minute additional hyaline longitudinal spot on the primaries beyond the cell, and the castaneous colour on the under-side perhaps less extended. *A. carus* is a close ally of *A. carausius*, Westw., with which it is confused in the Hewitson collection, but the markings of the under-side are very different, as will be seen from the figure here given. *A. principalis*, Hopff., from Peru, is unknown to me, but the description does not agree with the present insect.

EMESIS EURYDICE, sp. n. (Plate XXI, figs. 6, ♂; 7, ♀.)

♂. Alis glauco-cinereis, dimidio basali lineolis transversis nigris irregulariter notatis, fasciis duabus exterioribus (præsertim in anticis) fere obsoletis; subtus læte rufo-ferrugineis, lineolis nigris sicut in pagina superiore, marginibus externis late nigro-fuscis.

♀. Mari similis, sed majore et pallidiore, lineolis magis undulatis, anticis plaga magna prope apicem, altera parva ad apicem ipsum, albis; subtus dimidio basali anticarum et posticarum ochraceo, aliter fere ut supra.

Hab. ECUADOR, Sarayacu (*Buckley*).

This is a form of *E. fastidiosa*, Mén., but the male differs in having the ground colour of the upper surface uniformly glaucous and both wings broadly bordered with fuscous beneath. The female is very like that of the above-mentioned species, but the ground colour is ochreous beneath. The broad dark border of the wings in the male beneath separates it from both *E. godarti* and *E. aurimna*, Boisd. In the Hewitson collection *E. eurydice* is confused with *E. fastidiosa*.

EMESIS NEEMIAS. (Plate XXI, figs. 8, ♂; 9, ♀.)

Emesis neemias, Hew., Exot. Butt. v. Emesis, ff. 3, 4 (♂).

♂. Alis nigro-fuscis, lineolis variis transversis nigris (exterioribus angulatis), viridi-cæruleo limbatis, punctis in serie communi submarginali nigris; subtus ferrugineis, maculis irregularibus elongatis nigris.

♀. Supra pallide fuscis, aliter mari similis, subtus albescentibus lineis transversis paginæ superioris rufescentibus et in costa, apicem versus, squamis paucis metallacis notatis.

Hab. BOLIVIA, Yungas (*Garlepp*); BRAZIL, Chapada (*H. H. Smith*); PARAGUAY (*Coll. Crowley, in Mus. Brit.*).

Hewitson's figure of this insect was taken from a worn male from Brazil. I have now seen several good specimens of both sexes, and take this opportunity of re-describing the species. The metallic spots on the upper-side are very similar to those of *Symmachia fatima* (Cram.). My collection contains three males, two of which were received from Dr. Staudinger.

SYMMACHIA PROGNE, sp. n. (Plate XXI, fig. 10, ♂.)

♂. Alis fuscis ferrugineo tinctis, undique nigro irregulariter lineolatis, anticis ad marginem externum punctis nigris in serie notatis, fascia communi ultra cellulam anticarum fere ad marginem internum posticarum extendente ochracea vix cæruleo lavata; subtus rufo ferrugineis, lineis nigris sicut supra, margine interno fusco.

Hab. BOLIVIA, Yungas (*Garlepp*); E. PERU, Pozuzo (*Pearce*).

This species is about the same size as *S. emesina*, Staud., from the Upper Amazons, but may at once be distinguished by the absence of the ferruginous apical patch on the primaries and the ochraceous band crossing both wings, which in certain lights is shot with blue. I have also seen a specimen of *S. progne*, from Chanchamayo, in Dr. Staudinger's collection. It is very like *S. temesa*, Hew., from Ecuador, but is differently coloured above and beneath. Four males.

SYMMACHIA HIPPODICE, sp. n. (Plate XXI, fig. 11, ♀.)

♀. Alis aurantiis, anticis costa et margine externo (ad apicem macula transversa excepta) late fuscis, margine interiore valde dentata; posticis margine externo late (linea angustissima submarginali excepta) fuscis, angulum analem versus maculis tribus obscuris notatis; subtus ut supra, sed colore fusco minus extenso et in maculas fracto.

Hab. Brazil, Chapada (*H. H. Smith*).

The above description is taken from a single female specimen. It seems to be most nearly allied to *S. hetærina*, Hew., from the Lower Amazons, of which also the female alone is known.

Caria smaragdina, sp. n. (Plate XXI, fig. 12, ♂.)

♂. Alis fuscis, lineis submarginalibus nigris, anticis linea transversa prope basin quoque nigra, anticis et posticis (marginibus externis et in anticis fascia lata basin versus exceptis) squamis viridibus nitentibus dense vestitis, linea communi angusta submarginali metallica; subtus griseo-fuscis, lineis variis undulatis nigris transeuntibus, anticis in costa tota maculis metallicis notatis; capite et corpore supra squamis viridibus indutis.

Hab. Bolivia, Coroico, 6,500 ft. (*Garlepp*).

Dr. Staudinger has sent me an example of this species as a small variety of *C. amazonica*, Bates, but it differs from that insect in having the upper surface almost entirely clothed with green scales, and both wings have a submarginal metallic line. *C. smaragdina* is also very much smaller, and is really more nearly allied to *C. chrysame*, Hewitson (? = *C. psittacus*, Hopff.). *C. trochilus* occurs in the same locality, but is a much larger insect and the green scales are more restricted.

Caria marsyas, sp. n. (Plate XXI, figs. 13, ♂; 14, ♀.)

♂. Alis fuscis, lineis angustis interruptis transversis nigris, anticis ad basin, in area discali ad costam lata, et angulum analem versus anguste, squamis viridi-aureis vestitis; posticis squamis in dimidio basali ad angulum analem extendentibus coloris ejusdem, linea angustissima communi submarginali metallica, punctisque nigris, fulvo plus minusve circumcinctis, ultra eam; subtus pallide fuscis, lineis nigrescentibus irregularibus transversis, anticis litura elongata cellulam occupante coccinea, et maculis tribus aut quatuor notatis.

♀. Mari similis sed pallidiore et minus viridi squamata; subtus lineis transversis in maculas fractis.

Hab. Brazil, Chapada (*H. H. Smith*); Paraguay, Corrientes (*Perrens*).

This alone of the group of species including *C. argiope*, Godt., *C. amazonica*, Bates, and *C. lampeto*, G. and S., has the red patch in the cell of the primaries beneath broken by several transverse metallic spots, a character common to the females of most of the allied species. The submarginal metallic line is very narrow. The series before me consists of ten males and one female. I also have three male specimens from Corumba, in Brazil, which perhaps represent another form; in these the red spot on the primaries beneath is dentate on the upper edge.

CHARIS ARCUATA, sp. n. (Plate XXII, figs. 1, ♂; 2, ♀.)

♂. Alis nigro-fuscis, fascia communi arcuata a costa anticarum ad marginem internum posticarum extendente rufo-aurantia, intus linea angusta argentea limbata, linea altera argentea submarginali; subtus ut supra sed fascia multo latiore, linea argentea absente sed macula in margine interno posita.

♀. Mari similis sed fascia latiore et in anticis magis arcuata; subtus sicut supra.

Hab. COLOMBIA, Bogota.

This is a northern form of *C. cacias*, Hew., differing from it in the more arcuate fascia, which is specially noticeable in the female. I have one pair only.

CHARIS DUKINFIELDIA. (Plate XXII, fig. 3.)

Charis dukinfieldia, Schaus, Proc. U. S. Nat. Mus. xxiv, p. 401 (1902).

A figure of this species is given from the specimen from Parana, presented by Mr. Schaus to the British Museum.

MONETHE MOLIONE, sp. n. (Plate XXII, fig. 4, ♂.)

♂. Alis ochraceis, anticis costa, apice late, et margine externo nigris, macula elongata transversa angulum apicalem versus quoque ochracea; posticis margine externo nigro; subtus ut supra, sed posticis costa, linea angusta breve basali et altera margini interno subparalleli, nigris; corpore supra ochraceo, nigro lineato; pedibus nigris.

Hab. E. PERU, Pebas (*Hahnel, ex Staudinger*).

A very fine species, differing from *M. albertus*, Feld., and its allies in the large extent of the ochreous colour on both wings. The antennæ are long and very gradually thickened towards the apex, so that there is no distinct club. One specimen.

Cricosoma asclepia. (Plate XXII, fig. 5, ♂.)

Symmachia asclepia, Hew., Equat. Lep. p. 51; Exot. Butt. v. Erycinidæ, f. 9.

♂. Alis læte aurantiis, costa anticarum et marginibus externis maculis variis nigrescentibus, iis in costa transversis et in cellulam extendentibus; subtus fere sicut supra sed costa anticarum et marginibus externis pallidioribus, maculis nigrescentibus ad basin extendentibus.

Hab. Ecuador, Curarai; E. Peru, Sarayacu (*Buckley*).

Hewitson's type of this insect is in a very worn condition, and it is scarcely re-cognizable from his figure. I therefore take the opportunity of re-describing the species from a better specimen in my own collection. *C. asclepia*, Hew., is a close ally of *C. xypete*, Hew.; the type of the former is from Curarai.

Cricosoma irroratum, sp. n. (Plate XXII, fig. 6, ♂.)

♂. Alis pallide fuscis, squamis sparse et maculis parvis obscuris dense vestitis, iis ad margines externos flavo circumcinctis; subtus flavis, maculis obscuris sicut in pagina superiore.

Hab. British Guiana, Carimang River (*Whitely*).

In general colour this species somewhat resembles *C. calligraphum*, Hew., but it has less pointed wings, and it is possible that the insect is not rightly placed in the genus *Cricosoma*.

Mesene iasis, sp. n. (Plate XXII, fig. 7, ♂.)

♂. Alis nigris cyaneo tinctis, fascia lata infra et ultra cellulam anticarum fere ad medium marginis interni posticarum extensa coccinea; subtus nigris læte cyaneo lavatis, anticis macula elongata in margine interno ochracea.

Hab. E. Peru, Sarayacu (*Buckley*).

A single male, closely resembling *M. sagaris*, Cram., but larger and blacker, and showing a brilliant blue lustre both above and beneath. The common band on the upper-side is red, instead of being orange. The body appears to want the ochreous band so conspicuous in the male of *M. sagaris*.

Mesene eanes, sp. n. (Plate XXII, fig. 8, ♂.)

♂. Alis nigris, anticis litura magna subtriangulari basali a cellula ad marginem internum extendente, posticis altera discali oblonga, coccineis; subtus pallide fuscis basin versus ochrascentibus, maculis parvis obscuris et griseis dense notatis ; corpore supra nigro, coccineo late cincto.

Hab. LOWER AMAZONS, Santarem (*H. H. Smith*).

Closely allied to *M. debilis*, Bates, from the Tapajos, but differently shaped, and with the patches on the upperside of both wings red. One specimen.

LASAIA MERITA, sp. n. (Plate XXII, fig. 9, ♂.)

♂. Alis glauco-viridibus, anticis lineis angustis transversis in area costali, fasciis duabus submarginalibus exterioribus ad costam latioribus, et margine externo anguste, nigris ; posticis punctis in serie submarginali et margine exteriore anguste quoque nigris ; subtus griseis, maculis marginem externum versus sicut supra, anticis dimidio basali pallide fuscis lineis transversis obscure notatis, posticis dimidio basali lineis obscuris reticulatis ; ciliis nigris et albis.

Hab. BOLIVIA, Coroico, 6,500 ft. (*Garlepp*), Chairo (*Buckley*).

This is a form of the very variable and widely distributed *L. meris*, Cram., but the wings are less spotted, both above and beneath, the basal half of the under-side is more reticulate, and the distal portion (the apical angle of the primaries excepted) is principally grey. Three specimens, two of which were sent me under the MS. name of *L. merita* by Dr. Staudinger.

LASAIA OILEUS, sp. n. (Plate XXII, figs. 10, ♂; 11, ♀.)

♂. Alis pallide fuscis, punctis obscuris dense notatis, marginibus externis (præsertim in posticis) argenteo-cæruleo irregulariter notatis, anticis punctis duobus in costam ultra cellulam albis ; subtus fuscis, griseo et albo dense variegatis ; ciliis alterne fuscis et albis ; antennis albo annulatis.

♀. Mari similis, sed brunnescentiore, magis maculato et colore metallico fere obsoleto ; subtus alis brunneis albo variegatis.

Hab. PARAGUAY (*Perrens*).

The above description is taken from two males and one female from Paraguay, and I have another male labelled Cayenne, but this locality is probably incorrect. *L. oileus* seems to agree sufficiently well with *L. mœris*, Cram., to be included in the same genus, though it is much smaller than any of the other described species. It is also somewhat like *Calydna cathria*, Doubl. (= *C. micra*, Bates), from the Amazons.

LEMONIAS ANNULIFERA, sp. n. (Plate XXII, fig. 12, ♂.)

♂. Alis fuscis, anticis annulis tribus in cellula et duabus infra eas cæruleo-albis; posticis maculis obscurioribus tribus, una in costa, duabus in cellula, margine externo late albo; subtus ut supra sed pallidioribus, anticis annulis quinque et posticis annulis sex rufo-brunneis cæruleo circumcinctis.

Hab. BRITISH GUIANA, Quonga (*Whitely*).

This species is a close ally of *L. leucocyana*, Hübn., but may easily be distinguished by the annulated base of the wings.

LEMONIAS MÆON, sp. n. (Plate XXII, fig. 13, ♂.)

♂. Alis rufo-fulvis, lineis brevibus dispersis transversis, punctis marginalibus in serie fere obsoleta, nigris, anticis (nisi margine interno) brunneo lavato, fascia indistincta submarginali obscuriore; subtus cinereis, marginibus externis late obscurioribus, maculis transversis nigris sicut in pagina superiore, maculis indistinctis in serie submarginali cinereis, in posticis nigro pupillatis; ciliis anticarum albo maculatis; corpore supra rufo-fulvo.

Hab. W. COLOMBIA, San Pablo, Rio San Juan (*ex Staudinger*).

A single example. Nearly allied to *L. galena*, Bates, from the Amazons, but differing in having the fore-wings, except along the inner margin, much darker; the narrow whitish marginal line is absent. Beneath, the primaries are cinereous, instead of ferruginous, and the black submarginal spots on the hind-wings are less conspicuous and farther from the margin.

L. idmon, S. and G., from Chiriqui, is also very similar, but has the ground colour of the fore-wings of a uniform tint, as in *L. galena*.

LEMONIAS MÆONOIDES, sp. n. (Plate XXII, fig. 14, ♂.)

♂. *L. mæoni* similis, sed maculis discalibus posticarum rotundatis et punctis submarginalibus magis obviis; subtus pallidioribus.

Hab. BRITISH GUIANA, Bergen-Daal (*Ellacombe*).

A single specimen, differing from *L. mæon* as above described.

LEMONIAS ELPINICE, sp. n. (Plate XXIII, fig. 1, ♂.)

♂. Alis fuscis, anticis lineis angustissimis transversis cærulescentibus, posticis dimidio distali aurantiis; subtus anticis pallidioribus, dimidio basali lineis irregularibus transversis cærulescentibus, dimidio distali colore eodem variegato, margine externo punctis nigrescentibus; posticis albis, costa late cærulescente, lineolis et punctis fuscis notatis; ciliis aurantiis.

Hab. COLOMBIA, Fusagusuga (*Chapman*).

On the upper-side the secondaries of this species are broadly marked with orange as in *L. florus*, Staud., also from Colombia; but on the under-side the general colour resembles that of *L. leucocyana*, Hübn., *L. violacea*, Butl., and others. One specimen.

LEMONIAS MARTIA, sp. n. (Plate XXIII, fig. 2, ♂.)

♂. Alis anticis cæruleo-violaceis, ad basin et in margine interno brunneo-ferrugineis, dimidio basali nigro maculato, costa, margine externo et fascia interrupta submarginali quoque nigris; posticis brunneo-ferrugineis, dimidio basali lineolis transversis et margine externo nigris, fascia lata curvata ab angulum analem fere ad apicem extendente rufo-aurantia; subtus pallide griseo-cæruleis, marginibus externis late fusco suffusis, bitriente basali lineolis transversis nigris, anticis maculis in serie submarginali (iis ad apicem et ad angulum analem magis distinctis) nigrescentibus, posticis maculis elongatis submarginalibus nigris cæruleo circumcinctis; ciliis anticarum nigris et albis.

Hab. COLOMBIA, San Pablo, Rio San Juan (*ex Staudinger*).

Very like *L. florus*, Staud., but much larger, being of the same size as *L. staudingeri*. The hind-wings have the orange band of a richer colour and narrower, the ferruginous marking on the primaries extends well into the cell, and the submarginal band of these wings is broader towards the apex. It is somewhat remarkable that these three insects all inhabit the same very humid district on the Pacific slope. One specimen.

LEMONIAS STAUDINGERI, sp. n.

Lemonias sudias, Staud., Exot. Schmett, p. 259, t. 92 (♂) (*nec Hew.*).

♂. Alis cæruleo-violaceis, anticis maculis transversis in dimidio basali, costa, apice et fascia submarginali, posticis area costali maculis quinque transeuntibus, nigris; subtus pallide fuscis, dimidio basali nigro maculatis, posticis griseo lavatis, fascia irregulari submarginali obscuriore, maculis elongatis ultra eam nigris.

Hab. COLOMBIA, San Pablo, Rio San Juan (*ex Staudinger*).

The insect figured by Dr. Staudinger as *L. sudias*, Hew., of which he sent me an example, was wrongly identified and requires a new name. Hewitson's species is common in the low country of Central America, extending from southern Mexico to the republic of Honduras, the male being very different from that of the Colombian insect. *L. staudingeri* is considerably larger than *L. sudias*, the ground colour of the upper surface of the male is entirely violaceous, and the orange border of the secondaries is absent.

LEMONIAS PIRENE, sp. n. (Plate XXIII, fig. 3, ♂.)

♂. Alis anticis nigro-fuscis, litura transversa magna ultra cellulam et linea submarginali cæruleis, area marginis interni late aurantia, maculis transversis nigris notata; posticis aurantiis nigro limbatis, ad apicem (et interdum in area discali) nigro punctatis; subtus griseo-cæruleis nigro maculatis, punctis elongatis in serie submarginali griseo circumcinctis; ciliis nigris et albis.

Hab. ECUADOR, Rio Napo (*Whitely*).

This is a form of *L. rhesa*, Hew., from the Amazons, but differs from it in the less extension of the orange colour of the primaries and the much larger blue patch beyond the cell. On the upper-side it is not unlike *Charis amalfreda*, Staud., from Pebas, which, however, is a much smaller insect. Two specimens.

LEMONIAS NOMIA, sp. n.

Lemonias thara, Hew., var., Exot. Butt. v. Lemonias, t. 5, ff. 41, 42 (♂, ♀).

Hab. GUIANA, Aunai, Essequibo River (*Whitely*), Cayenne (*mus. G. & S.*).

The Guiana form of the Amazonian *L. thara*, Hew. (= *L. melia*, Bates), requires a separate name. Hewitson described it as a variety, but a comparison of his figures of the male of each shows that they should be treated as distinct. *L. nomia* may be readily distinguished from *L. thara* by the fulvous colour of the upper-side, and also by having an additional band of elongate black spots crossing the wings beyond the cell.

LEMONIAS FANNIA, sp. n. (Plate XXIII, fig. 4, ♂.)

♂. Alis nigro-fuscis, anticis ad angulum analem anguste cæruleis, posticis dimidio distali pallide cæruleis maculas duo nigro-fuscas ad apicem includente; subtus pallidioribus, lineis obscurioribus, transversis communibus ad basin frequenter interruptis; posticis maculis obscuris in serie submarginali ad apicem et ad angulum analem majoribus.

Hab. BRITISH GUIANA, Aunai, Essequibo River (*Whitely*).

A single rather worn specimen is all I have seen of this species. It appears to be very distinct from any known member of the genus, and is perhaps most nearly allied to *L. florus*, Staud., and *L. lasthenes*, Hew.

LEMONIAS (?) AXENUS. (Plate XXIII, fig. 5, ♀.)

Lemonias axenus, Hew., Exot. Butt. v. Lemonias, etc., f. 7 (♂).

The male only of this species was described and figured by Hewitson, and no locality was given. I have two males of it from Chapada, Matto Grosso, and two females from Estancia La Gama, Venado Tuerto, in the province of Santa Fé, La Plata; these latter, one of which is here figured, differ in having all the markings of the upperside straw colour. It probably does not belong to the genus *Lemonias*. *Bæotis bifasciata*, Mengel, from Paraguay,* is no doubt a nearly allied form, but has fewer spots on the outer margin.

APODEMIA GLAPHYRA.

Anatole glaphyra, Doubl. and Hew., Gen. Diurn. Lep. ii, t. 71, f. 3.

Anatole modesta, Mengel, Ent. News, 1902, p. 176, t. 8, ff. 12.

There does not appear to be any reason for separating the Paraguayan insect described and figured by Mr. Mengel from *A. glaphyra*, Doubl. and Hew. Possibly the American author was not acquainted with the figure of the latter.

* "Ent. News," 1902, p. 177, t. 8, f. 4.

APODEMIA MULTIPLAGA. (Plate XXIII, fig. 6.)

Apodemia multiplaga, Schaus, Proc. U. S. Nat. Mus. xxiv, p. 404 (1902).

The specimen figured is from Rinconada, Mexico, given by Mr. Schaus to the British Museum.

NYMPHIDIUM GRANDE, sp. n. (Plate XXIII, fig. 7, ♀.)

♀. Alis fuscis, fascia latissima a cellulæ finem anticarum ad medium marginis interni posticarum extendente albida, linea communi ferruginea submarginali exteriore, anticis macula elongata costali venis divisa apicem versus, aliisque minoribus plus minusve, lunulatis in serie angulum analem posticarum extendentibus, serie altera margini exteriori propiore (in anticis fere obsoleta), albidis; subtus pallidioribus maculis omnibus albidis majoribus; ciliis posticarum albis et nigris.

Hab. COLOMBIA (*Wheeler*).

This fine species is even larger than *N. nycteus*, G. and S., from Chiriqui, but in colour it approaches the female of *N. mycone*, Hew. It is probable that the male is without the broad median band. A single specimen.

ARICORIS PLAGIARIA. (Plate XXIII, fig. 8, ♀.)

Aricoris plagiaria, Grose-Smith, Rhop. Exot. iii, Erycinidæ, p. 4, t. 1, ff. 12, 13 (♂).

♀. Alis nigro-fuscis, anticis fascia a costæ medio fere ad angulum analem extensa sordide alba, anticis ad basin late posticisque (nisi in area costali et margine externo) cæruleo lavatis, posticis ad marginem externum venis, et lineis inter venas, obscuris notatis; subtus pallide fuscis, anticis fascia sicut supra, area cellulari indistincte nigro maculata, posticis grisescentioribus maculis variis nigris, ad margines elongatis, anticis ad basin et posticis in area basali ochraceo notatis.

Hab. E. PERU, Sarayacu (*Buckley*, ♂, ♀); AMAZONS, Santa Rosa (*Stuart*, ♂).

Mr. Grose-Smith described this species from two males supposed to be from Buckley's collection. We have both sexes from Sarayacu, and the female, which we now take the opportunity of figuring, approaches the same sex of *A. serica*, Westw., but is considerably larger, the fascia, too, on the primaries is whitish and more oblique, and the undersurface is spotted.

ARICORIS HIPPOCRATE, sp. n. (Plate XXIII, fig. 9, ♀.)

♀. Alis nigrescentibus, anticis fascia obliqua a costæ medio fere ad angulum analem extensa sordide alba; subtus sicut supra, sed posticis margine externo angulum analem versus obsolete albis; ciliis posticarum albo-notatis.

Hab. ECUADOR, Rio Napo (*Whitely*).

The above description is taken from a single female much resembling that sex of *A. lagus*, Cram.; but it is blacker, the band on the primaries is whitish, and the secondaries are without definite white spots on the outer margin beneath; the cilia of the hind-wings, too, are spotted with white. *A. hippocrate* is not unlike the female of *A. phædon*, but the band of the fore-wings is whitish instead of orange, and the secondaries are differently marked on the underside.

ARICORIS PHÆDON, sp. n.

♂. Alis nigrescentibus læte purpureo tinctis; subtus nitente fuscis, inter venas ad basin et ad margines externos pallide ochraceis.

♀. Alis nigrescentibus, anticis fascia lata obliqua apicem versus ochracea; subtus fere ut supra sed posticis ad marginem externum albescentibus.

Hab. ECUADOR, Rio Napo (*Whitely*).

A close ally of *A. velutina*, Butl., from the Upper Amazons, but smaller, the male with less elongate wings, and the lustre of the upper-side is purple instead of blue, as in *A. velutina*, and extends over the whole surface. Five specimens.

ARICORIS MAIA, sp. n. (Plate XXIII, fig. 10, ♂.)

♂. Alis nigro-fuscis, anticis squamis sparsis cæruleis inter venas maculas formantibus, ea angulum analem versus elongata; posticis (nisi area costali et venis omnibus) cæruleis; subtus fuscis, ad angulum analem anticarum et posticarum cæruleo indistincte maculatis.

Hab. W. COLOMBIA, San Pablo, Rio San Juan (*ex Staudinger*).

Very near *Aricoris alcmæon*, Hew., from Ecuador, but differs in having the blue scales on the primaries forming scattered elongate spots towards the outer, instead of occupying a broad space along the inner, margin. Three specimens.

ARICORIS HELICE, sp. n.

Aricoris cruentata, Staud., Exot. Schmett., p. 264, t. 93 (♀ nec ♂.)

The insect figured by Staudinger as the female of *A. cruentata*, Butl., was wrongly identified, and a new name is required for it. I have both sexes of *A. cruentata*, from Ega, where the types of the latter were obtained. Of *A. helice* I received two females from the Amazons, from Staudinger. It appears to be allied to *A. heliodora*, Staud.

ARICORIS (?) TERIAS, sp. n. (Plate XXIII, fig. 11, ♀.)

♀. Alis ochraceis, anticis apice et margine externo (intus valde sinuato, maculam elongatam includente) fuscis, posticis fusco limbatis; subtus anticis ochraceis costa et margine externo fuscescentibus et albo lineatis, posticis fuscis albo striatis.

Hab. PARAGUAY.

Of this extraordinary insect, which is very like a *Terias* on the upper-side, I possess a single female only. It is unfortunately imperfect, the legs and part of the antennæ being wanting, and its generic position in the absence of the male is doubtful. On the under-side it somewhat resembles the female of *A. cepha*, Feld., except that it is much more strongly streaked with white.

Explanation of Plates XX—XXIII.

Plate XX.

Fig. 1. *Mesosemia phace*, ♂.
2. „ *thera*, ♂.
3. „ *orbona*, ♂.
4. *Cremna malis*, ♂.
5. *Hyphilaria orsedice*, ♀.
6. *Eurygona licinia*, ♀.
7. „ *authe*, ♂.
8. „ *rhodogyne*, ♂.
9. „ „ ♀.
10. „ *tarinta*, ♂.
11. „ *fabia*, ♂.
12. *Mesenopsis pulchella*, ♀.
13. *Chamælimnas pansa*, ♂.
14. „ *joviana*, ♂.

Plate XXI.

Fig. 1. *Siseme pedias*, ♂.
2. *Riodina* (?) *theodora*, ♂.
3. „ „ ♀.
4. „ (?) *albofasciata*, ♂.
5. *Anteros carus*, ♂.
6. *Emesis eurydice*, ♂.
7. „ „ ♀.
8. „ *neemias*, ♂.
9. „ „ ♀.
10. *Symmachia progne*, ♂.
11. „ *hippodice*, ♀.
12. *Caria smaragdina*, ♂.
13. „ *marsyas*, ♂.
14. „ „ ♀.

Plate XXII.

Fig. 1. *Charis arcuata*, ♂.
2. ,, ,, ♀.
3. ,, *dukinfieldia*.
4. *Monethe molione*, ♂.
5. *Cricosoma asclepia*, ♂.
6. ,, *irroratum*, ♂.
7. *Mesene iasis*, ♂.
8. ,, *canes*, ♂.
9. *Lasaia merita*, ♂.
10. ,, *oileus*, ♂.
11. ,, ,, ♀.
12. *Lemonias annulifera*, ♂.
13. ,, *mæon*, ♂.
14. ,, *mæonoides*, ♂.

Plate XXIII.

Fig. 1. *Lemonias elpinice*, ♂.
2. ,, *martia*, ♂.
3. ,, *pirene*, ♂.
4. ,, *fannia*, ♂.
5. ,, *axenus*, ♀.
6. *Apodemia multiplaga*.
7. *Nymphidium grande*, ♀.
8. *Aricoris plagiaria*, ♀.
9. ,, *hippocrate*, ♀.
10. ,, *maia*, ♂.
11. ,, (?) *terias*, ♀.

XXV. *Supplementary Note to a Paper entitled* Hymenoptera aculeata, *collected* by the Rev. ALFRED E. EATON, M.A., *in Madeira and Tenerife*, in the spring of 1902. By EDWARD SAUNDERS, F.R.S., F.L.S.

[Read November 18th, 1903.]

I REGRET to say that when I wrote the above paper I entirely overlooked an article by Professor Perez of Bordeaux, published in the Annales de la Société Ent. de France for 1894, in which he describes the new species of Hymenoptera taken in the "Voyage de M. Ch. Alluaud aux îles Canaries."—In this article I find the species which I have described under the name of *Podalirius canariensis* described as *Anthophora alluaudi*, to which of course *canariensis* must sink as a synonym.

It is curious that Professor Perez and myself should have made almost identical remarks about the black variety of *Bombus terrestris* with the white tail, both suggesting that it probably represents what Brullé quotes as *B. soroensis.* I can only apologize to Professor Perez for unwittingly appropriating his observation.

It may be worth mentioning that *Alluaudi*, Per., is omitted by Friese in his monograph of the Genus *Podalirius* 1897.

XXVI. *Protective Coloration in its relation to Mimicry, Common Warning Colours, and Sexual Selection.*

By Abbott H. Thayer. Communicated by Prof. Edward B. Poulton, M.A., D.Sc., F.R.S.

[Read October 21st, 1903.]

The following paper records an artist's examination of the principles of butterflies' coloration, and shows how the results tend to restrict the fields heretofore claimed for Mimicry and Common Warning Colours, and to place them on a basis of Concealing Coloration. It contains also several arguments tending to restrict the hypothesis of Sexual Selection.

It does not attack the obvious fact that every possible form of advantageous adaptation must somewhere exist. It is obvious to its writer that there must be unpalatability accompanied by Warning Coloration,—as apparently in the cases of the Hornbills and Wood Hoopoes reported by Mr. Frank Finn, and probably in many Corvidæ, for instance,—and equally plain that there must be Mimicry, both Batesian and Müllerian. Yet every case demands special examination, for the reasons that I shall show herein; and no apparent conspicuousness of coloration is sure to prove such when examined on the principles established in this article.

First, it seems necessary to establish the artist's claim to be *the* judge of all matters of visibility, and the effect, upon the mind, of all patterns, designs, and colours. If even the artist is limited in this, his own field, what hope is there for others? Fullest wisdom on the part of naturalists would make them adjourn all matters of animals' appearance to us artists, just as any wise ruler gathers about him the most highly specialized minds, to widen, through them, his own scope.

An artist reads design wherever it occurs, just as a composer reads a score, without playing it, or hearing it. He perceives that every juxtaposition of spots, or shapes, or colours, or of dark and light, and of degrees of these, is just so much representation of some structure, whether the representation be accidental or intentional. He sees at a glance in marble-veins, the grain of wood, etc., not *imaginary*, but *actual* representations of natural objects and perspectives, and weighs the correctness of these. Nature has evolved actual Art on the bodies of animals, and only an artist can read it. When he examines the colour and colour-pattern of the animal kingdom, he sees that zoologists are hopelessly off the track in their general conception as to which coloration is to be called conspicuous, *i.e.* rendering its wearer so. *Any* coloration or pattern would be conspicuous *somewhere*, and Nature cannot prevent animals from straying beyond the environments that would most perfectly harmonize with their colour and pattern. But let us take the broadest possible survey, and we cannot doubt that most animals wear on their coats pictures of their habitat. As I before pointed out, even the under-sides of the wings and tails of hawks bear the general twig-patterns so common on forest birds, as if Nature found it worth while to efface the white silhouette their wings' under-sides would make when they extended them while perching. We see how completely such patterns (when couched, of course, as they always are, in the effacive gradation) *do* help to obliterate a partridge, grouse, woodcock, hare, or any other of almost all the species in every order; since they prove to be actual *animated pictures* of their environment. As I said before, in my paper on so-called "Banner-marks,"* these forest-like patterns are found on forest creatures, and not on desert creatures, or ocean creatures. Sand-birds are usually marked in longitudinal, delicate patterns, very like those the sand assumes when seen at the same angle at which one observes the birds themselves. Tigers and zebras are resolved into pictures of tall, strong flags, grasses, and bamboos, while the lion is a picture of the desert. (It will some day be plainly understood that the effacive gradation is the essence of the success of these patterns. Were they not arranged to compose one perfect counter-gradation, from top-dark to under-white, they would appear merely as what artists call "lines of quantity," like the hoops of a barrel, *emphasizing* the rotundity, not effacing it.)

Now, let me prove that *any* pattern would somewhere be

* 'The Auk,' vol. xvii, 1900, p. 108.

conspicuous. I once saw a skunk (*Mephitis americanus*) crossing a snow-field near at hand. This animal is black (with the slight amount of effacive gradation found even in black animals), with a large white pattern on top. He was totally unrecognizable, because his white against the snow was undistinguishable. His black was left to form a most grotesque silhouette. Had he been against black, it would have been this black part that disappeared, and one would have seen only an unrecognizable, moving *white* thing. Naturalists' lack of understanding this principle's immense import has gone far to strengthen the present Mimicry and Warning-Colour theories, which may prove to have been evolved, largely, in the effort to explain supposed conspicuousness, where such did not exist. A tiger in the desert sands, though his gradation would still, more or less, efface his solidity, would nevertheless show his *pattern*. His bamboo-vistas would be plainly a failure against the sand. The lion in the bamboos would, when not covered by them, tend to present an unaccountable *flat silhouette*,—a lion-shaped section of desert-landscape, out of place. On the same principle, a white patch on striped cloth or a striped patch on white cloth would be conspicuous. We see on all hands evidence that Nature cannot help moving forward to the utmost completeness of protective devices;—that, in fact, she cannot grope or blunder. A marvellous, turquoise, emerald-green and red-coral-marked Mediterranean fish looks conspicuous on the fishmonger's slab; but follow him to the sun-lit ocean grottos which he inhabits, and of which he is a wonderful picture! No, the whole use of the word *conspicuous* is mainly born of the zoologist's lacking the artist's sight.

Let us now turn to the field in which the naturalists are most conspicuously at fault, that of the butterflies and moths. One glance of an artist,—that is, of an artist accustomed to lifelong looking at vegetation and butterfly-life,—at a world's collection of butterflies, shows him that they are mainly either flying pictures of various combinations of flowers and their backgrounds, pictures of the *shadow under foliage*, with delicate patterns of vegetation or flowers drawn across it, as, for instance, in the North American *Papilo polydamas*, and the dark *Satyrinæ*,—or that they are wonderful representations of flowers themselves, as in the *Pierinæ* (all but their usually narrow dark border), many of which even bear a representation of six stamens (counting their two antennæ), and, what is very common in butterflies, a wonderfully perfect shading on that part of the wings next the body, grading toward it in a way that makes it appear like the bottom of a concavity. My photographs of *Limenitis* (*Basilarchia*) *arthemis* show the flower-form, the appearance of the rim of its cup being carried across the butterfly, as in the species of *Precis* which wear a large, bright semicircular bar, cutting them as the skunk's white cuts him.

I should have placed at the beginning this axiom: *Only unshiny, bright monochrome is intrinsically a revealing coloration.* As soon as patterns begin, obliteration of the wearer begins, as shown in the case of the skunk. Nature does not blunder, and Natural Selection would evolve the monochrome, instead of a patterned surface, were simple conspicuousness her aim. Also, she would, if she used patterns mainly as badges for identification of the wearer, have omitted the delicate subtilties that go to make up the patterns of most butterflies. Let us apply the skunk-lesson to the many dark butterflies which wear more or less bright, clean-cut patterns. As they rest on flowers, their *dark* matches very closely the shadow-depths *between* the flowers, especially when seen from above or outside the flower-mass; and, in fact, the delicate general gradation and *faint* detail existing even in these parts, appear to an artist to represent the near vistas under the flowers; while the bright pattern is likely to echo the notes of the flowers themselves. Only artists understand this colour-echoing. The artist's sight is conscious, as it ranges over a scene, of every recurrence of each colour-note. This colour-note, wherever seen, seeks, as it were, *its own*, in his brain,—just as a violin-string rings when its note is sung. In a book we are writing on protective coloration, my son and I shall show larvæ that resemble *things* (already well known), larvæ that disappear, larvæ that appear to be extensions of leaves; and larvæ with many other startling and dissimilar concealment-schemes. What wonder if in butterflies there prove to be as many different forms of concealment? It is impossible to lay too much stress on the fact that all patterns which look so striking and bizarre, when *off* duty, are, when *on* duty, up to the moment of detection, precisely the workers of the magical illusion that conceals. It is inconceivable that birds should more easily recognize minute patterns than colour, when we realize that the perfect colour-adaptation of innumerable forms of life, from mammals to larvæ, proves *that the lower animals see colour* (since otherwise such adaptation would not be necessary for their concealment). In each form of protective coloration there exist cases so pronounced as to leave no doubt of their use. Each of these has been assumed to be mimicked, or, at least, echoed, for some reason, by other species than the one in which it is most perfect. Let us look at the dead-leaf pattern, *i.e.* the pattern that represents, in the most minute degree, substance of the *colour and thickness of dead leaves*, and lying as near the ground as dead leaves usually lie. This pattern is marvellously perfect on the Copperhead snake (*Trigonocephalus contortrix*), on some Boas, on that form of domestic cat which has the most tiger-cat-like black and grey pattern (as well as, in fact, on tiger-cats themselves), and on several Sphinx moths. Of course, when this leaf-representation occurs on the rotundity of animals' bodies, as in the cats or snakes, it exists only in co-operation with the regular effacive gradation, but on the flat plane of a Sphinx's upper-wing-surface it has and needs no such co-operation. In the Sphinx-moth photograph which I have sent Professor Poulton, this reproduction of thin material casting a shadow on the surface it lies on is past all mistaking. This artifice is present on many moths, and its elements are traceable in such butterfly genera as *Vanessa*, *Grapta*, and many others. To know at what point in the long series of somewhat similarly marked species the original function has ceased, would require impossible study.

While it is plain that a hundred needs may each be represented in the pattern- and colour-schemes of animals, it is also plain to an artist's eye that in most butterflies all visible details of colour, pattern, and form are essential parts of the representation of flower-scenery. And it is surely conceivable that, in a certain region, one particular form of flower-scenery-representation may furnish such advantages to butterflies as to cause many widely-separated species to become modified till they wear a common aspect; and it is conceivable also that there would be one common form of wing which would best lend itself to this scheme. Surely we do not know enough of the habits of these insects or of the regions that may be their strongholds to feel sure that this hypothesis is absurd; and were it correct, it would complete a chain of seemingly perfect evidence.

After we see how inexplicable it would be if butterflies did *not* either resemble flowers, or represent some portion of flower-scenery, why should we, in view of the endless variety of flower-forms, stick at any form or pattern in the butterfly that frequents them? One must constantly remember that *any* pattern is less conspicuous than bright, unshiny monochrome. Therefore, "*conspicuous*" is not the right word for the character of patterned butterflies.

Now since the *Ithomiinæ*, *Heliconinæ*, and *Danainæ*, such for instance as the similarly coloured cow-red and chrome-yellow, black-bordered *Melinæa*, *Heliconius*, and *Lycorea* (and equally, in other colour-schemes, all the other so-called mimicking groups), are in every way completely painted by Nature into these three tones,—the note of *shadow under vegetation* making their borders, which it occupies, coalesce with the shadow under the flowers, and disappear, while the red and chrome wonderfully reproduce the colours and patterns of such flowers as *Odontoglossum triumphans*, who shall say that it is not to this flower—which perhaps, by its abundance, dominates the region—that these cow-red and chrome-yellow butterflies owe their common appearance? Some such flower may be overwhelmingly attractive for its honey.

Perhaps the most conclusive of all our evidence is to be seen in the transparent winged members of these mimicry groups. *Dismorphia orise*, for instance, with its green transparencies enclosed in a pattern of the same velvety dark fuscous that I have already described. What conceivable artifice could offer greater opportunity for frequently remaining unnoticed amidst flowers and leaves?

These little green windows must of course allow any bright object to show through them, while the fuscous cuts the aspect to pieces by representing a shadow far below the insect. The very word *transparent* wrecks any theory of conspicuousness or adaptation suitable for a badge. Add to this the present belief that the transparency has been attained through selection, and ought not those who hold this theory to believe that concealment was obviously the goal of a *change toward invisibility?* It is hard to conceive of a better device for representing little green leaves than by these glossy green, leaf-shaped, and leaf-veined windows, bordered with imitation background, and ever ready to look like glossy leaves the moment they are extended over a bright flower or other bright object.

Professor Poulton has already noticed the efficacy of the imitation hole in the wing of *Grapta* (a device similar in effect to the gold dots on some pupæ).

During the writing of this article I have been learning that iridescence itself is an immense factor of concealment, far greater than I at first realized. I have lately had excellent opportunity to study several species of golden-brown butterflies with sheeny black tips spotted with white, and I begin to realize the wonderful power of this combination. The white dots *stand changeless*, while upon the black, in bright sunlight, faint rainbow sequences dissolve the *actually* flat wing-surface into liquid depths, apparently wholly detached both from the insect and from the white spots, which appear, as I before said, to be shiny points like dewdrops down in the spaces below the butterfly.

If butterflies were mimicking each other, Mr. Blandford's objection (Proceedings of the Entomological Society, 1897) that the resemblances would be hypertelic would seem true. Since an attempt on Nature's part to give common colours and patterns to a group of insects involves no need that any one of them shall have sharp delicate contours of spots, or have subtle gradations, these species would, if their object were to resemble each other in their colour and markings, stop short of such sharp contours, etc. On the other hand, if they are representing flowers or any organic *forms* instead of merely patterns, etc., *on* forms, they would profit by the utmost minute finish of every part of their design, since just this *finish*, this microscopically perfect smoothness and minuteness of detail is an essential characteristic of flowers and even of leaves.

Upon my hypothesis, the many "warning-colour" species that have dull-contoured spots instead of sharp ones, would seem (as they do to the supporters of Mimicry) to be species in process of adaptation, but *to the aspect of flowers*, instead of to that of each other.

As soon as the advocate of the Mimicry theories sees that to wear the region's prevailing pattern *tends to conceal*, his case looks bad; since we see throughout the animal kingdom common coloration, and often common form in widely separated orders, plainly accompanying common environment and habits. The Salmon's silver, grading upward into dusky, and downward to purest white, is identical with that of countless fish in many groups, and no one doubts that environment and habits are the cause. Among birds, *Emberiza miliaria*, *Anthus pratensis*, *Alauda arvensis*, and *Alauda arborea* are four species of three genera for all four of which *one* minutest colour-and-pattern-description would almost suffice; and the same colour-scheme and pattern with slight variations is found on a great many other species throughout the world, both of *Passeres* and even *Scolopacidæ* and *Gallinæ*, telling plainly of *life on the ground amidst grasses.* Among the *Scolopacidæ*, many females and young of the *Anatidæ*, and the *Laridæ*, Nature betrays, in the main, great lack of variety in design, easily accounted for by the lack of variety in the aspect of the environment. In a broad survey of the animal kingdom we perceive that everywhere the degree of colour-and-pattern difference between different members of an order, family, or genus keeps pace with the degree of variation in their environment's aspect.

Why may not the circumstances of a group of butterflies furnish them similar needs to wear a common livery, even if we cannot see the reason? Might they not tend also to have their *flavour* similarly affected by similar food? The Spruce Grouse (*Canachites canadensis*) is saturated with spruce flavour, and the world is full of such cases. Even the amazing similarity between members of these groups is no proof they may not, for reasons which we have not discovered, profit each by exactly the same form of concealing-coloration. It should be borne in mind that it is not a *flower* that these mimics evidently represent, but a certain combination of the flower's aspect with that of its surroundings. Hence there may be one best way to render this. Butterflies on wing are conspicuous, but are wonderfully protected by their jerky flight, which is completed by their wings being so large as necessarily to throw the body up and down at every movement. This latter advantage, attainable by no other conceivable means, may be a great factor in the whole matter. In flight they are doubtless practically safe, *i.e.* too troublesome a quarry to be seriously decimated. I send, for Professor Poulton to exhibit, photographs of a number of so-called conspicuous butterflies (dead specimens), the examples having been placed as far as possible without an unfair attempt to favour my argument, except in a few cases where the attempt is obvious. Surely they speak eloquently. Could they be seen in their colour-coalition, they would speak even more so. Any one *carefully* examining them will see that, in most cases, their dark parts are not distinguishable from the background (*although the average person, unaccustomed to analyze his sight, will, by recognizing the butterfly through its pattern, fancy he sees every part*).

The very keynote of the zoologist's error is psychological. One *sees* only what is out of place;—that which is *in place* is harmonious and unnoticed. We know how many of these concealed animals we *see*, but we do not dream of how many we *pass by*.

By tracing back to so palpable an example as our Sphinx-moth photograph, we see that the various combinations of sharp-edged markings with delicate blendings, exactly resembling the combination of patterns made by any sharp-edged fabric lying near a ground on which its shadow falls, do *represent* such combinations of form; so that we must believe that so elaborate and delicately complete a design would scarcely exist merely to identify a species as unpalatable. We find on several *Preces*, as on many *Vanessæ*, and *Papiliones*, very highly developed cases of the varied combinations of design worn by multitudes of the most obviously protected birds, and other animals;—slight variations of representation either of near objects casting a shadow on the background, as in the cats, snakes, and moths mentioned, or of near objects relieved against more distant, fainter ones, as in the European Woodcock's wings, many female Pheasants, and male Pheasants' tails, such as that of the Copper Pheasant. Doubtless each species has some particular headquarters, as it were,—some region which it fits best,—and unless we chance to study it in this very region, and at the most favourable season, we shall never witness the full operation of its protective colour-scheme. Mr. Frank M. Chapman has already pointed this out in a paper entitled "On the Birds of the island of Trinidad," published Feb. 1894, in the "Bulletin of the American Museum of Natural History," a paper containing some very prophetic glances into the future of protective coloration.

Apparently Nature has two main protective-colour schemes; one of which is closely imitative of the *very near environment* of the animal, and applicable to such species as sit close, and keep still, for concealment, as do the tree-toads, moths, goatsuckers, certain snakes, and, among butterflies, the species of *Grapta*. (The latter, at least, keep very still when resting, and expose at such times only the rock or bark representation on the under-side of their wings.) Among those butterflies, on the other hand, which have no pronounced habit of protecting themselves in this manner, Nature seems to have been forced to a bolder, more positive way by furnishing them an upper-side bearing a sort of conventionalized representation of the predominant details among which they are destined to move. Flowers, of course, must almost always be present. And always the notes of the conventionalization are *perfect*. Here is a most impressive argument, viz., so-called conspicuous butterflies have the body, head and all, exquisitely effacively graded. Would it not be absurd for Nature to spend energy in *effacing* the *body* while making the *wings conspicuous!* The multitude of species, the world over, whose main colour is largely the peculiar fuscous of shadow under vegetation, have in most cases not merely this shadow-colour, which so perfectly coalesces with the shadow and apparently vanishes from the insect, but also a system of exquisitely delicate perspectives *within* the patches of shadow-colour; as in the genus *Caligo* especially. I mean that *Caligo* is an exquisitely developed representation of the perspectives which an artist sees in peering down through the openings between the flowers. The parts of the world which I know well do not yet furnish me a clear vision why so many butterflies, such as several *Precis*, and *Anosia plexippus*, for instance, have these delicate perspectives done in golden brown instead of either shadow-colour or the more delicate flower-colour; but that this delicate design does represent perspective, and would be wasted if used for any attempt at conspicuousness, and that it is entirely akin to the perspectives rendered on perfect shadow-colour in so vast a number of species, is reason enough for trusting it to prove to be some form of concealment device; and on red flowers these species show surprisingly little. I myself suspect that butterflies of the *A. plexippus* type represent half a concave flower. Watch any butterfly of this class, or any of the classes in which the pattern, when the wings are open, arranges itself in amphitheatre-like semicircles of stripes or dots, etc. When such a butterfly rests with open wings on a flower, its head is at the centre, its antennæ form two stamens, and these semicircles seem to belong to half the flower of which its head is the centre. In several *Preces*, and many other butterflies, there is a general representation of something like a bunch of stamens casting their shadow deep under them in the flower's cavity. Usually a butterfly's upper-side has the exact colour-note characteristic of flowers and flower-scenery seen from right overhead (take, for example, *Papilio turnus*); while its under-side is a picture of such greater distance as would be seen from the *side* position necessary for beholding it when the wings are in their characteristic vertically-folded position; and this is the position from which enemies on neighbouring bushes would see it. So-called "conspicuous" butterflies have, in short, their upper-side designed with the full strength "values" of the nearest flowers looked into from above, and their under surfaces designed in notes more delicate, to counterfeit the distance, and a perfectly effacively-graded body. Their under-side is also more delicately finished, as if against the nearer inspection possible from neighbouring bushes. In fact, they wear every conceivable aspect to fit them into the background from each point of view, and make you think you see through them; or else, seen from above, to make you think, as in the case of the *Pierinæ*, that you see a flower itself. How can such a case call for a theory that is based on the hypothesis that they are conspicuous? One very important fact is that we have abundant proof that animals, including birds, have totally different sight from ours; and the existence of these patterns, etc., unless it can be denied that they even *tend* to efface, should be taken as proof that they sufficiently *succeed in effacing*. Otherwise, why are they there, when almost the whole animal kingdom does need concealment? A fox, a deer, a bear, a grouse, a turkey, or any small bird or mammal, may come almost to one's feet if one stay still, yet flee wildly on seeing any motion. Is not this sufficient proof that even if we were usually able to detect a Papilio when it is effacively situated, it is no sign that a *bird* could do so, if the insect kept its place?

Butterflies very often remain unobserved amidst flowers or other vegetation, by any one approaching (especially if he be not keenly in search of them) until once flushed. Of course our yellow and our white *Pierinæ* are pretty sure to catch the eye of the person approaching, if, as very commonly, they are found amidst dark vegetation. Yet their colours are precisely those of our most abundant flowers, just as they are our most abundant butterflies. This fact harmonizes with my argument that, however conspicuous in many situations, few animals are so in the place or region to which they doubtless owe their abundance. We see largely the overflow individuals *from* a concealing region *into* a less favouring one, and erroneously think of the species as typical of the region where it is visible to us. The gentle waving of the wings, so common among butterflies when they are feeding, seems plainly a protective imitation of the swaying of leaves and flowers in the breeze. Any one who has photographed outdoor vegetation knows how seldom it stands still.

To sum up, the general aspect of each animal's environment, throughout the animal kingdom, is found painted upon his coat, in such a way as to minimize his visibility, by making the beholder think he sees *through* him. How has it chanced that, while this fact has long been recognized, in a crude way, in many fields of zoology, it has remained essentially unnoticed in butterflies? Their most critical moments being passed upon flowers, the aspect of flowers combined in various proportions with the dark vistas down among them to the shadowy earth beneath, is exquisitely painted upon a vast majority of the world's butterflies, and on none more plainly than on those called conspicuous. The *Pierinæ* are mainly representations of flowers, though surrounded by a dark border which appears to belong to the shadows beneath it. On the other hand, there are a vast number of dark species which represent a portion of this shadow-under-vegetation, with bits of yellow vegetation, or of flowers, seen against it (these of course being rendered by the light markings). Could small, bright patterns on dark possibly be more perfect generalizations of small blossoms, buds, and stems?

I cite the following examples of the various colorations described.

Among the *Brassolinæ*, *Caligo eurylochus* is a marvel of wholly effacive design, so subtle as to make it absurd to suppose that Nature could be trying to have him conspicuous, or to use such delicate gradations for *identification*. *Caligo telamonius* and *Caligo demosthenes* are even more wonderful examples. *Cynthia* has a wonderful multiplicity of perspectives represented on its surface. Black and green *Nymphalinæ* are notably orchid-like in design. Their dark tips disappear, uniting with the shadows. *Dione* has good near-scenery on its upper-side, while the silver spots of its under-side appear in a side view to cut holes through its wings.

The Danaine butterfly *Limnas chrysippus* is covered with design which I am not prepared to interpret. Whether or not it is a flower, the four interior spots on the upper-side of the hind-wings may pass for stamens, as may also, of course, the antennæ; and whether or not the yellow-red ground counterfeits the colour of a flower, it represents a flower's form. *Caduga melaneus* has the colour-scheme of the skunk, with, of course, similar advantages.

The *Satyrinæ*, i. e. the dark ones, with strong, light patterns, have also the skunk's colour-principle. The *Danainæ*, *Ithomiinæ*, and *Heliconinæ* of South America, *Lycorea*, *Melinæa*, and *Heliconius*, for instance, display marvellous mutual resemblance, yet their likeness to *Odontoglossum triumphans*, when their dark tips are cut out by coalescing with the shadow, is most impressive.

Among the transparent *Satyrinæ* I may mention *Pierella nereis*. Unmistakably the whole surface of this insect (and likewise that of *Cithærias menander*) pictures a single flower.

Pierella astyoche represents flower-scenery (likewise *Pierella rhea*).

In the Oriental Danaine genus *Euplœa* we see exquisite shadow-perspective over which white spots relieve. The blue sheen, seldom or never occurring on both wings at once, additionally effaces.

In the *Lycænidæ* the exquisite *blue* species represent flower-cups, their black border of course detaching into the background.

The above examples I have chosen from all the families I have lately examined, which do not include the Skippers, or the great mass of *Papilionidæ*.

Let me add a few more reflections, all harmonious with my theory.

The act of flight tends to obliterate pattern, by the too quick substitution of one colour for another before the eye. A black-and-white butterfly, therefore, tends to look simply *grey* in flight.

It is not necessary to conceive that a bird must find the imitation flower on its proper plant, if the flower represent a type common in the neighbourhood. A vast majority of butterflies, including most members of Mimicry groups, have the common dark wing-tips of the *fuscous* colour which causes this portion to seem lacking from the butterfly, leaving the lighter-coloured parts to represent a more flower-like form. The white dots, so common on these black tips, surprisingly aid the representation of *space below the flower* by supplying the average sharp details that are to be seen down in the shady under-spaces,—little glints of light on twigs, etc.,—and their dark ground is rendered additionally transparent in appearance by iridescence.

If the foregoing arguments prove that the so-called Warning-colours commonly cited do not exist mainly to make their wearer conspicuous, it does not follow that they may not still serve *secondarily* as Warning-colours. When, for instance, they happen to fail to conceal, they may then serve to warn. My main point is that they first of all *conceal*. I suspect that the same principles apply to striped wasps and hornets, and many other insects called conspicuous. The yellow pattern unmistakably allies their appearance to the pollen-covered flower-interiors, making them far less conspicuous than an unmixed need to be seen would have them. Yet when seen, they may well profit by the pattern's recognizability.

Can any one, once shown, as I here show, that butterflies' patterns are *not* intrinsically the thing to make the wearer conspicuous, and shown that they *are* wonderful representations of the flower-scenery I describe, believe that Natural Selection has bungled, and *wasted* design of the most intricate kind? No, it is the beauty of the whole thing that *absolute fitness* is the goal of all changes by Natural Selection:—is, in fact, the only motive-power; changing all forms steadily toward itself.

We see, then, that butterflies are imitation flowers, or pictures of flower and background. This has escaped the eye of zoologists. They see that fish wear representations of under-water scenery; that forest animals are forest-patterned; beach animals, beach-patterned, etc., through the whole animal kingdom. But this other obvious case has escaped them. What other equal hope were there for insects that feed in full sunlight on masses of bright flowers?

In another paper I shall extend this criticism on the animal-conspicuousness-theory to the field of birds, and to strengthen the present paper by showing reasons to suspect that this theory is also not well intrenched in the bird part of its field, I append the following examples of the material to be used in the next paper.

Several of the most apparently conspicuous details of the exteriors of male birds can be shown to be such as would aid them to escape their enemies, and it is plain that simple life-preservation must for ever take precedence in the scale of importance of animals' needs. It is a mild statement to say that if the animal kingdom is to survive, females have greater need of the mere *existence* of mates than of any particular attribute in them, and if this statement is true, in all its immense import, it is among the most primitive needs of the male, that we should search for the explanation of his present attributes. All the nuptial developments, either of feathers or fleshy growths on beaks, etc., are much more rationally explicable along the simple lines of utility, than those of direct Sexual Selection, since it is apparent that every appendage, and every brilliancy of colour or costume adds to the formidableness of a warrior's aspect. One male conquers another partly through overawing him by superior splendour, and actually looking larger by means of his appendages, and when these gaudy-feathered braves flaunt before their females, why are they not presumably appealing to the females' love of a good fighter,—a sentiment so dominant, even in the human race,—and a simple sense of what constitutes a husband full-equipped for the rough work devolving on all feudal lords? In fact, from which end of the animal scale is this human sentiment traceable? If from the lower, as seems obvious, it must exist there. I believe that a material need for any existing thing will always be found to precede the spiritual, just as simply as a man must *catch* before he can *eat*, and will *then think*.

These arguments suggest, at least, that the nuptial superficial developments are for the direct use of the male who wears them. Let us look at the iridescent splendours of the Peacock family. An artist can see that whereas unshiny monochrome reveals its wearer to the utmost, iridescence, on the other hand, destroys visibility of surface, by substituting for a normal light-and-shade gradation, a totally new succession of colour and light notes, and above all one that changes its character with every movement of the bird, and every change of the beholder's standpoint. Add to this in the Peacock's case, for instance, his habitual resort to dense cover, and his gorgeous blue and green gleams, through its interstices, present merely the aspect of foliage-colours and hints of flower-masses. I feel sure that Peacock hunters will testify that this bird is hard to see when lying close.

Let us imagine an animal stalking this bird. He will look *wholly for motion*:—(such at least is the habit of all predatory creatures I know). Now it is the peculiar property of sheen, that it will *stand still* while the thing it is on *moves*. This means that a Peacock can move his brilliant neck, while its sheen *stands still*,—just as the gleam on the telegraph wires keeps pace with the railway train as one sees it from the window. And since this gleam of the bird's neck must be the most visible thing, the possibility of the neck's gliding along *behind* it, while *it stands still*, must often save the Peacock; (for the balance between the *evolved skill of the hunter* and the *evolved skill of the hunted* must always be close, and smallest advantages must often tip the scale). While the fore-part of the bird is beginning to move, unnoticed, his conspicuous tail, a yard behind his vital parts, catches the tiger's eye, in its earliest motion, and the tiger, seeing no other part so distinctly, springs at these long feathers, whose design is arranged for *conspicuousness in motion*.

These gorgeous birds will prove to be additionally concealed, not revealed, by their costumes. It is worth mentioning here, in connection with the Warning-Colour theory, that while Peacocks and Pheasants are *iridescent plumaged* birds, and would be called conspicuous in the highest degree, they are not *unpalatable*;—a fact that goes to strengthen my argument.

The next thing to be pointed out is that the general tendency of birds to wear longitudinal markings forward, and transverse ones aft, is an important factor of protection, especially in the case of the Pheasants and Peacocks, among whom this arrangement is very highly developed.

Any one who has tried to catch a snake in the grass will see at a glance why Nature tries to direct an enemy's attention behind the animal he is hunting. The snake for ever proves to be further on. It is hard to set one's foot far enough ahead as he moves, just as a wing-shot tends to shoot behind. Now Nature, realizing this, offers the enemy the utmost inducement to strike too far back. The strong cross-bars of the Reeves or the Copper Pheasant, while visually they cut the tail to pieces when it is still, are, as with the Peacock, by far the most visible part of the bird as soon as he moves. The reason of this is that in forward motion the longitudinal markings scarcely show, while the transverse ones become conspicuous. To prove this, any reader has only to blacken a few points an inch or so apart on a white cord, and then move the cord longitudinally, drawn tight across some aperture a few yards away, the cord being only visible where it crosses the aperture. He will see that its motion is distinguishable much farther off when the spots are in sight than when the *unmarked* cord is passing. The spots correspond to the tail-marks of the Pheasant, and the cord where it is *not* spotted represents the bird's longitudinal markings, *i. e.* his body-markings.

Before closing I beg to say that I do not mean that I am convinced that Mimicry and Common Warning Colours have no hand in these resemblances. I merely point out that the coloration of every individual of the "mimicking groups" of butterflies seems to be the best conceivable for effacing the aspect of its wearer, and also that it is perfectly conceivable that an external influence, like superabundance of certain very sweet flowers, could do the whole thing.

XXVII. *A brief discussion of A. H. Thayer's suggestions as to the meaning of colour and pattern in insect bionomics.* By Professor Edward B. Poulton, M.A., D.Sc., F.R.S., etc.

[Read October 21st, 1903.]

The discoverer of the meaning of the white under-sides of animals is entitled to a respectful hearing on any question of animal coloration. Furthermore, by his discovery, he has *proved* the benefits which the artist can confer on the naturalist, benefits which we naturalists are only too pleased to receive with gratitude. Our only difficulty is that so few artists seem disposed to consider our problems seriously. In order to be able to do so they must become, at least in spirit, naturalists as well as artists. The more numerous the men of creative power who can occupy, as Mr. Thayer does, the double standpoint, the better it will be for both domains. I therefore express my cordial agreement with Mr. Thayer's claim for the artist. I now propose to make a few comments upon the details of his interesting paper.

Every naturalist will agree that "any coloration or pattern would be conspicuous somewhere." We have often called attention to the fact that colour, pattern, shape, and attitude can only be understood in the natural environment. In fact, Mr. Thayer's own suggestions are, I think, most open to criticism when he is speaking of animals in countries he has not visited; when, for instance, he suggests the kind of concealment brought about by the stripes of the zebra. The lion is the zebra's great enemy, and in spite of their very different kind of colouring they are both adapted to the same general environment. The proportion of dark and light stripes, Francis Galton told us long ago, "is such as exactly to match the pale tint which arid ground possesses when seen by moonlight." So too the suggestion that the groups of similar South American butterflies have gained their resemblance by a common (syncryptic) likeness to some flower which they chiefly frequent would be more plausible if Mr. Thayer had studied them in their native haunts. I have asked Mr.

W. J. Kaye if he can remember the colour of the flowers visited by the black, cow-red, and yellow *Melinæa* group and its mimics in British Guiana, and he tells me they are either white or cream-coloured. Furthermore, Mr. Thayer treats this group as though it were uniform throughout tropical South America, disregarding the extraordinary changes of colour and pattern undergone by its representative species as we pass from one part of the Neotropical region to another. It is almost inconceivable that the following features, which are characteristic of whole groups in particular areas, can be due to the special flowers of those areas. The barred form of Central America, Colombia, and Venezuela, the black hind-wing of the Guianas, the bright yellow band of Eastern Brazil, the chestnut ground-colour of Ega on the Amazon, the black marked fulvous of the Napo River, passing on into the black forms with fulvous marks which constitute so large and characteristic a group in Ecuador, Peru, and Bolivia. In all these cases, nothing short of actual evidence on the spot can warrant the improbable suggestion that we are dealing with syncryptic groups, changing as the species of flowers are replaced by others in passing from one district to another.

Moreover, the theory of a syncryptic resemblance to flowers fails to account for certain broad characteristics of the groups in question, which on the other hand receive a ready explanation on the theory of common warning (synaposematic) coloration. These are (1) the predominance of forms belonging to the sub-families *Ithomiinæ*, with the allied *Danainæ*, and *Heliconinæ*, with the allied *Acræinæ*: (2) the fact that the predominant members of the chief groups in all the other tropical parts of the world are also contributed by the *Danainæ* and *Acræinæ*: (3) the flaunting flight, exposure at rest, and general want of alertness exhibited by the species of these sub-families as compared with others: (4) the more or less exact similarity of the pattern on the under to that on the upper surface, an arrangement comparatively rare in other Rhopalocera: (5) the experimental evidence of the unpalatability of these very sub-families to a large number of the enemies of insects.

Hence, until positive evidence is obtained on the spot in favour of Mr. Thayer's suggestion of syncryptic resemblance, I must regard such an interpretation as highly improbable, in the case of the groups hitherto explained by the Müllerian or Batesian theories. Of course close syncryptic resemblances between bark-like moths, lichen-like moths, grass-like and pine-needle-like larvæ, etc., have been known and admitted for many years.

Leaving the tropics we find a beautiful example of mimicry, Batesian, or more probably Müllerian, which has arisen in Mr. Thayer's own region, and has never wandered much beyond it, an example moreover very well known to the American artist-naturalist, viz. the resemblance of the northern *Limenitis* (*Basilarchia*) *archippus* (*misippus*) to the Danaine intruder from the tropical south, *Anosia plexippus*.

In this case there is little doubt that the Nymphaline has been actually drawn away from an ancestral appearance, much like that now borne by *L. arthemis*, explained by Mr. Thayer as promoting concealment by likeness to flower-masses and their background. If therefore Mr. Thayer is compelled to admit all this effect produced by the Danaine intruder in his own northern region, why should he not be ready to accept far more extended effects of the same kind in the crowded luxuriant life of the tropics?

I do not think that naturalists *have* so entirely misunderstood the principle of a cryptic pattern resembling some object in the environment combined with the effacive gradation so admirably explained by Mr. Thayer. His illustrations of tiger, lion, brilliantly-coloured fish, appearance of forest and shore birds, etc., all these are accepted at once and have been accepted for a long time. But naturalists have regarded the skunk as conspicuous, and I feel sure that Mr. Thayer will admit that it falls into another category from that which includes the forms just named. If concealment is brought about by the beautiful and delicately adjusted effacive gradation from upper dark to under white, as is now generally admitted, surely the "slight amount of effacive gradation" of the black skunk cannot be the same thing, or belong to the same class.

We must admit Mr. Thayer's main conclusion, that the forms we call conspicuous might be more conspicuous, and also accept the statement that a pattern is less conspicuous than the monochrome.

Admitting all Mr. Thayer says, at least of the butterflies he knows in the living state, and of the skunk, he cannot contend, I think, that his criticisms are powerful enough to transfer these examples into the bionomic group which contains the well-known examples of cryptic colouring—the skunk into the same category as the hare or ptarmigan, the under-side colouring of the Danaine butterflies, or the Nymphaline genus *Limenitis* (*Basilarchia*) into the same category with that of *Grapta* or *Kallima*, etc. I believe the whole of his criticism of warning colours can be accepted, and can be reconciled with the existing hypotheses. All animals with warning colours have enemies, all are liable to special attacks, in times of exceptional hunger, by enemies which would at other times neglect them. Even the skunk has special bird enemies. Provided such forms are easily seen and avoided by enemies which respect their special modes of defence, it is clearly an advantage to be as far as possible concealed from those which do not respect them. Hence conspicuousness, but, as Mr. Thayer tells us, something very far short of ideal conspicuousness. The black and white pattern of the skunk is probably glaring and conspicuous enough to all enemies near at hand, but at the immense distance covered by the long-range sight of a predaceous bird it may melt into an inconspicuous grey.

The same kind of interpretation probably holds for a cryptic element whenever it exists in the appearance of butterflies belonging to distasteful sub-families. It is the probable meaning of the transparency so widespread in the *Ithomiinæ*, although I do not think it is so effective in concealing as Mr. Thayer supposes. We must remember that many of these transparent species are excessively abundant, flying in clouds often made up of the individuals of several species and different genera. I quite recognize that the transparency may protect such forms against distant enemies, but I should be much surprised if the species of *Methona* and *Thyridia*, as well as *Dismorphia orise*, of which they are the models, are not rendered extremely conspicuous to enemies close at hand, by their numbers, habits of flight, and attitudes of rest. As Mr. Thayer has said, the black and white markings will melt into an elusive grey on a rapidly vibrating wing ; but the specially protected groups have developed a sailing flight which shows off the elements of pattern to perfection. When the body in such groups is effacively graded the explanation may well be that it is advantageous to direct attention to the wings rather than the vital parts; but it is precisely in these groups that the black body, and sometimes the head, are so often marked with white or red. A bright red or orange collar is found in several species. Furthermore, it must be remembered that the body being moved much less rapidly than the wings during flight is more easily seen. The black and white apical area of the fore-wing may help to conceal, as Mr. Thayer supposes, under certain conditions, but the numerous examples of injuries at this very spot, figured in Plates IX and XI of our Transactions for last year, strongly support the hypothesis that it is directive, and diverts the stroke of the attacking enemy from the body.

Apart from the suggested interpretation of mimetic resemblance, which I believe to be untenable, Mr. Thayer's suggestions supplement and complete rather than oppose existing hypotheses. The words he uses of the wasp may in fact be employed of the skunk, and the well-known distasteful Rhopalocerous groups, etc. The colours may not be conspicuous to enemies at a great distance, "yet when seen they may well profit by the pattern's recognizability." We have rather insisted on this latter fact and its advantage, and Mr. Thayer has done us good service in calling attention to the other aspect of the appearance.

Ideas not dissimilar to those of Mr. Thayer's upon warning colours have for some time crossed my mind. Thus last year I suggested as regards the abundant, much-mimicked *Limnas chrysippus*, that its desert form *dorippus* (*klugii*) "is a development in a procryptic direction in areas where the struggle" is especially severe (Trans. Ent. Soc. Lond., 1902, p. 475).

Furthermore, the idea has often forced itself upon me that the ground colour of the type form of this butterfly, as well as of the Ethiopian *Acræinæ* and Lycid beetles, may, under certain conditions and at a certain distance, become procryptic against the prevalent reddish tinge of the soil of Africa.

The author's suggestions of the resemblance of butterfly patterns in general to flower-masses and the shadow-depths between them; of the under-sides of *Grapta* and the upper-sides of many moths representing dead leaves lying on the ground and casting such shadows as they would throw at their small distance from it; of the concealing effect of iridescence ; of the overflow of individuals from a concealing region into one less favourable—in all these we have illuminating ideas which demand the fullest and most respectful consideration. That they are sound principles must, I think, be admitted at once ; but their relative importance, the amount of ground which they cover, cannot be decided offhand. I would only point out the extraordinary frequency with which a continuous black colouring unrelieved by pattern is accompanied by iridescence or surface colours of some kind. In view of the whole drift of Mr. Thayer's interesting and most suggestive paper it becomes probable that dead black would be *too* conspicuous even to many a well-armed aculeate or nauseous *Euploea*, and that it is therefore modified so that it obtrudes less upon the distant view of enemies which "mean business."

Although I have criticized some of the details of Mr. Thayer's paper, I should wish again to point out that they concern just those species which have not come under his own eyes in the living state. Naturalists owe him a large debt for the many new points of view and illuminating suggestions contained in his memoir.

DECEMBER 24th, 1903.

THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1903.

February 4th, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT announced that he had nominated the Rev. Canon FOWLER, M.A., D.Sc., F.L.S., Professor RAPHAEL MELDOLA, F.R.S., and Dr. DAVID SHARP, M.A., F.R.S., F.L.S., as Vice-Presidents for the Session 1903–1904.

Election of a Fellow.

Mr. T. ASHTON LOFTHOUSE of the Croft, Linthorpe, Middlesbrough, was elected a Fellow of the Society.

Exhibitions.

Dr. T. A. CHAPMAN exhibited two male specimens of *Orina* (*Chrysochloa*) *tristis*, var. *smaragdina*, taken at Pino, Lago Maggiore, on May 30, 1902, still alive; and living larvæ of *Crinopteryx familiella*, second generation, bred at Reigate from the egg. The parents were taken at Cannes in February 1901.

The Rev. F. D. MORICE exhibited, with drawings of the abnormal parts, a hermaphrodite of *Eucera longicornis*, Linn., showing one ♀ antenna normal, and one ♂ antenna remarkably shortened and with the joints greatly dilated; the clypeus and labrum one half white (the ♂ character), and the other half black as in the ♀. In the abdomen and legs the ♀ character predominated, but one half of the apical segments and genitalia seemed to be ♂.

In a discussion which followed on hermaphroditism, Dr. SHARP stated that Father Wasman had announced the discovery that in certain Diptera, parasites of Termites, the individual commences as a male and ends as a female—a phenomenon entirely new to entomology, though paralleled in some other groups. Father Wasman had examined a large number of cases, and considered that the whole genital system changes in the course of the imago life from male to female. It was noteworthy that in this case of chronological hermaphroditism protandry existed, as in all other cases of the kind. The PRESIDENT expressed the opinion that such a discovery required the confirmation of several workers.

Mr. R. McLACHLAN, F.R.S., exhibited a living example of *Chrysopa vulgaris*, Schnd., taken by Dr. Chapman in his house at Reigate. The primary object of the exhibition was to show the manner in which this species, which is ordinarily bright green, assumes a brownish colour, the abdomen being often marked with reddish spots in hibernating individuals.

Mr. W. J. LUCAS submitted specimens of a bug—*Miris calcaratus*—and some fruit of a grass, swept up together by Mr. W. J. Ashdown from the canal side near Byfleet on July 14, 1902, on the occasion of the South London Entomological and Natural History Society's excursion. The similarity of form and colouring constituted a probable case of protective resemblance.

Major NEVILLE MANDERS exhibited two specimens of an undescribed species of *Atella* from Ceylon; and remarked that it was a very local insect, and only found in the Nitre Cave district, one of the localities most remote from civilization in the island. It was probably a well-marked local race of *A. alcippe*, but easily distinguished from any known species of the genus by the apex of the fore-wing being entirely black. The species is constant in colouring, but apparently varies considerably in size.

Mr. F. B. Jennings exhibited British specimens of two species of Hemiptera—Heteroptera: (1) two females of *Drymus pilipes*, Fieb., a rare species of the family Lygæidæ, which were found among dead leaves on a hillside near Croydon in September 1901; (2) the black aberration of *Miris lævigatus*, L., recorded by him in the Entomologists' Monthly Magazine for 1902, p. 224. The species of *Miris* and the allied genus of Capsidæ, *Megalocerœa*, are ordinarily grass-green, or pale-yellowish.

Mr. H. J. Elwes, F.R.S., exhibited two cases of arctic butterflies. The first contained specimens from a collection formed by Mr. David Hanbury on the arctic coast of North America, in the region where the Parry expedition was lost. Of the butterflies observed—fifteen species in all—a large number for such barren and inhospitable ground, two had not been taken since they were first described by Curtis sixty years ago. Among them was *Colias boothii*. This species, in comparison with *Colias hecla*, Lef., is undoubtedly distinct in both sexes, but it is most remarkable that the male in coloration and markings appears to approximate more closely to the characters usual in the females of other members of the genus. The collection contained nothing new, but included the rare and curious *Argynnis improba*, Butler, hitherto taken only in Novaya Zembla (cf. Markham's "Polar Reconnaissance," p. 351), which Mr. Elwes believed to be nothing more than a high arctic form of *A. frigga*, Thnb.; a remarkable aberration of *A. chariclea*, Schn., in which the black netting marks were resolved into smeared black lines; *A. pales*, for the first time from this region, precisely similar to the form taken on the east of the Lena river in Siberia; and *Cœnonympha tiphon* closely resembling the form from Kamtschatka.

The second case contained specimens from a collection made by a Russian, between Jakutske and Verkhojansk in north-eastern Siberia at about the same latitude, 67°, as the preceding exhibit. They included many species which occur in the western palæarctic region, such as *Aporia cratægi*, *Triphysa phryne*, *Cœnonympha iphis*, *Argynnis selene*, *A. ino*, *Melitæa phœbe*, etc., and most remarkable of all, *Neptis lucilla*. Also *Parnassius delius*, which Mr. Elwes said was the first

Parnassius he had seen from within the arctic circle, and *Colias viluiensis*, Mén., an insect peculiar to Siberia, showing remarkable female aberrant forms. The PRESIDENT observed that these collections threw a great light on the butterflies inhabiting the fringe of the holarctic region.

Mr. C. O. WATERHOUSE gave an account of a nest of a bee, *Trigona collina*, recently received from Malacca. The whole resinous mass weighed 40 lbs. A section of the nest which was exhibited showed the cavities in the resin filled with pollen. The central portion of the nest was constructed of more waxy material, and contained numerous cells in which were immature bees. The bees were still alive when the nest arrived, and among them males as well as workers were found. Specimens were exhibited, as were also males and a worker of the much smaller species, *Trigona ruficornis*, Smith, received at the same time from Singapore, and sent by Mr. H. N. Ridley.

Mr. W. J. KAYE exhibited two drawers containing Danaine, Ithomiine and Heliconine species from British Guiana, all of similar coloration, and forming a Müllerian association with a black hind-wing. He pointed out that possibly the species had converged, and that some were in advance of others. The central species was considered to be a *Melinæa*—*Melinæa crameri*, a species with a constant pattern and a very complete black hind-wing. Closely following this *Melinæa mneme* (a very abundant and variable species) entered, drawing in its turn a large number of different species of even widely different families. A diagrammatic table was shown with the exhibit, which included the following species: (1) *Ithomiinæ*, *Melinæa crameri*, *M. mneme*, *M. egina*, *M.* n. sp., *Ceratinia veritabilis*, *Ceratinia*, sp., *Mechanitis doryssus*; (2) *Danainæ*, *Lycorea ceres*, *L. pasinuntia*; (3) *Heliconinæ*, *Heliconius vetustus*, *H. numata*, *H. sylvana*, *Eueides*, n. sp.; and (4) *Erycinidæ*, *Stalachtis calliope*.

Papers.

The following papers were communicated :—

"On the Hypsid Genus *Deilemera*, Hübner, by Colonel CHARLES SWINHOE, M.A., F.L.S."

"An Account of a Collection of Rhopalocera made in the Anambara Creek in Nigeria, West Africa, by Mr. P. J. Lathy."

"Some Notes on the habits of *Nanophyes durieui*, Lucas, as observed in Central Spain by Mr. G. C. Champion, F.Z.S., and Dr. T. A. Chapman, M.D., F.Z.S., with a description of the larva and pupa by Dr. T. A. Chapman."

March 4th, 1903.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of a Fellow.

Mr. Harry Eltringham, of Eastgarth, Westoe, South Shields, was elected a Fellow of the Society.

Exhibitions.

Colonel C. T. Bingham sent for exhibition specimens of Diptera and two Aculeates from Sikhim, constituting in the banding of the wings and other characteristics a striking case of mimicry. The Rev. F. D. Morice drew attention to the way in which the fly imitated with its tibia the tarsus of the bee.

Mr. A. J. Chitty exhibited specimens of *Atomaria rhenana*, Kr., taken by him out of some flood rubbish found near Lancing, probably the same locality where the beetle was discovered formerly by Dr. Sharp. The species is represented in the Power collection, and it is also mentioned in Canon Fowler's "British Coleoptera" as having been taken at Bognor, and in Wicken Fen. He also exhibited a *Ptinus*, apparently new to Britain, found in a granary in Holborn in 1893, where it had probably been introduced.

Mr. W. J. Kaye exhibited species of Lepidoptera from British Guiana, forming a Müllerian Association in which all but one were day-flying moths, the exception being an Erycinid butterfly, *Esthemopsis sericina*. The moths, belonging to three families, included *Syntomidæ*: *Agyrta micilia*, and *Euagra* *cælestina*, *Hypsidæ*; *Iostola divisa*, *Geometridæ* (?); *Pseudarbessa decorata*. It appears very evident from the specimens collected over eighteen months in exactly the same place, that the *Syntomidæ* in being so numerous have acted as the types, toward which the other species have converged. The particular interest of the exhibit consisted in the association being one of moths, a butterfly being the exception, and not one of butterflies with perhaps a single moth, which latter is so frequently the case in South America. The butterfly most closely resembled *Agyrta micilia*, one of the *Syntomidæ* that is perhaps the most abundant of all the groups.

Papers.

Mr. C. O. WATERHOUSE read "Notes on the nests of Bees of the Genus Trigona."

Mr. G. A. ROTHNEY communicated a paper on "The Aculeate Hymenoptera of Barrackpore, Bengal;" and another paper entitled "Descriptions of eighteen new species of *Larridæ* and *Apidæ*, from Barrackpore, by Peter Cameron."

Colonel CHARLES SWINHOE communicated a paper "On the *Aganiidæ* in the British Museum, with descriptions of some new species."

Wednesday, March 18th, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. H. W. BELL-MARLEY, Durban, Natal, Mr. J. C. DOLLMAN, Newton Grove, Bedford Park, W., Mr. W. W. ROWLANDS, Lickey Grange, near Bromsgrove, and Prof. T. H. TAYLOR, M.A., The Yorkshire College, Leeds, were elected Fellows of the Society.

Exhibitions.

The Rev. F. D. MORICE exhibited with drawings a dissected gynandromorphous specimen of a bee (*Osmia fulviventris*, Panz.). He said in this species the ♀ is normally larger, less brightly æneous, and altogether darker-looking above than the ♂. There are also of course the regular sexual differences between them, which occur in all Anthophila, as to antennæ, number of abdominal segments, possession of a scopa, genital armature, etc. The clypeus and mandibles differ also in shape, though not in colour; the last or sixth dorsal segment is simple (apically incised, as is the seventh also, in the male); and the hind metatarsi are without a little tooth, which in the ♂ is always present, though generally quite concealed by longer and very dense hairs. In the specimen exhibited, the general appearance above was (before dissection) completely ♀; as were also (I believe) both antennæ, though unluckily one has been broken off and lost. That remaining is obviously ♀. The genital armature seems to be entirely ♀ also, though not quite in a normal state, as though somewhat shrivelled and distorted. But the following parts are certainly ♂: the right mandible; the right posterior metatarsus; the two last apical (sixth and seventh) visible dorsal plates of the abdomen; the right side only of the third, fourth, and fifth ventral plates of the abdomen. I think that the first and second ventral plates are also ♀ throughout. The last or sixth ventral plate is rather puzzling. It shows, on the right side only, what looks like part of the ♀ scopa; whereas, in the preceding segments, the scopa-bearing ♀ side is, as has been said, the left. Thus, on the ventral side of the abdomen ♂ characters largely predominate (the ♀ with one doubtful exception occurring only on three segments, and only on the left side of each of these). The dorsal apex is also ♂ entirely. Yet the genital armature seems to be completely ♀, and I can find no trace of the concealed imperfectly chitinized segments which in all Hymenoptera ensheath the armature of a ♂. In the head the general appearance, the clypeus, one antenna at least (? both), and the left mandible certainly suggest a ♀:—perhaps too the thorax does so, but one ought to have studied its sexual modifications more thoroughly than I have done, to be certain as to this. The insect was kindly sent to me (with the gynandromorphous Eucera which I exhibited last month, and several other similar monstrosities) by M. Jean

Vachal of Argentat, France. The species is a common one; whether that called *fulviventris* in the British List is a variety of it, or a distinct species, is not yet finally decided. I have handed the dissections to Prof. Poulton, for presentation to the Hope Collection in Oxford.

Mr. A. Bacot exhibited a number of specimens of *Malacosoma neustria* × *castrensis* in various stages, including a series of six ♂ ♂ and sixteen ♀ ♀ imagines reared during 1902 from one batch of ova laid by a ♀ *Castrensis*, which had been mated with a ♂ *Neustria*, and two ♀ ♀ reared from another batch of ova the result of a similar cross; also blown larvæ of hybrid parentage, and twigs showing attempts at ovipositing on the part of ♀ ♀ hybrids that had paired with hybrid ♂ ♂ of the same brood; also a series of *M. Neustria*, *M. Castrensis* and the hybrid moths reared during 1901 for comparison. He said that the larvæ of the 1902 broods, as stated in the Society's Proceedings for June 4th last, exactly followed those of the previous year in respect of their division into "forwards" and "laggards," the former again producing only females, and the latter males. By forcing the pupæ of the laggards it was found possible to synchronize the emergencies this year, and pairings between the hybrid moths were obtained. The females attempted egg-laying, adopting the position and motions of normal females of *Castrensis*, but at each opening of the ovipositor they produced only the small drop of cement which accompanies the egg in the normal oviposition of the parent species, resulting in a more or less perfect spiral band of cement upon the twigs. The length of time occupied in producing this result was about the same as that required by *M. Castrensis* ♀ for depositing her normal batch of eggs, which are laid at the rate of about eight or nine a minute. Pairings or attempted pairings were also obtained between the hybrid males and females of both the parent species, but only a very few eggs were laid by these females, who subsequently recommenced calling. Perhaps the most interesting feature of the exhibit was the great variability shown by the specimens comprising the larger of the 1902 broods compared with the remarkable uniformity of the hybrid moths reared during the previous year. Such uniformity appears the more remarkable if we remember the wide range of variability shown by both the parent species, and that a very wide, if not the entire local range, may be found within the limits of a single brood of either species.

Mr. H. St. J. Donisthorpe exhibited specimens of *Trimium brevicorne*, Reich., from Chiddingfold, Surrey, an unusually southern locality for this species.

Mr. C. P. Pickett specimens of *Hybernia leucophæaria* and *Phigalia pedaria* taken at Chingford on February 14th. With regard to the resting habit of the former species he said it was somewhat curious. The bodies lay in a parallel position to the bark of the trees on which they were found; the cross-markings of the wings in an upright position corresponding closely with the lines of bark. Their colour also harmonized remarkably well with the surroundings. He also exhibited ova of *Endromis versicolora* on birch twigs, laid March 17th. The parent moths paired on March 16th at 1.20 p.m., remaining *in cop.* thirty-three and a half hours, until 10.55 p.m. the following day. The female then commenced crawling about the cage to find some suitable place for laying, and on the introduction of some birch twigs deposited thirty-eight ova in ten minutes upon them. On the morning of the 18th she had laid 171 ova, which were cream-coloured and shiny in appearance, but after two or three days assumed the colour of the birch twigs upon which they were placed near the buds. The female in the act of oviposition prefers to rest head downwards, and sometimes uses the back legs for arranging the ova.

Mr. G. C. Champion exhibited a long series of specimens of a species of *Cneorrhinus* (? *pyriformis*, Boh.) from Piedrahita, Spain, and called attention to the great dissimilarity between the sexes, and also to the possibility of the females being dimorphic, one form clothed with green scales, and the other with grey scales like the male. He also exhibited *Dorcadion dejeani*, Chevr., from the Sierra de Bejar, a species peculiar to that district.

Mr. R. McLachlan, F.R.S., exhibited a dragonfly belonging to a small species of the genus *Orthetrum*, attacked by a fly, almost as large as itself, of the family *Asilidæ*, taken in

Persia in June 1902, by Mr. H. F. Witherby, F.Z.S., the well-known ornithologist. The fly had inserted its proboscis at the junction of the head and prothorax, a vulnerable point. Mr. G. H. Verrall said that he had seen a moderate-sized Asilid in Darenth Wood attack an insect much larger than itself, and that Lord Walsingham had received a species of the same family which attacked large dragonflies. Mr. McLachlan also exhibited a female specimen of a large Æschnid dragonfly, *Hemianax ephippiger*, Burm., captured in a street at Devonport on February 24, 1903, by a tram-car driver as it was flying about his vehicle. The species occasionally visits southern Europe in migratory swarms or sporadically, but is especially African, and its presence at Devonport in February might possibly be due to the example having flown on board a vessel off the African coast, and then becoming lethargic until roused by the unusually high temperature prevailing in the south of England at that time. The species has once been observed on the Continent as far north as Brussels. Mr. F. Merrifield suggested that there might be some connection between the appearance of the insect in England and the reported showers of fine dust which are generally supposed to have come from the Sahara.

Professor E. B. Poulton, F.R.S., exhibited seasonal forms of *Precis antilope*, parent and offspring, bred in 1902 by Mr. G. A. K. Marshall in South Africa, showing the remarkable dimorphism of the species, which was especially noticeable in the protective colouring of the under-side of the dry-season form as compared with the startling conspicuousness of the under-side of the wet. He also exhibited *Precis cœlestina*, captured by Dr. C. A. Wiggins in the Victoria Nyanza region, with the dry-season form of that species, now taken probably for the first time. The resemblance of the under-side of the latter to dead leaves was very marked. Professor Poulton also showed lantern-slides of the same two species.

Mr. W. J. Lucas exhibited with the lantern a slide showing the larva of *Cossus ligniperda* in its gallery in a tree trunk.

Dr. T. A. Chapman exhibited with the lantern a series of slides illustrating the life history of *Liphyra brassolis*, Westw., a Queensland species, the larva of which lives in ants' nests, and feeds upon the ant larvæ. The imago on emergence from the pupa is clothed with scales highly distasteful to the ant, which thus protect it from attack during emergence, and until such time as it is able to fly, when the scales drop off. (Cp. *Entomologist*, xxxv, pp. 153, 184.)

Papers.

Mr. G. C. CHAMPION, F.Z.S., read a paper on "An Entomological Excursion to Bejar, Central Spain."

Mr. EDWARD SAUNDERS, F.R.S., F.L.S., communicated a paper on "Hymenoptera Aculeata collected by the Rev. A. E. Eaton, M.A., in Madeira and Teneriffe, in the spring of 1902."

Dr. FREDERICK A. DIXEY, M.A., M.D., read a paper, illustrated by lantern slides, "On Lepidoptera from the White Nile, collected by Mr. W. L. S. Loat, F.Z.S.; with further Notes on Seasonal Dimorphism in Butterflies." He said that the collection of butterflies which had been made at intervals by Mr. Loat during his tenure of office under the Egyptian Government, was of special interest on account of the accurate data which accompanied the specimens. Mr. Loat's collecting grounds were in the neighbourhood of Kaka, about 11° N. lat.; and of Gondokoro, about 6° further south. The meteorological conditions at the time of collecting were generally those of the dry season, though at Kaka the rains were just beginning. Most of the examples of seasonally dimorphic species belonged to the "dry-season" phase; but there were some curious exceptions. Perhaps the most remarkable of these was *Teracolus daira*, Klug, specimens of which caught in January, during the height of the dry season, were of the full "wet-season" colouring; while some of those taken at the beginning of the rains were much "drier." The large proportion of *Pierinæ* to the whole number of captures was noticeable, as also was the general likeness of the whole assemblage to the butterfly fauna of Aden; the different forms of *L. chrysippus*, for example, were found by Mr. Loat all flying together at the same spot, just as is the case at Aden. The collection brought to light no new species; it contained, however, a single example of the male of *Pinacopteryx venatus*, Butl., of which only two specimens, including the type, both females, have hitherto been known to science.

Mr. Loat's series did not seem to favour the opinion that had been held that *Teracolus evagore*, as described and figured by Klug, was the dry-season form of *T. yerburii*, Swinh. It appeared from this and other evidence that Mr. G. A. K. Marshall was right in dissociating the two forms. The weakness of the reasons given for the contrary view had lately been pointed out by Col. Yerbury.

With regard to the general question of Seasonal Dimorphism, a point that deserved notice was the greater intensity and greater persistence of the cryptic dry-season coloration of the under surface, which often characterizes the female sex. This might be illustrated from among Mr. Loat's specimens; but the principle was of wide application, and was operative in both hemispheres. In the genus *Teracolus* especially, the "wet-season" female often retained some of the "dry-season" garb, and in certain cases (as in *T. puellaris* and *T. phisadia*) the female could scarcely be said to have a "wet-season" phase at all. The significance of these facts lay no doubt in the special need for protection experienced by the female sex. Prof. Poulton had lately given strong grounds for believing that on the whole concealment was a more efficacious means of defence for moderately distasteful forms than the display of warning colours, especially when the pursuit was keen; and the instances here adduced seemed to show that it might in some cases be of advantage for the female of a given species to remain cryptic in the wet season, even though the male should assume brighter colours with the advent of a more copious supply of insect life. An interesting parallel with the seasonal changes in *Precis antilope* and *P. archesia*, so carefully worked out by Mr. Marshall and Prof. Poulton, was furnished by the Central and South-American *Proterpia pyrisitia*, Fabr. (a Pierine form allied to Terias), with what is doubtless its dry-season phase, *P. gundlachia*, Poey. Here, as in *Precis*, the dead-leaf appearance of the under surface in the dry-season form is enhanced by the falcation of the forewings and the development of "tails." These changes of shape are found in the *gundlachia* form of both sexes, but are intensified in the female; in the wet-season or *proterpia* form they are retained by neither sex, but the under-surface of the female is duller than that of the male.

The simultaneous occurrence in generally dry localities, such as Aden, of forms which in other places are associated with contrasting seasons, was not easy to explain. Prof. Poulton had shown that in several species of *Precis* the dry-season form was larger than the wet, and had on that fact founded the inference that the dry-season form must have been predetermined in the larval stage. But there was reason to believe that in many genera, and perhaps even occasionally in *Precis*, the assumption of the characteristic seasonal garb was not determined until a later period—in some cases, the last few days before emergence from the pupa. If it might be assumed that the Aden species in question were in a state so sensitive to meteorological conditions as to respond almost immediately to a few heavy showers, such as were reported to fall there not unusually from January to May, the intermixture of "wet" and "dry-season," which in many cases meant an intermixture of aposematic and cryptic forms, might possibly be accounted for. This suggestion could only be verified by observers on the spot.

Wednesday, April 1st, 1903.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Message to the Entomological Society of France.

The President announced that he was going to Paris at Easter, and proposed that the Society should authorize him to deliver a greeting to the Entomological Society of France, before whom he was to read a paper. The meeting acceded unanimously to the President's proposal.

Exhibitions.

Mr. M. Jacoby exhibited specimens of *Rhagiosoma madagascariensis*, Heyd., from Madagascar, and *Carpophagus banksiæ*, McLeay., and *Mecynodera coxalgica*, Boisd., from Australia. In appearance they presented many characteristics not usually associated with phytophagous coleoptera.

Mr. C. P. Pickett exhibited specimens of *Dilina tiliæ* forced from Essex pupæ during February and March. In two ♀♀ the usual rust-coloured markings on the fore-wings were abnormally pale, and the hind-wings were black. In another ♀ the rust-red hue pervaded the whole wing area, the four normal green blotches being a deep reddish-brown, corresponding with a form of *Smerinthus populi* frequently bred. A third ♀ displayed light-brown hind-wings; while one ☿ was of the normal ♀ coloration.

Mr. W. J. Lucas exhibited lantern slides of the specimen of *Hemianax ephippiger*, and of the *Orthetrum* species attacked by an Asilid fly, shown by Mr. R. McLachlan at the last meeting.

Mr. W. J. Kaye exhibited a lantern slide to illustrate the collecting grounds visited by him in British Guiana.

Papers.

Dr. T. A. Chapman read a paper entitled "Contributions to the Life History of *Orina* (*Chrysochloa*) *tristis*, var. *smaragdina*."

Sir George Hampson read a paper on "*Apoprogones hesperistis*, a remarkable new lepidopterous insect from Zululand." He said that the genus must be referred to the family *Euschemonidæ* which is represented by the single species *Euschemon rafflesia*, Westw., from Australia. In what quarter of the globe the family originated it was impossible to say, but the appearance of the species in question suggested that it was a survival of the scattered remnant of the Antarctic fauna. It was, however, most remarkable that the genus should occur in Africa and Australia alone. The President remarked that the wide spread of the Hesperiadæ indicated a group to which a local origin could only be assigned with great doubt. Mr. M. Jacoby mentioned that there were similarly divided coleopterous genera occurring simultaneously in South America and South Africa only.

Mr. F. Enock gave the following account of "The Life History of *Cicindela campestris*," illustrated with lantern slides.

"It was only after many years' watching that I observed the female, boring into the sand at Hampstead Heath, depositing a single egg in a tiny burrow one-sixteenth of an inch wide by a quarter of an inch deep. I was not successful in rearing the eggs, but from observations found that they hatched in from a week to ten days—according to the weather. The young larva is decidedly like the mature one, both in form and temper, which may be described as 'nasty.'

"In certain parts of Hampstead, where the sand is free of moss and grass, I have frequently seen dozens of burrows—of all sizes—from the one inhabited by a baby larva to that of a full-grown one, just the diameter of an ordinary penholder. On cautiously approaching the ground the larva may be seen 'sitting,' the head filling up the hole, which is finished off with a saucer-shaped concavity of three-eighths of an inch diameter: a mere hollow, just sufficient to cause an unwary insect to stumble on a quick run, and—fall into the jaws of the larva.

"To dig these holes *up* and turn out the larva is no easy task, unless the following plan be adopted. Cut a grass stem a foot long, letting it down the hole until it will go no farther; if the top end is agitated, the other is probably between the mandibles of the irate larva. Keep hold of the end, and with a three-fourth-inch half-round file bent round an inch at the tip, dig away the sand from around the stem, keeping on until you come to the end, where the larva is seen sitting, its body turned into a perfect zigzag, which is soon straightened out on being placed on level ground. The strange appearance of the creature can then be studied, with its huge head and receding 'frons,' the mandible turning *up* instead of *down*, the immensely developed mentum, then the large semi-circular chitinous thoracic plates, followed by the soft, white flaccid abdomen, until the fifth segment is reached. This is swollen into a large dorsal hump capped by two short and powerful vertical spikes; and in front, but lower down, two longer ones pointing forward, each having a somewhat twisted or corkscrew form—the tips diverging.

The remaining segments gradually taper to the anus, each having tubercles of long spines, those at the anus shorter and stronger. The legs are decidedly wiry, and the claws long and sharply pointed.

"On touching its tail, the larva under observation immediately turned its head over its back, seized its own tail, suddenly let it go, and sprang a distance of seven to ten inches.

"The larva uses its wedge-shaped head as a shovel, digging into the sand, which it throws over its back right out of its way. It soon disappears, though the continual upheaval of the sand shows that it is still at work. Occasionally there is a great uprising of sand, followed by the appearance of the head of the larva, which clears away the accumulated heap. This it accomplishes by thrusting its head into the mass, and quickly jerking it over its back, sending the sand flying a distance of several inches. Many hours are occupied in excavating the burrow, which sometimes reaches a depth of ten inches.

"As soon as the required depth has been reached and the hole cleared out, the larva ascends slightly above the level, and taking mouthfuls of sand from the edge, hurls them clear; and this is continued until a *rough* excavation is made around the entrance. At this point the larva ascends a little higher, and hammers all round the burrow with its chin, until it has beaten the sand into a smooth saucer-shaped excavation. Satisfied with its labours, it rests therefrom in the following manner. The head is drawn up level to the top, just fitting one-half the entrance, the other half being exactly filled by the first semi-circular plate on the thorax, thus completely blocking the entrance—the colour of the head and thorax giving it natural protection.

"By filling a large bell-glass with sand to within three inches of the top, and with a cane three-sixteenths of an inch diameter, I made holes down the sides, so that the glass formed one side. I then placed a larva in each hole, with the result that some escaped and tried to enter that of another larva, an act of trespass for which its life was forfeited. Others made themselves at home after trying to plaster the glass with wet sand;

but when this happened—and some kept it up for a fortnight—I dug them up and started them in a fresh hole, and at last they adapted themselves to circumstances. I was then enabled to watch their habits underground. They deepened the burrow by using their mandibles as picks and their heads as shovels and elevators, for as they excavated heads down, they drove their long-pointed claws into the sides above, and making a larger excavation on one side they passed the sand above by simply turning up their heads, ramming the sand past and above their tails; until, having a sufficient weight or load, the larva reversed its position, put its head and first thoracic plate underneath, and simply pushed and pushed until it raised the sand to the ground-level, where a large heap accumulated, which from time to time was shot away.

"When the desired step was reached and the pitfall set at the entrance, the larva quietly put its head and thoracic plate to the top to bar the entrance, the feet were driven into the sides below the mentum, and the fifth abdominal segment drawn up until the hump was wedged close up and under the thorax, bringing the two vertical dorsal spines at right angles to the burrow, into the sides of which the points were driven; the remaining abdominal segments were curled round until the anal spines touched the opposite side, into which they were driven, thus securely holding the larva, in its peculiar zigzag form, ready at a moment's notice to drop down to the bottom of the burrow by releasing the anal spines, and straightening the abdomen. Occasionally the larva in its deepening would meet with a small quartz pebble, which it seized between its mandibles and carried to the top, where, with a rapid backward movement of its head, it jerked the pebble away a distance of ten inches.

"Watching the larva through the glass, I pushed a dead fly near. When it was within five-eighths of an inch it seemed to suddenly disappear, and appear at the bottom of the burrow in company of the larva. The movement was almost too rapid to follow and observe how it was made, but after endless watchings I was able to follow its movements. I caught a Blow Fly, killed it, and tied a thread of floss silk to its leg, then pushed it toward the waiting larva, at the same time keeping the thread 'taut.' On reaching to within five-eighths of an inch of the larva it struck out, and I held on to the thread. The larva would not let go, and I was able to see that in springing out the larva had sprung up and backward (just the movement of a gymnast turning a back somersault), throwing all its legs out clear of the burrow, the abdomen forming a semicircular arch between the hole and the seized fly. I gently pulled my thread, so did the larva, when I was enabled to see that in throwing itself out of the burrow it had made a centre of the two vertical spines, which, as the head turned over, were levered out of the sand; while the points of the other longer pair in front of the dorsal hump were brought into contact with the sides of the burrow, into which they were deeply driven and firmly 'anchored' the larva, whilst it seized its prey. I tried this experiment a number of times, fully confirming my observations.

"On the approach of cold weather in October the larvæ begin to deepen their burrows, ramming the excavated sand above them, so closing all entrance and exit. Without food of any kind the first winter was spent underground. During March the larva commences to re-excavate the sand above, a laborious task of biting it down until, in April and May, the surface was reached, and another year or six months spent in feeding. For the second time in September or October the larva retired to the bottom of its burrow, after filling in with sand above it.

"On the approach of warm weather it once more re-ascended to the surface, and for a few months feasted upon earwigs, etc. Several times I found remains of lepidopterous larva. Once also I observed a White butterfly caught, and on another occasion a fully-developed Puss moth.

"In August of the third year the larva excavates an oval chamber at the bottom of the burrow, sometimes in a slanting position, but more frequently horizontal—an inch and a half long by three-quarters diameter. The burrow is rammed full of sand to within an inch of the chamber; the larva then rests upon its back, but only the thorax dorsal hump touches the sand, the anal segments being turned up. In a week it changes to a pure white pupa, the dorsal hump disappears, and in its place a large fleshy process is evolved at each side, terminated with a brush of strong spines. A similar but much smaller pair appears on the 1st, 2nd, 3rd and 4th segments, each process diverging outwards, the brushes of stiff hairs giving a firm hold, and in this trussed position the pupa rests safe from contact with the sand.

"In less than a week the limbs become suffused with a delicate tint of green, which increases in intensity until the legs are distinctly visible under the pellicle. The mandibles as well as the eyes are brown. At the end of four weeks the pupa becomes restive. At last it turns over, frees itself of the membrane enveloping its whole body, and there appears a very delicate-looking Tiger Beetle, but so weak that it cannot bear its own weight. In a day or two it attains its full colour and character.

"After this it quietly rests in a semi-torpid condition until the following April, when it sets out for the small shaft left by the larva as a final instruction. This it proceeds to enlarge by biting the sand, which it removes grain by grain until its labour is ended, and it reaches the surface."

A discussion followed as to how far the abundance of food in the larval state affects the development of insects, in which the PRESIDENT, Mr. W. E. SHARP, and other Fellows took part. Mr. ENOCK said that where the food supply happened to be insufficient, neuropterous nymphs would continue two years in that stage, and Mr. C. O. WATERHOUSE mentioned a case reported to him of the larvæ of *Vanessa urticæ* which, having exhausted their summer pabulum, retired to hibernate until the following year. Mr. A. J. CHITTY said he had observed that some coleopterous larvæ under similar circumstances would consume flies; while Mr. H. St. DONISTHORPE mentioned that he had bred successfully a species of the same order on paper.

May 6th, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

The PRESIDENT announced that he had received a generous welcome from the Entomological Society of France on the occasion of his recent visit to Paris. He remarked that the Entomological Society of London, as now constituted, came into existence two years after that of France, and exhibited one of the original invitations to join the Society issued in 1834, and signed "G. R. GRAY, Secretary pro tem." The Meeting signified approval that this document should be reproduced in lithograph, and placed in the Library.

The PRESIDENT also announced that a Suggestion Book for subjects of discussion and .exhibition would be placed in the Library for the use of Fellows.

Exhibitions.

Mr. WILLOUGHBY GARDNER exhibited nest cells of *Osmia xanthomelana* from Conway, North Wales. He said the species, one of our rarer mason bees, places its beautifully constructed pitcher-shaped cells at the roots of grass, usually four or five together. The bee itself is always scarce in Britain, and there is no previous record of the nest having been found since Mr. Waterhouse discovered and described it from Liverpool about sixty-five years ago.

Mr. M. JACOBY exhibited *Arsoa longimana*, Fairm., and *A. aranea*, from Madagascar, the only other specimens of these species he knew of being in the British Museum collection. He also exhibited *Megalopus melipona*, Bates, and *M. pilipes* from the Amazon, which bore a remarkable resemblance to a bee, so much so that Bates always mistook it for one when settled on a twig.

The PRESIDENT remarked that two species of Cetoniidæ observed by him in Majorca, in 1900, were very like humble-bees in their mode of settling or rising from flowers.

Mr. A. J. CHITTY exhibited a water-beetle new to Britain, viz. *Hydroporus bilineatus*, Sturm., discovered by Mr. Edward Waterhouse among some specimens of *Hydroporus* given by

Mr. Chitty to him as *H. granularis.* The specimens were taken at Deal in 1891, and probably all records of *granularis* from Deal relate to this species. He also exhibited a specimen of the rare *Trechus rivularis* (*incilis* of Dawson), taken at Wicken Fen in August 1900. The only other British specimens of this insect are believed to be the original specimens taken at Whittlesea Mere, and some afterwards found by Dr. Power at Holme Fen.

Mr. O. E. Janson exhibited specimens of *Neophædimus melaleucus*, Fairm., a goliath beetle from Upper Tonkin, and remarked that the white colouring was derived from a dense clothing of peculiar semi-transparent coarse scales which were apparently easily removed by abrasion, and seemed to partake of the nature of the "fugitive" scales found upon freshly-emerged specimens of *Hemaris* and other Lepidoptera.

The President read the following communication on "Protective Resemblance and other modes of Defence adopted by the Larvæ and Pupæ of Natal Lepidoptera" from Mr. G. F. Leigh.

"Having devoted a great deal of time during the past two years to finding and preserving the larvæ of Natal Lepidoptera, it appeared to me that some account of the most striking examples, as well as of the conclusions to which I have been led, would be useful.

"Among the butterflies the larvæ of Papilios *demodocus*, *policenes*, *brasidas* and *nireus* do not appear to conceal themselves, and I have never seen birds, hornets or spiders attacking them. *Papilio morania*, until the last change of skin, is also very conspicuous; but then the larva becomes of a perfectly green colour, exactly resembling the food-plant, and is very difficult to detect except during movement. The larva progresses in a characteristic jerking manner, spinning a web all the time. *Papilio dardanus* (*cenea*) is however quite different: in the first and second stages the larva is chocolate and white, and always feeds on the leaves near the ground and among the undergrowth. During the third and fourth stages, on the other hand, the larva is green with small white and blue markings. It is then extremely difficult to find, so closely does it resemble the colour of the older leaves of its food-plant, upon which it now feeds. These older leaves are blue-green in colour and covered with white spots. The resemblance of the pupa to the leaf is so perfect, that I have failed to notice them upon twigs which I had picked for food, until they were revealed upon the bare stems from which all the leaves had been stripped. I believe that Col. Fawcett has described and illustrated this example of protective resemblance.

"The larva of *Charaxes citheron* exactly resembles its food-plant in colour and markings, whereas *C. varanes* has yellow markings, which render it very conspicuous. *C. ethalion* also, with its one or two black-bordered yellow bands, is conspicuous, as is *C. brutus* with its large orange spot. Of all the Charaxes larvæ with which I am acquainted none equal *C. neanthes* in the perfection of its protective disguise. This larva when at rest upon the stem—its characteristic position during the last two stages—is so well concealed by colour and markings that it is almost impossible to detect. The small green dumpy pupæ of this species exactly resemble some of our berries.

"The larvæ of Acræas *buxtoni*, *cabira*, *petræa*, *natalica*, *encedon*, and *doubledayi*, as also that of *Limnas chrysippus*, use no disguise, and are certainly unpalatable and avoided by birds, hornets, spiders, and Mantides.

"It is however in the larvæ of moths that the cryptic characters are chiefly seen, and, strange as it may appear, most of all in those that congregate together during the day. *Metanastria aculeata*, for instance, exactly resemble the bark of the tree upon which they rest by day, crawling up to eat the leaves at night. The larvæ of *Musgravia leighi* also vary in colour—grey, green, yellow or brown—according to the colour of the bark or lichen upon which the hours of daylight are passed. Their food is not even supplied by the leaves of the tree, but by a mistletoe growing upon it. Another species of *Metanastria* (as yet unnamed) rests by day upon the trunks of trees in large patches of one hundred to two hundred larvæ. Each patch so exactly resembles the bark that it entirely escapes notice. In nearly every instance where I have found them it has been owing to the conspicuous appearance of the individuals attacked by Ichneumonidæ, and covered with their small white larvæ. When desirous of rearing any of these, I visit the patch each morning and remove all the infected individuals. It is almost impossible to induce these larvæ to feed in confinement, and I conclude their long journey each night is necessary for their health. The larvæ of *Matarbela* sp. exactly resemble the droppings of birds, and is also armed with a telescopic appendage that lies prone upon the back when at rest. As soon however as the caterpillar is touched, it whips this structure backwards and forwards, behaving like the larvæ of *Cerura vinula*, although the appendage is in quite a different position and placed far more anteriorly. This caterpillar is the most curious of any I have yet seen. The larva of *Homoptera glaucinans*—a green and silver half-looper—almost exactly resembles the stem of the Acacia upon which it feeds. The caterpillar of *Nephele variegata* in its young stages is reddish-brown, exactly like the young leaves of its food-plant, the fig-tree. It turns green in its last stage, thus reversing the history of the colour-changes in almost all the Sphingidæ. In spite of its strong cryptic colouring it is one of the most ichneumoned larvæ with which I am acquainted. *Bunæa caffraria* and *belina* are most conspicuous larvæ, and birds will not eat either, although they are very fond of another species of the same genus, *Bunæa tyrrhena*, which exactly resembles the colouring of the leaves of its food-plant. In spite of its size this caterpillar is so difficult to find that it is necessary to look for the fæces upon the ground, and then carefully to search the under-side of the branches over the spot. It is interesting to note that the eggs of this species are laid upon the upper-side of the leaves, whereas those of the other Bunæas with freely-exposed larvæ are always placed upon the under-side. The caterpillar of *Argema mimosæ* is also very difficult to detect and exactly resembles its food-plant in colour, although the beautiful silvery cocoons are very conspicuous upon the bare twigs of the trees during the winter months. The larvæ of *Gonometer postica*, *Metanastria cuneilinea*, *Jana edulis*, *Ludia delagorguei*, and *L. smilax* are all extremely conspicuous, and sting very badly. They are attacked by ichneumons, but birds, etc. always avoid them. In fact I do not know any yellow and black or black and white larvæ which birds will eat, and these are by far the commonest colours for larvæ out here.

Stauropus mediata is another very brilliant larva which nothing will eat. Its colours are green, bright yellow, blue and black. The moth is however far from common, owing to the attacks of Ichneumonidæ. The larvæ of *Eublemmistis chlorozonea* is also well concealed in the last stage by the adoption of allocryptic methods. It feeds upon lichen and is white in colour : when full-fed it completely covers itself with the lichen, and uses the same to form its cocoon, which is suspended from the branches or trunk of the tree upon which its food-plant grows. The moth itself when at rest exactly resembles the lichen, and is most difficult to find.

"The larva of *Lophostethus dumolinii* is certainly a distinct case of mimicry, as it is far more like a Saturniid larva than one of the Sphingidæ, and does not even rest in the manner usual among Sphinx larvæ. It is greatly persecuted by ichneumons, and very difficult to rear unless taken full-fed or at any rate in the last stage.

"*Ophiusa mormoides* and *echo*, large half-loopers, almost exactly resemble the bark of the trees upon which they rest, and their colour varies so as to match that of the particular tree on which the larvæ are found. *Ophiusa indeterminata*, on the other hand, is conspicuous, and does not possess the power of colour adjustment, so that three or four different forms may be found upon the same food-plant : it is moreover refused by birds. The very common larvæ of *M. armigera* also appears in three or four different forms, which are relished by birds. These larvæ however prefer to feed concealed inside lilies and the pods of peas. The conspicuous black and white larva of *Diaphone dominica* also feeds inside the thick leaves of lilies, but this garden pest is unfortunately refused by birds.

"Geometers I need not refer to, as they are much the same as at home, only far less numerous.

"There are a great many other larvæ which might be mentioned, but, as they produce moths as yet unnamed, I will leave for another occasion, when the species have been determined or described.

"The general conclusion may be accepted that black and yellow, and black and white larvæ are distasteful to birds, Mantides, hornets, etc., as also are moths, butterflies, beetles, and flies of these colours in almost every instance.

"The greatest enemies of larvæ here after birds are Fossorial wasps and Mantides. I have found nests of the Fossores full of larvæ, generally but a single species in a single nest. Sometimes as many as twelve green geometrid larvæ may be found in one nest. Spiders of the family Attidæ are also frequently found eating larvæ. When disturbed the Attid will jump away, carrying its caterpillar prey with it.

"In conclusion I desire to express my thanks to Sir G. F. Hampson for naming the moths which I have succeeded in breeding. A great deal of work still remains to be done in this direction in Natal. Not one quarter of the larvæ are at present known, and yet as a result of the work that is proceeding, new species of moths are appearing almost every week."

The PRESIDENT said that it was of great interest to hear the conclusions, as to the general meaning of the colouring of Natal larvæ, reached by one of their Fellows who had so wide and intimate an experience as Mr. Leigh. It was interesting to observe that Mr. Leigh considers the larva of *Papilio nireus* to be conspicuous, when its pupa possesses a wonderful power of colour adjustment, as was first shown and figured by Mrs. M. E. Barker in our Transactions (1874, p. 519). The first account of the larvæ and pupæ of *Papilio dardanus* (*Merope*, *cenea*) was given by Mr. Mansel Weale (Trans. Ent. Soc. Lond., 1874, p. 131). The combination of many larvæ to produce a patch of colour like the bark on which they rest is very interesting, as also is the "homing" instinct which leads the larvæ to return to the same spot at the end of each night. It would be useful to experiment in order to ascertain the cause which enables them to return and collect together, whether following the clue afforded by a thread or otherwise. A gregarious habit in order to promote concealment by the production of a brown patch has been described in the young larvæ of *Mania typica* (Proc. Zool. Soc. Lond., 1887, p. 241).

The adjustment of the colours of the larva of *M. leighi* to the trunk of a tree on which it does not feed is a further and very interesting proof to the many already supplied that this colour-relation is in no way associated with food.

A careful drawing of the larva of *Matarbela* sp. and an investigation of the structure of its dorsal appendage would be valuable.

When Mr. Leigh considers that the conspicuously-coloured Heterocerous larvæ are the most abundant in Natal, is it not likely that sufficient allowance is not made for the far greater difficulty in finding the others and for the immense number of cryptic species of which the larvæ are as yet undiscovered?

It is probable that the spines of the larva of *Lophostethus dumolinii* are not mimetic of Saturniidæ, but an indication of real affinity. All Smerinthine larvæ and many other Sphingidæ may be seen by the lens to be covered with spines during the first stage, and these spines are often forked. A drawing of the young larva of *Macroglossa fuciformis*, magnified a few diameters, would show a most astonishing form apparently very different from anything that we are accustomed to regard as a Sphinx. (See Trans. Ent. Soc. 1887, pp. 568–74, together with the references cited.)

Professor POULTON then exhibited the cocoons of *Eublemmistis chlorozonea* sent by Mr. G. F. Leigh in illustration of his paper. He also showed a specimen of *Polygonia* (*Grapta*) *C-album* in the attitude of prolonged repose, together with specimens of *Anæa moeris* set in different ways to illustrate its probable resting position, and upon these specimens he read the following notes:—

"Many years ago I came to a conclusion as to the probable meaning of the 'C' or 'comma' on the under surface of the hind-wings in butterflies belonging to the genus *Polygonia* (*Grapta*). I believe that it represents, in bright, strongly-reflecting 'body-colour,' the light shining through a semi-circular rent in a fragment of dead leaf,—the rent produced when a little segment of leaf has broken away along a curved line, but still remains connected with the rest across the chord of the arc. Unless such a segment remains precisely in the plane of the leaf, light may pass through a curved and often a semi-circular slit-like window. Such curved cracks are extremely common in old weather-beaten dead leaves. They are probably produced by drying and shrinkage after much wetting and some decay.

"On April 23rd last I had the opportunity of testing how far the whole attitude of *Polygonia C-album*, during profound repose, is consistent with the interpretation suggested above. By a curious coincidence I had been speaking of the differences between temporary and prolonged resting attitudes in butterflies, at the meeting of the Entomological Society of France on the evening of April 22nd, and the very next morning saw for the first time in my life the position of this species during complete repose. The day was excessively cold for this time of the year, and the butterfly was hanging perfectly torpid from the horizontal rail of a wood fence in a street at Passy. Several excellent but very small photographs were taken with my daughter's camera: enlargements have been made, and from these the actual specimen has been set and photographs of the natural size taken by Mr. Robinson in the Oxford University Museum.

"The specimen which is now exhibited affixed to a piece of stick in precisely the same manner in which it hung from the rail, shows that the two anterior wings are held so far forward that a deep wedge-shaped notch appears between them and the hind-wings. On each side of this notch the well-known ragged outline of the wings is extremely distinct. The two posterior pairs of legs by which the butterfly clings to the supporting surface are light-brown in colour and unexpectedly conspicuous. The antennæ are concealed, and the contour of the head does not break that of the costal margin of the anterior wings so as to interfere in any way with the general effect. The whole appearance is consistent with a single interpretation—concealment effected by resemblance to a weather-beaten fragment of dead leaf, deeply notched and ragged, and hanging by two denuded fibro-vascular 'veins' standing out far beyond one of the edges. The kind of injury suggested by the 'comma' only adds another convincing detail to a perfectly harmonious cryptic effect.

"It is interesting to compare this mode of concealment with that which is far commoner in Nymphaline genera (*Kallima*, *Doleschallia*, *Anæa*, *Precis*, etc.), viz. the resemblance not to a fragment but an entire dead leaf, with midrib and suggestion of lateral oblique venation. In this latter form of disguise, holes are frequently suggested in the apparent leaf, either by opaque 'body-colour' as in *Doleschallia*, by transparent windows as in *Kallima*, or by actual discontinuity, as is probably the case in certain species of *Anæa* in which the deeply-cut bay in the inner margin of the fore-wing may be converted into the likeness of a hole by closure along its open side by the costal margin of the hind-wing, in the manner indicated in one of the specimens exhibited. In certain parts of the under surface of *Kallima* a hole is suggested by 'body-colour,' in other parts by transparency, and the latter is undoubtedly the more recent and more highly-specialized method; for when the transparent window is examined under the microscope scattered opaque white scales can still be seen in abundance over its surface, not thickly placed so as to prevent the passage of light, but witnesses to an earlier and less perfect representation of light shining through a hole.

"It is interesting to note that the holes represented in these apparent dead leaves seem to have been produced by gnawing, whereas in the leaf-fragment suggested by *C-album* the forces of the inorganic environment, which by their prolonged action have produced the wear and tear of the margin, have also been responsible for the more centrally-placed discontinuity. Comparing various species of the genus *Polygonia* (*Grapta*), it is seen that the curved C-like window occurs in several; in some the suggested rent is V-like, while occasionally the mark appears to represent a hole of a reniform shape."

Professor Poulton also exhibited a pair of *Hypolimnas misippus* taken "in coitu" on Feb. 3rd, 1903, by Mr. Horace A. Byatt, B.A. (Lincoln College, Oxford), near his highland home at a height of 4500 to 5000 feet, in Dedza, Central Angoniland, British Central Africa. The specimens are remarkable in that the female is excessively worn and old, far more so than the male. Such an observation tends towards the conclusion that pairing occurs more than once in the life of an individual of this species.

Mr. Byatt writes (Feb. 15th, 1903) concerning the species —"Close round my house *H. misippus* is in vast numbers just now, but other species are not very numerous. You will see that at Dedza *L. chrysippus* is quite rare—at least at this season. I have sent you only two, I think, and my eyes are always open for it." This observation of relative abundance certainly suggests the Müllerian rather than the Batesian interpretation of the mimicry of the former for the latter species; although quite near to Dedza the proportions may be entirely different. The following passage shows how rapidly Mr. Byatt can pass from one kind of area into another. "You must understand that I have two distinct climates to work in. I am about 4500 to 5000 feet up—the top of Dedza is 7000 —and I drop straight down into what is really tropical Africa on the lake level: tropical foliage, swamp, damp atmosphere and intense heat. This station might be in S. Africa—say the Orange River Colony. Consequently Lepidoptera are widely different: in this open country they are fewer and more sober in colouring; down below they are plentiful, more varied, larger and more gaily coloured. *Precis* so far seems to be below 3000 feet, and extremely rare up here."

The observations of another friend further to the north in Africa also show the great abundance of *H. misippus* and how far it is from occupying the subordinate numerical position assigned to mimics by the late H. W. Bates. Between January 20th and 25th of the present year Mr. C. A. Wiggins captured at Kisumu, near the terminus of the Uganda line, on the N.E. shore of Lake Victoria Nyanza, the following specimens of this model and mimic:—

Limnas chrysippus.	*Hypolimnas misippus* (females).
Type-form 10.	Type-form 27.
klugii-form 20.	*inaria*-form 16.

And again at the end of January and the beginning of February:—

L. chrysippus.	*H. misippus* (females).
Type-form 73.	Type-form 18.
klugii-form 85.	*inaria*-form 15.

These results are roughly compiled from the unset specimens, but no serious modification of the proportions is to be expected. Mr. Wiggins' very large and interesting series of captures, bearing upon many bionomic problems of the highest interest, are now being studied in the Hope Department by Mr. S. A. Neave, B.A., of Magdalen College.

Paper.

Mr. G. A. J. ROTHNEY communicated "Descriptions of twelve new genera and species of *Ichneumonidæ*, and three new species of *Ampulex* from India," by PETER CAMERON.

Wednesday, June 3rd, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Exhibitions.

Mr. G. C. CHAMPION exhibited numerous specimens of *Coccinella distincta*, taken during the past few days in the pine woods of Woking. They were found, as usual, running about the ground in company with *Formica rufa*, and were perhaps wanderers from some other locality. Mr. DONISTHORPE said the species was still common at Weybridge in the nests of *Formica rufa*, and that he had observed it also at Bexhill, while Mr. CHITTY noted its former occurrence in Blean Woods in great numbers. The life history of the larva, he said, had not been worked out. Mr. CHAMPION suggested that it might pick up stray aphids dropped by the ant.

Mr. H. ST. J. DONISTHORPE exhibited a very remarkable melanic form of *Halyzia* 18-*guttata*, L., black with white spots, the type, which was also exhibited, being light brown with white spots. The former was taken at Oxshott on the 22nd May. He also exhibited *Stilicus fragilis*, Gr., a melanic form with a black thorax instead of red as in the type, taken at Shirley on May 15th; and *Staphylinus fulvipes*, Scop., taken by himself at Bamber Forest on June 1st, a new locality for this rare beetle.

Dr. T. A. Chapman exhibited two full-grown larvæ of *Thestor ballus*, sent by Mr. H. Powell, from Hyeres. In its previous stages the back, except the dorsal line, is bright yellow, from the metathorax to the sixth abdominal segment, the ends being reddish, giving the larva a very brilliant appearance, while the conspicuous black spiracles on the top of the seventh and eighth (abdominal) segments give very much the appearance of a mammalian head to these segments. In this last skin the colours are much darker and more red-purple, and the posterior spiracles less obvious. The front of the larva has now much more the aspect of a head, say of a wild boar, largely owing to the uniform colour, black spiracles, and depression of the prothoracic plate which characterises the larva throughout. There are two eversible glands behind the last pair of spiracles as well as the glandular line across the preceding segment. The lenticles are very inconspicuous. The President remarked that the terrifying appearance usually occurred in large insects.

Dr. Chapman also exhibited a larva of *Heterogyna paradoxa*, full fed, reared from the egg at Reigate, and a cocoon of *Orgyia auro-limbata*, with parasite Braconid. In this instance a larva produced an imago and the parasite. The cocoon when opened last October showed the cocoon of a Braconid within it ; a dense oval-ribbed cocoon of whitish silk, with longitudinal darker flutings. One compartment of the *O. auro-limbata* cocoon was quite empty and flattened, the other contained larva-skin of *Orgyia*, pupa-skin of *Orgyia*, a small shrivelled ♀ of *Orgyia* denuded of wool and containing eggs (perhaps a dozen), and the microgaster cocoon, which was well coated with and entangled amongst the loose wool of the moth. The cocoon looked as if made first and mixed up in the hairs afterwards. If this be correct, then the microgaster larva emerged from the pupa, and the moth nevertheless emerged afterwards. As against this, the cocoon was loosely, if at all, attached to the cccoon of the moth, as one would expect it to be if it emerged from the pupa. In that case it must have emerged from the moth. In any case, the microgaster and the moth both came from the same larva, and the moth, though containing few eggs and (not being fertilised) laying none, was nevertheless energetic enough to denude herself of all her clothing. An imago and a parasite from the same larva have not infrequently been recorded, but very often doubt has been thrown on the occurrence. In this instance this is impossible, since the apterous female of *O. aurolimbata* not only never leaves her cocoon, but never makes an opening in it, that being done by the male. In this case the cocoon had no opening in it, and nothing had gone in or out since the larva spun it. The miserable development of the female showed that it had suffered some serious malady, and there was no trace of a second larva having been in the same cocoon. Some Fellows may like to be assured that the wretched fragment exhibited is really the imago of a moth. Such as it is, it is precisely like the ordinary female of *O. aurolimbata* after she had laid her eggs and denuded herself of her wool and died in the cocoon. The only difference is that this specimen never had any eggs to lay.

The President exhibited the dry form of *Precis actia* bred by Mr. Guy A. K. Marshall from an egg laid by a female of the wet form. The parent was captured by Mr. Marshall at Salisbury, Mashonaland (5000 ft.), on February 14th, 1903; the egg was laid on the following day. It hatched February 20th, the larva pupated March 16th, the perfect insect, a male, emerged March 28th. The differences between these two forms are as astonishing as those between the two phases of *Precis antilope*, bred, the dry from the wet, by Mr. Marshall last year (Trans. Ent. Soc. London, 1902, pp. 418–20). In fact, upon the upper surface of the wings the differences are much greater than in this latter species, the dominant colour upon the black background of the dry form of *actia* being blue, as it is in the dry form of *sesamus*, while the red is of so deep a shade as to be sombre and inconspicuous. In the wet form these blue markings are only represented by marginal, submarginal, and apical traces, while the dull red becomes a bright and vivid reddish-brown, which forms a startling contrast with the background and the row of black spots which crosses both wings. Within these spots, in the position of the chief blue band of the dry form, the reddish-brown band of the wet form passes into a brilliant pearly white in the female, into a pale reddish-brown in the male,—forming in each case a startling contrast with the nearly black basal half of both wings against which it terminates abruptly. Intermediate forms are probably much commoner than in *P. sesamus.* In one dry male out of four in the Hope Department, the chief blue band is in large part replaced by an intrusion of dull red. The extraordinary differences in shape are the same as those between the two forms of *P. antilope* (compare Fig. 3 on Plate XII of Trans. Ent. Soc. Lond., 1902, with Figs. *3a* and *3b*), and much greater than those between the forms of *P. sesamus* (compare Fig. 1 with 1*a* or 2 with 2*a* on the same plate). In the dry phases of *actia* and *antilope* the hooked tip of the fore-wing is even more recurved than in that of *sesamus*, while the prolongation of the anal angle of the hind-wing which is so marked a character in the two former is wanting in the latter species. These characteristic features in the contour of the wings in the dry *antilope* and *actia* are related to the beautiful and detailed resemblance of their under-sides to dead leaves, while the greenish-black underside of the dry *sesamus* is well concealed by a general harmony with the dark shady environment which it seeks for prolonged rest, rather than by any detailed special protective resemblance. Hence the necessity for a profound modification of shape is far less imperative in this latter. It has been pointed out that the upper-side differences between the two phases of *actia* are greater than in *antilope.* As regards their under-sides the reverse is the case, because this surface is so much less conspicuous in the wet phase of the former when compared with that of the latter species. It is, however, very far from being cryptic, attaining nearly the same degree of conspicuousness as *Precis trimeni* which Mr. MARSHALL considers to be another of the wet forms of *antilope* (*l. c.* pp. 419, 420). The representation of a dead leaf by the underside of the dry *actia* is slightly more elaborate than in *antilope.* Both species have an equally beautiful mid-rib-like stripe, but the former alone possesses the representation of two holes, the posterior minute, near the tip of the simulated leaf—due to white semi-transparent spots. Equally elaborate detail is seen in *P. cuama*, of which *P. trimeni* is the wet form. In Mr.

Marshall's opinion, however, *P. antilope* and *P. cuama* are two dissimilar dry forms and *simia* and *trimeni* two dissimilar wet forms of a single species. It is much to be hoped that the point will soon be settled by breeding.

Mr. Marshall is to be warmly congratulated on this third South African species of the genus *Precis*, in which he has produced incontrovertible evidence of the specific identity of forms widely separated in colours, patterns, shape, relation of upper- to under-side, etc., and even instinct, including the selection of a particular type of country.

The President also showed a small series of ants, part of a much larger collection made by the late W. J. Burchell in Brazil between the years 1825 and 1830. They were obtained with his other vast zoological and botanical collections at Rio or its neighbourhood, or in the course of the long journey from Santos to Pará. Considering their great age the specimens were wonderfully well preserved and are accompanied by remarkably exact and detailed data, and, in many cases, interesting notes on habits, instincts, etc. Hardly anything in the whole of the zoological material, all of which was presented by Miss Anna Burchell to the University of Oxford in 1865, has as yet been published. Arrangements were now being made to ensure that these interesting results may, with as little delay as possible, be given to the scientific world.

The President then gave a summary of his paper on the effect of lichen-covered bark, etc., upon certain Lepidopterous larvæ. He explained that these results were now being brought forward about ten years after the experiments had been begun. The delay was to be explained by the disorganization of the library and papers of the Hope Department during the building operations in 1894. As a result the notes of the Professor and Mr. Holland, as well as the beautiful water-colour drawings made by Mr. P. J. Bayzand, were mislaid, and when everything necessary had been recovered the press of other work for a time prevented this memoir from being undertaken.

The chief object of the investigation was to test the efficiency of lichen-covered bark as a stimulus for the production of a lichen-like appearance in certain larvæ. It was found that

Gastropacha quercifolia was highly sensitive to such a stimulus up to the beginning of hybernation, but that during and after hybernation, all such susceptibility entirely ceased. The larvæ were also sensitive, during the same period, to brown and black bark, which caused the appearance of corresponding tints. In all experiments the food made use of was the same, viz. the leaves of the hawthorn.

Odontopera bidentata was also sensitive to the same surroundings, lichen in the environment producing the well-known green patches on the dorsal surface.

The rigid restriction of the sensitive period to the earlier part of larval life in the case of *quercifolia* suggested a set of transference experiments on the highly sensitive larva of *Amphidasis betularia*, carried out in the summer of 1896. The result was to prove that this species remains sensitive, at least to the strongest stimuli, viz. those provided by dark bark, for nearly the whole of larval life.

Papers.

Mr. O. E. Janson communicated a paper "On the genus Theodosia, and other Eastern Goliathides, with descriptions of some new species."

Colonel C. Swinhoe communicated a paper on "New genera and species of the family Lymantriidæ in the National Collection."

Mr. G. W. Kirkaldy communicated a "Memoir on the Rhynchota collected by Dr. Arthur Willey chiefly in Berara and Lifu."

Professor E. B. Poulton read an account of "Experiments in 1893, 1894, and 1896 on the colour-relation between certain lepidopterous larvæ and their surroundings, and especially the effect of lichen-covered bark upon *Odontopera bidentata* and *Gastropacha quercifolia*."

Wednesday, October 7th, 1903.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. F. M. LITTLER, Althome, High Street, Launceston, Tasmania; Mr. H. SWALE, M.B., Arawa House, Rotorua, New Zealand; Col. JESSE GRIGGS PILCHER, I.M.S., F.R.C.S., 133 Gloucester Road, Kensington, S.W.; Mr. S. A. NEAVE, B.A., Magdalen College, Oxford; and Mr. C. A. WIGGINS, Kisuma, Lake Victoria Nyanza, British East African Protectorate, were elected Fellows of the Society.

Exhibitions.

Mr. G. C. CHAMPION exhibited on behalf of Professor Hudson Beare some specimens of a *Niptus* new to the British list, captured at Messrs. Horsnaith and Reynolds' granary, Strood, on May 11th, 1901. The specimens were found crawling about on empty sacks inside the building, and were probably numerous; the insect being mistaken for another, only a few were taken.

Mr. C. O. WATERHOUSE exhibited on behalf of Mr. Charles Pool specimens of a beetle of the genus *Niptus* closely resembling *N. crenatus*, but with distinct shoulders, and more parallel elytra which also are less strongly striated. They were found in large numbers in a corn-chandler's at Edmonton. The insect had no doubt been introduced, but whence it was impossible to say. It was new to the Museum collection, and Mr. WATERHOUSE had not been able to find it described.

Mr. H. ST. J. DONISTHORPE exhibited specimens of *Aphanisticus emarginatus*, a beetle new to the British list, from Parkhurst Forest, where it occurred plentifully this year, and a Scymnus new to science, from Yarmouth, Isle of Wight.

Mr. M. BURR exhibited a living adult male earwig, *Labidura riparia*, Pall., captured near Boscombe at the end of August 1903. He said that the very noticeable pale coloration becomes darker after death, sometimes nearly black, which might account for some of the numerous "colour-varieties." He had observed that the insect used its forceps with great agility to seize a very active bluebottle which was placed with it. It greedily devours flies, leaving the chitinous shell and horny parts sucked dry.

Dr. NORMAN JOY exhibited a specimen of *Argynnis selene*, taken last year in Berkshire, showing a remarkable tendency to melanism. He also exhibited Coleoptera taken in the same county during 1903, including *Dinarda dentata*, from a nest of *Formica sanguinea* at Wellington College; and *Notothecta confusa*, Märk, from the nest of *Formica fuliginose* from the same locality. Also *Aleochara mærens*, Gyll., from fungi; *Philonthus fuscus*, Grav., from a *Cossus*-infected tree at Bradfield; *Scopæus sulcicollis*, Steph., from a sandpit at Bradfield; *Diplocælus fagi*, Gaer., from Streatley; *Aphanisticus pusillus*, Ol., from Aldermaston; *Colon dentipes*, Sahl., from Bradfield; and *Elater elongatulus*, Ol., from an old fir-stump at Mortimer.

Sir GEORGE HAMPSON exhibited a collection of Norwegian butterflies made by him on the Dovrefjeld, on the Alten fiord, at Bossekop, and other localities this year, and remarked how greatly the dates of emergence appeared to differ from those experienced by Staudinger and other collectors. The specimens included fine series of *Colias hecla*, Lef., *Chrysophanus hippothöe*, var. *stieberi*, Gerh., *Œneis norna*, Thnb., *Melitæa*, var. *Norvegica*, Auriv., the Norwegian form of *M. aurelia*, *Argynnis freija*, Thnb., and *A. frigga*, Thnb., a Labrador, arctic, and North American species, now found further south at Kongsvold for the first time.

Mr. A. H. JONES exhibited examples of *Erebia christi*, taken this summer in the Laquinthal, and of the species of *Erebia* to which it is allied; *Satyrus actæa*, var. *cordula*, captured last July at Sierre, having four equal-sized pupilled eyes on the fore-wings, probably a local form peculiar to this warm locality; a short series of *Chrysophanus dorilis* (type) and *C.* var. *subalpina* from the Laquinthal, with *P. hippothöe*, var. *eurybia*, showing the strong resemblance on the upper surface, which the ♀ of this latter species bears to the ♀ *subalpina*.

Mr. A. J. CHITTY exhibited specimens of a Proctotrupid which he said approached *Poncra constricta*, Latr., in appearance, and might be an *Isobrachium*. If so, it was new to the British list. He also showed a specimen of *Pieris napæ*, and the head of a Bombus, severed from the body when found by him, but still alive, and opening and shutting its jaws, illustrating the manner in which these insects are attacked by their enemies.

Mr. H. Willoughby Ellis exhibited *Criocephalus polonicus*, Motsch, a Longicorn beetle new to Great Britain, and also specimens of all stages from the egg to the imago, to illustrate the life-history of the species which he explained. The insects were taken in Scotch fir-trees this year in the New Forest; and the fact that the larva was found plentifully seemed to prove that the colony had been in existence for some considerable time. He also exhibited specimens of *Asemum striatum*, L., with larva and pupa, accounted heretofore rare in the New Forest, but this year occurring in abundance.

Mr. Ambrose Quail exhibited cases showing the life-history of some Australian *Hepialidæ*.

Dr. D. Sharp, F.R.S., exhibited specimens illustrative of the egg-cases, and life-histories of eight species of South African *Cassididæ* as described in a paper by Mr. F. Muir, and himself. The larvæ displayed, with one exception, the peculiarity of retaining the cast larval skins as accumulations on the long anal processes with which the larvæ are provided. The exception is the larva of *Basipta stolida*. In this species the anal tails are more robust and better developed than usual, but they do not carry the exuviæ, and are probably used for some other purpose. The egg-cases showed a very interesting series of degrees of perfection; some of them consisting merely of a few membranes enclosing two or three eggs, and covered with a patch of excrement; while in the case of *Aspidomorpha puncticosta* the oötheca is among the most remarkable and perfect structures produced by any animals. Both the larvæ and eggs are extensively destroyed by parasitic Hymenoptera.

Mr. W. L. Distant also showed the pupa cases of some African species of the genus *Aspidomorpha*, South, with the cast heads of the larvæ. Sir George Hampson said that in the case of some *Nolidæ* these cast skins acted as a protection, the enemy attacking them instead of the insects themselves.

Mr. Roland Trimen, F.R.S., exhibited some cases of mimicry between butterflies inhabiting the Kavirondo-Nandi district of the Uganda British Protectorate, particularly that in which *Planema poggei*, Dewitz, is imitated by an apparent variety of *Pseudacræa künowii*, Dewitz, and also by a hitherto undescribed form of the polymorphic ♀ *Papilio merope*, Cram. He mentioned that both *Planema poggei* and *Pseudacræa künowii* were described and figured by Dewitz in 1879 from single specimens taken by Dr. Pogge in Angola, and added the interesting fact that the only other example of the undescribed mimicking form of the ♀ *Papilio merope* known to him—in the Hope Department of the Oxford University Museum—is ticketed "Angola; Rogers, 1873." Now, all three butterflies had been found as far to the eastward as Uganda, the *Planema* apparently not uncommonly, but its two mimickers very rarely indeed, by Mr. C. W. Hobley, of Kisumu.

This case was of special interest because it was the first brought to notice of the mimicry of one of the *Acræinæ* by a ♀ *Papilio* of the *merope*-group of the genus, members of the Danaine genera *Amauris* and *Danais* being the known models copied. Yet it must not be forgotten that the extremely rare form of ♀ of the Abyssinian *Pap. antinorii*, Oberthür, named *Ruspinæ* by Kheil, mimicked the moth *Aletis helcita* more closely than it did *Danais chrysippus*; and the large number of variations in various directions from the principal and pronounced mimicking forms of the *merope*-group indicated plainly how plastic and adaptable they remain for modification in any advantageous direction.

Planema poggei was one of the largest species of its genus, and must be very conspicuous in life owing to the very broad postmedian transverse rich ochre-yellow band of the fore-wings in contrast with the white median band of the hind-wings. The *Pseudacræa*—which Mr. Trimen referred with some hesitation to *Ps. künowii*, on account of the different markings on the under-side of the fore-wings in the premedian area—was an excellent mimic of the *Planema* in every way, except in the narrower white band of its hind-wings. In Mr. Hobley's large collection only one example (♀) of this *Pseudacræa* occurred, and similarly only one of the undescribed form of the ♀ *Pap. merope*.

The characters of the last mentioned were the following, *vid.* :—

Fore-wing: *markings rich deep ochre-yellow,—the sub-apical bar, disco-cellular streak, and much narrowed, but superiorly prolonged inner-marginal patch being confluent into a wide discal band* very irregular in outline; some slight fuscous scaling on yellow band between 2nd and third median nervules indicates the normally wide separation between the sub-apical and inner-marginal markings; ordinary apical spot wanting; two small sub-marginal spots respectively above and below 2nd median nervule of the same ochre-yellow as the discal band. *Hind-wing*: white patch from base outward much restricted, barely reaching middle and extending only just beyond extremity of discoidal cell; sub-marginal spots all dull ochre-yellow except the three next apex which are white. *Under-side*: Apex of fore-wing and all outer area of hind-wing of a paler brown than in the form *Hippocoon*. *Fore-wing*: ochre-yellow bar as above but rather paler, and with scarcely any fuscous scaling between 2nd and 3rd median nervules; an additional sub-marginal very small ochre-yellow spot close to posterior angle. *Hind-wing*: restricted white patch as above, but much duller.

The second example (from Angola) of this form of the ♀ *merope* agreed very nearly with the Uganda specimen above described, only differing in the rather duller ochre-yellow of the band in the fore-wings; in the presence in the same wings of a very small ochre-yellow apical spot, and of a similar spot close to the posterior angle on the upper-side; and on the under-side the increase of the fuscous scaling about 2nd median nervule, so as almost to interrupt the yellow discal band.

This made the *fourth* pronounced known form of the ♀ *Papilio merope*. The usual and generally distributed form of this sex throughout Tropical Africa was that named *Hippocoon*, by Fabricius—an excellent mimic of *Amauris niavius*, L.; all the other forms appeared to be very rare, and two of them —*Dionysos*, Doubl., and the form from Zanzibar described in Mr. TRIMEN's Presidential Address to the Society on January 19, 1898—were not direct mimics of any other butterflies, but were least divergent from the non-mimetic coloration and pattern of the male. The form which he now brought to notice was, on the contrary, a direct and unmistakable mimic of *Planema poggei*; and, as it was inconvenient to refer to the mimetic forms without assigning names to them, he proposed to style this form *Planemoïdes*.

The President congratulated Mr. Trimen on the exhibit, and the special interest attaching to an interpretation of this remarkable form of the female *meropė*. The Society would sympathize with the feelings of the author of the original discovery brought before the scientific world, more than thirty-five years ago, of the most remarkable of all examples of mimicry in Rhopalocera, that of *merope* and its allies, as he saw before him for the first time this mysterious form accompanied by its model. At the same time it was only just to a younger worker, who had been in great part guided by Mr. Trimen's classical monographs, to point out that the interpretation so convincingly illustrated that evening had been made out last spring by Mr. S. A. Neave, B.A., of Magdalen College, Oxford, who had just become a Fellow of their Society. Mr. Neave had exhibited this form of the female *merope* together with *Planema poggei* as its model at both *soirées* of the Royal Society in May and June, a time when Mr. Trimen's absence from England unfortunately prevented him from seeing them. Mr. Neave had shown at the same time another most striking and interesting member of the same group, a species of *Elymnias*, almost certainly a form of *E. phegea*, Fabr. He had formed the group in the course of an investigation into the bionomics of a very fine set of butterflies from the north-eastern shores of Lake Victoria Nyanza, presented to the Hope Department by Mr. C. A. Wiggins. Still later Mr. Wiggins had captured and presented further consignments, including a small but very interesting set of specimens from Entebbe. Among the later series, and especially that from Entebbe, Mr. Neave had found additional members of the same group:—another Acræine butterfly, viz. *A. aurivillii*, Staud., synaposematic with the principal model, *Planema poggei*; the *Pseudacræa*, exhibited by Mr. Trimen, *P. künowii*, Dewitz, var.; and a second probably undescribed species. All the above are obvious and strongly characterized members of the "*Planema poggei* group": a more outlying, but apparently distinct member was found in the female of *Precis rauana*, Grose-Smith.

Dr. T. A. CHAPMAN exhibited butterflies taken last summer near Biarritz, and in Spain, in the Logroño Sierra.

These he suggested were probably examples of homœochromatism. Little attention has been directed to homœochromatism in European butterflies, and these were certainly not examples of the detailed mimetism we are now familiar with in Müllerian groups from the African and neotropical regions. The first of these sets of associated species has, however, some of the aspects of a Müllerian group. It contains three species, which are all on the wing together in very restricted habitats, into which the numerous other butterflies flying at the same time in the immediate vicinity do not intrude. They have the same general appearance and coloration when flying; a peculiarity which none of the outside species happen to possess.

They are dark, almost black on the upper-side, a colour rather unusual amongst European butterflies, and besides these three, only found, I think, in *Aphantopus hyperantus*, and in *Satyrus actæa* and *S. cordula*; in the two latter without the dingy brownish tone of the species exhibited.

The locality is at Guéthary, a most pleasing little watering-place near Biarritz, and the date July 29-30, 1903.

The three butterflies are *Cœnonympha œdipus*—of course of the southern (western) French form, rather larger and better marked than the type—*Heteropterus morpheus*, and *Satyrus dryas*. They are confined to small boggy or swampy hollows an acre or two in extent—rarely more than five or six—often a mile or two apart. The two first species do not leave these hollows, and if by any chance a specimen is driven a few yards up the surrounding slopes, it at once begins to work its way back again.

The third species, *S. dryas*, is extremely abundant in some of these swamps, and seems to be really equally confined to them, though its abundance and comparative large size and powers of flight lead to its making short excursions up the slopes, and an odd one or two was even seen on the levels above.

The only other butterflies seen in the bogs at the same time are comparatively rare—viz. a few *Brenthis euphrosyne* and *Augiades sylvanus.* The country around and above abounds in various common butterflies; the common "whites," *Leptidia sinapis*, *Colias edusa*, and *C. hyale*, several Vanessas, *Satyrus arethusa* abundant, and *Epinephele tithonus* in swarms; *Pararge ægeria*, *Cœnonympha arcania*, *Chrysophanus phlæas*, etc. None of these visit the swamps except by rare accident, *C. edusa*, which goes straight across everything, being in fact almost the only species doing so.

Last year, at St. Jean de Luz, we found *S. dryas* and *H. morpheus* on very similar ground, but *C. œdipus* was wanting. This was in a swamp or bog at nearly sea-level in the open river valley. *C. œdipus* appears to require the protection afforded by the steep slopes, surrounding on all sides the hollows in which we found it. These hollows are the upper ends of small streams, perhaps a couple of miles from the sea, and the little valleys wind enough for one to say that the swamps are surrounded on *all* sides by very steep slopes of 100 to 300 feet, rising to the general low undulating country behind Guéthary, the highest point of which cannot be of more than 500 feet elevation.

I have found *S. dryas* in various localities, generally on low-lying or shady, and, I imagine, more or less boggy ground. Here and there, as at Aix, I have met with it where I thought it abounded on dry slopes, but I suspect it must really have belonged to damp places adjacent. Nor have I anywhere else than at Guéthary been so impressed by its slow, floppy flight. I must confess, however, that I have usually regarded it as too common a butterfly to be worthy of much attention.

In the Entomologist's Monthly Magazine for 1894, p. 221, Mr. W. E. Nicholson notes the association of these three butterflies in a marsh near the Lac de la Négresse, near Biarritz. He places with them *S. arethusa* and *S. statilinus*, not, perhaps, thinking it necessary to mention, what he tells me is stated, however, in his diary, that these two butterflies occupied drier ground close by. At Guéthary *S. arethusa* was abundant on the higher open ground. The Lac de la Négresse is well sheltered from the sea by an intervening hill.

I do not know, but the European distribution of *morpheus* and *œdipus* suggests them as frequent associates, whilst *dryas* is probably always common enough to join the group. If not so rare in the S.E. of France as they are (*œdipus* is, I believe, absent), it is certainly not so widely distributed there as elsewhere. Without forming any theory as to the cause of the homœochromatic separation of these butterflies from the other species of the district, it seems difficult to believe that it is merely fortuitous. Assuming for the sake of argument that it is an instance of Müllerian association, several points may be worth noting. The three butterflies are of very much the same colour on the wing, and no other of the butterflies flying in the country around at the same time are at all like them. They keep together, and are not mixed up with their neighbours. They fly in a slow, floppy manner, and are captured with the greatest ease. Not to be misunderstood, I must add that even *C. œdipus* can mend its pace at need, whilst *H. morpheus* has the capacity for a sudden and almost mysterious disappearance that many skippers possess, and *S. dryas* is, when it likes, a very strong flier.

To associate the three forms together, as differing from everything else, must be as inevitable to the bird or other predaceous enemy, as to the entomologist. Equally, however, it must happen that such enemy, if it were useful to him to do so, could not possibly fail to discriminate between them with the greatest facility. *S. dryas* is at once separated by its great size, whilst the peculiar hopping, dancing flight of *H. morpheus*, in which it shows the colour and even marking of its under-side, is unmistakable. We have here none of the detailed agreement of colour and markings that we are now so familiar with in neotropical groups.

I do not know of any association of European butterflies that is quite parallel to this one, nor has it before occurred to me to regard any other association of butterflies I have seen, as being of homœochromatic significance, whatever that may be. "Blues" often swarm together, but they seem to be blue because they can't help it, and not of any set purpose. Similarly one finds *Chrysophanus virgaureæ* and *C.* var. *rutilus* together, and *Thecla spini* and *T. ilicis*, and so on.

The *Erebias* are perhaps less accidental: several of the "grass" *Erebias* are generally found together, usually I imagine fortuitously; but *E. eriphyle,* which I found in Carinthia established in localities by itself, rarely occurs in Switzerland except with, and possibly protected by, *E. pharte.* Again a few years ago I found at Guarda (Lower Engadine) *E. pharte* and *E. manto,* forms usually abundantly distinct, equally common on the same ground, and most specimens of such approximating forms as to require some little care to discriminate them. But all these "grass" *Erebias* are apparently very closely related. This year I found associated in Spain two *Erebias* that belong to very different sections of the genus—viz. *E. evias* and *E. stygne.*

In the district examined these were always on the same ground; if one was found you might be sure very soon to see the other. *E. evias* is an early species. At Digne and Locarno I have found it in April, *E. stygne* usually at the beginning of July. But these dates must be largely a matter of elevation in each locality. Central European specimens are certainly rarely taken together, and they differ much in habits of flight and especially in size. Rühl gives *stygne* as 38–42 mm., and *evias* 45–49 mm., and though both vary rather more, and *evias* is usually 50–55 mm., this fairly represents their ordinary relative size. Our specimens from Canales and elsewhere present the two species as very much the same in size, *stygne* indeed being if anything the larger and closer together in colour and marking than the usual Swiss or French specimens.

Evias was perhaps a week earlier than *stygne,* but both flew together all the time we observed them, perhaps about a fortnight. The *evias,* though not quite agreeing with description, are no doubt substantially of Zapater's var. *hispanica,* whose leading difference is its smaller size than the type. The *stygne* are not so large, or otherwise quite the same as my var. *bejarensis,* but are rather intermediate between the type and that local race.

Zapater says nothing of *stygne*, which was not reported from Spain, till taken last year by Mrs. Nicholls and by us. We did not see *evias* last year when taking *stygne*, var. *bejarensis.* So that the association of the species in Spain is far from universal. I may remark, by the way, that the ground where *bejarensis* was found was very different from that affording the species this year. Nevertheless, it seems highly probable that this association has something to do with Spanish *evias* being small and *stygne* larger.

The homœochromatism here consists in these two *Erebias*, so very distinct in their ordinary habitats and belonging to different sections of the genus, when they occur in Spain on the same ground, doing so at the same time, and making a considerable approach to each other in markings and an almost absolute coincidence in size. I have placed with them some *bejarensis* for comparison. It will be noticed that it goes much beyond the Canales form in the direction in which that has varied. Looking at the under-sides, one would say the ♀ *bejarensis* were forms of *evias* and not of *stygne*. Might one suggest that, in Spain, *evias* attracted *stygne* and led to its variation to the form before us, and by this assistance enabled it to get over the intermediate ground, and to pass on when dissociated again from *evias* to the *bejarensis* form?

I note some specimens of *evias* vary very much towards the form, size, and colour of *E. zapateri*. There is no evidence known to me of these species ever being associated (*zapateri* is much later than *evias*), so that this resemblance must be one entirely due to climate and locality.

Erebia stygne in Spain will obviously repay more study; there is the curious problem of the large (high level) and small (low level) forms taken last year at approximately the same dates, and in adjacent localities near the Picos de Europa by Mrs. Nicholls. Has association with *E. evias* anything to do with this as yet unexplained phenomenon?

I propose that the present form of *E. stygne* be called var., or at least local form, *hispanica*, as parallel to *E. evias*, var. *hispanica*. It is rather darker and more strongly marked than the type, and has an average expanse of 48 mm., ranging from 45 mm. to 51 mm.

Dr. CHAPMAN also exhibited living imagines of *Crinopteryx familiella*. These had just emerged at Reigate; where they and their parents, descended from pupæ brought from Cannes in March 1901, had lived out of doors during their active existence, being brought into the house only during their pupal æstivation. This seemed noteworthy in so southern (Mediterranean) a species. The experiment seemed quite likely to continue successful for the next generation.

Papers.

Mr. AMBROSE QUAIL read papers "On the antennæ of the *Hepialidæ*," and "On *Epalxiphora axenana*, Theyr."

Mr. GILBERT J. ARROW read a paper "On the Laparostict Lamellicorn Coleoptera of Grenada and St. Vincent, West Indies."

Mr. THOMAS HAROLD TAYLOR, M.A., communicated "Notes on the Habits of *Chironomus* (*orthocladius*) *sordidellus*."

Mr. F. DU CANE GODMAN, D.C.L., F.R.S., communicated "Descriptions of some new species of *Erycinidæ*."

Mr. W. L. DISTANT communicated "Additions to the Rhynchotal Fauna of Central America."

Dr. D. SHARP, M.A., F.R.S., read a paper "On the Egg-cases and Early Stages of some *Cassididæ*."

Wednesday, October 21st, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S. (President), in the Chair.

Election of a Fellow.

Mr. MONTAGUE AUSTIN PHILLIPS, F.R.G.S., F.Z.S., of 22 Petherton Road, Canonbury, N., was elected a Fellow of the Society.

Exhibitions.

Mr. J. H. KEYS sent for exhibition a black variety of *Carabus nemoralis*, Müll., from Dartmoor, recently recorded by him in the Entomologist's Monthly Magazine.

Mr. G. C. CHAMPION exhibited a series of *Rosalia alpina*, Linn., found by himself on old beech-trees at Moncayo, North Spain, in July last.

Mr. A. J. Chitty exhibited a larva of *Drilus flavescens*, taken by Mr. Pencott, the schoolmaster of Eastling, Kent, near the school buildings.

Dr. T. A. Chapman exhibited an album containing several series of photographs of the development of the embryo within the egg of *Psammotis hyalinalis*, taken in 1901–2 by Mr. W. H. Hammond of Canterbury, and Mr. W. R. Jeffrey. The depth of focus obtained, and the consequent amount of detail exhibited in the photographs was remarkable.

Col. J. W. Yerbury exhibited (1.) 4 ♀♀ of *Gastrophilus nasalis*, Linn., taken at Torcross, Devonshire, from the 19th to the 31st of August last. He said that as this rare species differed in a marked degree in its mode of flight, etc., from the common Horse Bot-fly, *Gastrophilus equi*, it would be as well to draw attention to these differences. *Gastrophilus equi* when flying round a horse visits as a rule the belly and the fore legs. The ♀ carries her ovipositor almost horizontal, and she looks when on the wing like the lower two-thirds of the letter Z (L). *G. nasalis*, on the other hand, carries the ovipositor tucked under the belly and almost parallel to the axis of the body, this gives her when on the wing a peculiar ball-like appearance; *G. nasalis* too always flies to the horse's head. While at Torcross during August and September 20 Bot-flies, 4 ♀♀ *G. nasalis*, and 12 ♀♀, 4 ♂♂ of *G. equi*, were taken round the same horse. The flies came up wind to the horse, *G. equi* always appearing under the belly between the fore and hind legs, while *G. nasalis* would appear in the triangle formed by the fore legs, the neck, and the ground. As a rule, the horse paid no attention to *G. equi*, but *G. nasalis* caused him great alarm. The eggs of *G. equi* were in hundreds on the shoulders and fore legs of this cart-horse, but although the face and nostrils were searched carefully no signs of eggs or larvæ could be found thereon. Exhibiting (2.) *Chersodromia hirta*, Walker, Col. Yerbury said these little Empids were common on the shore near Prawle Point: some were obtained by sweeping over seaweed, while others were taken running about over the sand. Although these insects were loth to take flight, still they were by no means easy to catch as they ran very fast, and even when covered by a glass-bottomed box stuck to the ground rather than run up the box to the glass ; they were therefore very difficult to box. Col. YERBURY also exhibited (3.) *Pamponerus germanicus*, Linn., from Barmouth, taken on the 27th and 30th of June (1 ♂ and 4 ♀ ♀), and from Porthcawl ♂, on the 3rd of the same month. He said this rare species appeared to be struggling to keep its place in the British List. Mr. Verrall took it some years ago in fair numbers at the first-named locality, while Mr. Dale reported it as taken by Capt. Bloomer at Bridgend fifty or sixty years ago. The second locality was probably the same as Capt. Bloomer's. This insect appeared to frequent the marram grass on the sand hills, and a ♀ taken at Barmouth 27th June was preying on a beetle.

Mr. A. H. JONES exhibited specimens of *Melitæa deione* from the Basses Alpes, *M. athalia* from the Cévennes, Upper Engadine, Lago di Loppio near Riva, and *M.* var. *navarina* from Lugano.

Mr. H. ROWLAND-BROWN exhibited *M. didyma*, *M. athalia*, *M. deione* from Digne ; and *M. aurelia*, *M. parthenie* and var. *varia*, with *M. asteria*, from various alpine localities.

Dr. T. A. CHAPMAN exhibited specimens of the same genus from Spain, and Mr. R. W. LLOYD specimens from the Engadine, and eastern Switzerland.

A discussion on the probable affinities of the several named species took place.

Dr. CHAPMAN said that he was really very ignorant of these species, but had come to the conclusion that *M. athalia*, *M. aurelia* and *M. parthenie*, and even perhaps *M. asteria*, were local or seasonal forms of the same species quite distinct in some localities, difficult to separate in others. The larvæ as described vary very little. The difference of the under-sides in the specimens examined by him was quite within the ordinary limits of variation. His own specimens of *M. athalia* taken in Spain appeared to differ but very little from the typical British form.

Mr. J. W. TUTT said he was quite unable to distinguish specifically between various specimens that had been sent to him from Switzerland at various times under the names of *Melitæa athalia*, *M. parthenie* and *M. aurelia*, and he was inclined to think that almost all the specimens caught in the Rhone valley proper and the lower lateral valleys branching therefrom were referable to one species. This, however, he was unprepared to assert, as *M. parthenie* was always recorded as a double-brooded species, and *M. athalia* as a single-brooded one, and only those lepidopterists who could deal with the life-histories of these two so-called species in these districts (1) by breeding, (2) by comparison of the eggs, larvæ and pupæ, could determine the matter. It was to be remembered that in the Rennes district (*teste* Oberthür) and Havre district (*teste* Dupont) typical *M. parthenie* occurred as a double-brooded species in April, May and August, with typical *M. athalia*, appearing, practically on the same ground, as a single-brooded species between these broods, viz. in June. It was also recorded as occurring similarly in Fontainebleau Forest, and certainly, in June 1897, he had found typical *M. athalia* in great abundance there, and, in August 1899, two or three specimens of what might be well considered the double-brooded *parthenie*, but this was the extent of his practical experience with the species in this locality. His doubts as to these species were, however, most increased by the capture of a large number of a *Melitæa*, in the meadows of Grésy-sur-Aix, in late July and August, 1894-1900. Here the time of appearance suggested that the specimens captured must be the second-hood of *M. parthenie*, and this view was further strengthened by the fact that in early May 1897, Dr. Chapman had taken a fine large typical *M. athalia* in the same place, showing that, at any rate, *M. athalia* occurred here earlier in the year; but the July—August specimens of Grésy-sur-Aix, whilst furnishing some examples with the particular facies that experts associate with *M. parthenie* (and existing in the most marked manner in the specimens obtained in the higher alps and known as var. *varia*), are, on the whole, particularly characteristic *M. athalia*, and, so far as can be judged, most are quite indistinguishable from British and Continental specimens of undoubted *M. athalia*; nor must it be overlooked that Dr. Chapman found, as just noted, a large typical *M. athalia* in early May at Grésy, when

M. parthenie should have occurred, for, at this time, *Callophrys rubi*, *Syrichthus malvæ*, and the ordinary early spring butterflies were only just showing there; it is therefore most difficult to come to a conclusion on the July—August specimens captured, and it really becomes a matter of first importance that some lepidopterist with leisure should stay at Aix-les-Bains one season long enough to determine whether (1) *M. parthenie* (as the species is known at Rennes and Havre) occurs at Grésy-sur-Aix in April—May, (2) *M. parthenie* is followed by the single-brooded *M. athalia* of typical form, (3) *M. parthenie* or *M. athalia* produces the second brood which has been found so abundantly in the district in July—August. The only place in which he had captured what he considered more or less typical *M. parthenie* in spring was at Digne in April 1897, but he unfortunately knew nothing about the *M. athalia* reputed to occur at Digne in May—June, or whether a second brood of what he presumed to be *M. parthenie* occurred in July. These points exhibit the weakness of any scientific conclusions based on the haphazard way in which British lepidopterists work on the Continent. We go to the Continent, collect "holiday" series, sort them out maybe according to Dr. Lang's plates, in some cases put on one side the doubtfuls and fill a cabinet series of very typical-looking examples. That at least is the general conclusion one comes to after examining many series in the cabinets of British collectors. What we want are longer series of specimens, and longer rests in the same district. As to *M. berisalensis*, which has been referred to *M. athalia*, the facies of three very fine examples from Martigny given Mr. Tutt by Mr. Sloper, had led him to suggest that the insect does not even appear to belong to the *athalia* group. His impression was that it came very close to *M. deione*, although at present he knew too little of both insects, to wholly support Mr. George Wheeler, who in his recently-published work on "The Butterflies of Switzerland and the Alps of Central Europe," had come to the conclusion that *berisalensis* was a mere Swiss form of the southern species.

Mr. H. Rowland-Brown said that he did not remember having observed *M. athalia* and *M. deione* flying together at Digne in June, but that he had noticed *M. athalia* and *M.*

aurelia on the same slope if not actually overlapping in the mountains about Susa, Piedmont.

The PRESIDENT, who also exhibited some forms of *M. aurinia* taken by Mr. A. H. Hamm at Basingstoke and elsewhere, and specimens of *M. athalia*, *M. didyma*, and *M. phœbe* from Asia Minor and Persia, continued the discussion, in which Mr. M. JACOBY and other Fellows joined.

The PRESIDENT inquired of any Fellow present whether it was the case that the dead leaves upon the ground in tropical countries tended to warp and curl in the dry season, but lay flat in the wet. He suggested that the remarkable tendency in the dry phases of many species of butterflies, with dead-leaf-like undersides, to develop an elongated and hooked or bent apex to the fore-wing, and a greatly produced anal angle to the hind-wing, might thus receive its interpretation. The development certainly could not be explained by affinity, occurring as it did in the Nymphaline genera *Kallima* and *Precis*, the Satyrine genus *Melanitis*, and as Dr. Dixey has recently shown in the Pierine genus.

The PRESIDENT further stated that Mr. H. C. Robinson had informed him that it was certainly the case in northern Australia that the dry-season dead leaves were warped and the wet ones flattened.

In reply Mr. W. J. KAYE stated that he had been in Trinidad in the dry season, and noticed that the dead leaves were curled and bent, whereas in British Guiana which he visited in the wet season they were flat like damp blotting-paper.

Paper.

The PRESIDENT gave an account of a paper by Mr. ABBOTT H. THAYER on "Protective Coloration in its relation to Mimicry, Common Warning Colour, and Sexual Selection," and made comments thereon.

Wednesday, November 4th, 1903.

Professor E. B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. W. A. Bogue, Wilts and Dorset Bank, Shepton Mallet; Mr. G. R. Baldock, 71 Hertford Road, Lower Edmonton; Mr. Robert Etheridge, Junior, Curator of the Australian Museum, Sydney, New South Wales; Mr. Charles French, F.L.S., Government Entomologist, Victoria, Australia; Mr. J. T. Houghton, Worksop, Notts; Mr. G. Lyell, Junior, Gisborne, Victoria, Australia; and Mr. William Herrod, the Horticultural College, Swanley, Kent, were elected Fellows of the Society.

The Secretary announced that in some copies of Part III of the Transactions recently issued, the numbers to the figured species on Plate IX were accidentally omitted, and that Fellows returning Part III to Messrs. R. Clay & Sons, Bungay, might have the same printed in without additional expense.

Exhibitions.

Mr. H. J. Elwes, F.R.S., exhibited a small collection of butterflies made in July last in Saltdalen, Norway, within the Arctic Circle. Owing to the continued dull, wet weather and extreme lateness of the season he had not procured some of the arctic fjeld butterflies which occur there, such as *Colias hecla*, *C. werdandi* and *Lycæna aquilo*.

He said that it was remarkable to find such plants as *Cypredium calceolus*, and such butterflies as *Pararge mæra* in this high northern latitude close to such arctic insects as *Erebia disa*, of which he took a fine series on the one fine day that occurred during his stay. He also took a series of *Carterocephalus sylvius*, which, so far as he knew, had been taken nowhere else in Norway. *Pieris rapæ* was in the female sex extremely variable, here some of them, though much suffused, being more like Scotch specimens than the var. *bryoniæ* which is found in the Alps and in the extreme north of Norway.

Mr. A. J. Chitty exhibited living specimens of *Anthribus albinus*, showing the way in which this beetle mimics its surroundings. The resemblance to the lichened bark was most striking, the species choosing the inside holes of hazel twigs intertwined in hedges, and generally covered with lichen.

Mr. J. W. Tutt exhibited a number of series of the genus Melitæa to illustrate his remarks made at the last meeting. The discussion on the affinities of the several named species was continued, and in reply to a question by Mr. Tutt, Mr. H. J. Elwes said that so far as he knew no systematic examination of the genitalia had yet been made. The President suggested that the real physiological test by which to determine and differentiate the several species of the genus was by breeding, and he impressed upon entomologists resident in favourable localities, as in Switzerland, the desirability of making these experiments.

Mr. H. J. Elwes mentioned that he was at present engaged in the classification and arrangement of the Melitæas and Argynnids in the British Museum, and appealed to collectors to bring their series there to be looked over, and to present such specimens as might be useful for the completion of the group.

The President exhibited a set of 323 butterflies from British Guiana, all captured on one day, August 28th, 1903, between the 9th and 10th mile from the Potaro River to the gold-mines. The road starts from the river-side at a point about 30 miles above the confluence with the Essequibo. This opportunity of studying the proportions of the various constituents of the Müllerian group was owing to the kindness of Mr. W. J. Kaye. The specimens constituted the entire catch of a single day, and all were taken by the road-side, on the white blossoms of a large-leaved plant which springs up wherever the bush is cut down. The catch represented a full day's work. August 28th was a particularly dry day in one of the driest months in the year. The butterflies were most plentiful from 6 to 11 a.m. and from 3 to 6 p.m., retiring into the thick bush during the hottest part of the day.

The dominance of the black-hind-winged group is seen in the fact that it included no less than 295 specimens belonging to the following species :—

Ithomiinæ.

Melinæa mneme—253.	*Mechanitis polymnia*—9.
,, *crameri*—8.	,, n. sp.—10.
,, *egina*—9.	

DANAINÆ.

Lycorea ceres—1.
,, *pasinuntia*—3.

HELICONINÆ.

Heliconius vetustus—1.
Eueides, n. sp.—1.

Thus a single species, *M. mneme,* entirely dominates the group. Beautiful series exhibiting transition from the barred to the black-hind-wing were seen in this species, and in the 3 individuals of *L. pasinuntia.* The single *L. ceres* was an intermediate example. One specimen of *Melinæa crameri* was broadly barred, and another faintly so. In Mr. Kaye's experience this species had hitherto always been black. *Mechanitis* n. sp. included a fine transitional series, but, as in other examples from this district, the black markings were very heavy even in the lightest forms. *Mechanitis polymnia* was, as usual, an antithesis to the last-named, the blackest hind wings being still distinctly barred.

Comparing these and other specimens in the Hope Department, and Mr. Kaye's fine series, with Oxford specimens of the same or representative species from Surinam, it appears certain that the Potaro district must stand on the fringe of the area where this black-hind-winged group is developing. The ancestral barred pattern and the various grades of intermediates which occur so abundantly with the black on the Potaro road are apparently far less common in Surinam, and are probably less common still in French Guiana. We do not, however, know the distance to which the group extends along the coast or into the interior. The apparent anomaly of the dominant *Melinæa mneme* exhibiting the most ancestral series of any species in the group may be merely a result of this position on the fringe of the area. Extended observations are greatly needed; for, so far as it is possible to judge from the facts before us, more could be learnt of the origin and more inferred as to the bionomic significance of this black-hind-winged group of the Guianas than any other in the world.

The remaining specimens, with the exception of a single Hesperiid, were all *Ithomiinæ*. They included 5 *Scada theaphia*, but no other member of its group; 1 *Ithomia zarepha*, but in this case also no other member of the group; 16 *ceratinia vallonia*, 1 *Napeogenes pheranthes*, another obvious member of the same group, and 4 *ceratinia barii*, a more outlying member. The Hesperiid *Hesperia syrichthus* was the only butterfly out of the 323 which did not fall into one of the Ithomiine combinations.

Mr. J. C. Kershaw communicated a note on the larva and pupa of *Clerome eumeus*, Drury, as follows:—

"No recent description has, I believe, been published on the habits of *Clerome eumeus*, Drury, and, so far as I am aware, the larva has never been figured or described.

"For the following references to the literature on this insect I am indebted to Mr. Francis A. Heron:—Pupa described by J. J. Walker in Trans. Ent. Soc., 1895, p. 450; Drury's 'Illus. Exotic Ent.,' vol. i (1773), and Cramer's 'Pap. Exot.,' vol. ii (1777), Trans. Ent. Soc., 1858, p. 183. The larva is smooth, cylindrical, Indian or salmon-red on the entire upper surface, the articulations of the segments marked in black. Sides and back sprinkled with whitish hairs. Under surface and legs black. Head black, upper part of clypeus bifid. About $1\frac{3}{4}$ inches in length when full-grown. The spiracles indistinctly marked. The larva feeds on *Smilax lanceæfolia*, a common climbing plant in South China, growing as a rule amongst thick jungle—a smooth-stemmed creeper, with large lanceolate shiny green leaves, broad and rounded at the base, of thick texture and glaucous beneath.

"The larvæ usually feed in little colonies, and have a habit when not feeding of resting side by side on the under surface of a leaf, perhaps half-a-dozen together, so closely packed as to touch one another.

"The pupa is smooth, of a light pea-green, the apex of abdomen, from which the pupa is slung without a girdle, blue bifid, tips yellow. The insect is more or less on the wing throughout the year, having several broods, some emerging in January and February, the larvæ feeding in November and December.

"*Clerome eumeus* is very common in the districts round Hongkong and Macao, and may sometimes be seen in the streets of those towns. It haunts damp and shady localities, flitting between the tree-trunks and undergrowth, and often settling on the ground amongst dead leaves. It is to some extent crepuscular, though it is on the wing throughout the day in shady spots. There is no noticeable variation in the insect between the wet and dry seasons. The butterfly appears to be distasteful to birds and lizards; though very common in parts of South China and fairly conspicuous both flying and at rest, when it closes its wings, I have never seen it attacked. Its flight, though slow and rather flabby—the wings of this butterfly are what may perhaps be termed 'limp'—is erratic, and it delights in threading its way through thick cover, being a wandering insect, and seldom returning to the same resting-place after once leaving it."

Papers.

Mr. W. J. Kaye contributed "A Catalogue of the Lepidoptera-Rhopalocera of Trinidad, with an appendix by G. L. Guppy."

Mr. P. I. Lathy, F.Z.S., communicated a paper "On some Aberrations of Lepidoptera."

Wednesday, November 18th, 1903.

Professor E. B. Poulton, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. John Rowland Cattle, of Nettleton Manor, Caistor, and 59 Chancery Lane, E.C., and Mr. E. J. Hare, of 8 Hillsboro' Road, East Dulwich, S.E., were elected Fellows of the Society.

Obituary.

Mr. G. C. Champion announced the death of Mr. Philip Brookes Mason, M.R.C.S., F.L.S., one of the oldest members of the Society, and on the motion of Canon W. W. Fowler, seconded by Mr. Champion, it was unanimously resolved to express on behalf of the Society sincere sympathy with Mrs. Mason in her bereavement.

Nomination of Officers and Council for 1904.

Mr. H. Goss, one of the Secretaries, then announced that the Council had nominated the following Fellows as Officers and members of the Council for 1904, in accordance with the new Bye-laws :—*President*, Professor E. B. Poulton, M.A., D.Sc., F.R.S. *Treasurer*, R. McLachlan, F.R.S., F.L.S. *Secretaries*, H. Goss, F.L.S., and H. Rowland-Brown, M.A. *Librarian*, G.C. Champion, F.Z.S. *Other Members of the Council*, Colonel C. T. Bingham, F.Z.S., Dr. T. A. Chapman, M.D., F.Z.S., A. J. Chitty, M.A., J. E. Collin, Dr. F. A. Dixey, M.A., M.D., Hamilton C. J. Druce, F.Z.S., W. J. Lucas, B.A., the Rev. F. D. Morice, M.A., the Hon. N. Charles Rothschild, M.A., F.L.S., F.Z.S., Dr. D. Sharp, M.A., F.R.S., F.L.S., Colonel C. Swinhoe, M.A., F.L.S., F.Z.S., and Colonel J. W. Yerbury, R.A., F.Z.S.

Exhibitions.

Mr. G. C. Champion exhibited numerous specimens of both sexes of *Xyleborus dispar*, from Moncayo, Spain, taken out of beech-stumps. Canon Fowler said that the late Miss Ormerod, who found this beetle abundantly in orchards at Evesham, had prophesied that it would become a pest. As a matter of fact the insect is now extremely rare, and there appear to be hardly any ♀s in the collections of the United Kingdom. Mr. O. E. Jansen said he had found it in pear-trees.

Mr. F. B. Jennings exhibited (1.) on behalf of Mr. H. Britten, of Great Salkeld, Cumberland, a specimen of *Tropiphorus tomentosus*, Marsh., from Great Salkeld, showing the deciduous false mandibles intact; (2.) a ♀ specimen of *Anchomenus parumpunctatus*, F., from the same locality, showing a malformation of the middle right tibia which was abnormally thin, and bent in the centre, but thickened at the base; the right antenna also had the last seven joints flattened and dilated. Mr. Jennings also exhibited on his own behalf *Apion sanguineum*, De G., taken at Brandon, Suffolk, in August last, on Rumex. Commenting on (2) the Rev. F. D. Morice remarked that similar malformations occurred in Hymenoptera. The abdomen in the specimen exhibited appeared to be normal, but he had found in hymenopterous insects, segments of the abdomen distorted in such a manner as hardly appeared consistent with life. Mr. JENNINGS said that some years ago he had taken a weevil, *Sitones regentsteinensis*, with a double club to one antenna, and Mr. M. BURR said that it was not uncommon to find malformations in the forceps of Earwigs which were not also hermaphrodites.

Later in the discussion, replying to Mr. MORICE and Dr. CHAPMAN, the President said that during the past summer he had been experimenting on the eyes of the larvæ of *Ennomos autumnaria*. In the attempt to ascertain the physiological significance of the eyes, some of these larvæ had been blinded with a photographic varnish rendered opaque with lamp-black. It seemed impossible to imagine a more innocent material, and furthermore the application was but of short duration, for the varnish did not adhere well to the smooth chitin, and was soon rubbed off—probably an accidental result of the ordinary movements of the larvæ. Nevertheless, when the corresponding imagines emerged the speaker was intensely surprised to find that the majority of them were devoid of eyes, and that the antennæ were generally rudimentary. He could only suppose that something in the varnish, perhaps the spirit, penetrated pores in the chitin and injured the subjacent tissues.

Mr. H. St. J. K. DONISTHORPE exhibited *Apion sorbi*, ♂, taken this year at Freshwater, Isle of Wight, and said that the ♂ of this species was extremely rare.

Mr. M. BURR exhibited two ♀s and two ♂s of the largest known earwig, *Anisolabis colossea*, Dohrn., from New South Wales, representing the extremes of size, the average size being between these two extremes.

Mr. A. J. CHITTY exhibited a specimen of the beetle *Homalium testaceum* taken in Blean Wood in 1900, and a pair of bees *Nomada guttulata*, of which the ♂ has never been recorded hitherto in Britain, taken by him at Huntingford, Kent, in May last.

Dr. NORMAN JOY exhibited (1.) *Euconnus Mäklini*, Mannerh., taken at Bradfield in July 1901, new to the British list of Coleoptera, and (2.) a series of beetles taken at Bradfield at the exuding sap of trees attacked by *Cossus ligniperda*; including *Philonthus fuscus*, Grav.; *Thamiaræa hospita*, Märk.; *Thalycra sericea*, Sturm.; *Cryptarcha strigata*, F.; *Cryptarcha imperialis*, F.; a series of *Epuræa* 10-*guttata*, F., and *E. diffusa*, Bris.; and some apparently intermediate forms; *Quedius ventralis*, Ar.; and *Atomaria elongatula*, Er.

Colonel J. W. Yerbury exhibited (1.) *Leptopa filiformis*, Zett. He said that as this insect stood in italics in the last edition of Verrall's List, the confirmation of its occurrence within the British Isles was worthy of note. Haliday ('Entomological Magazine,' Vol. iv. p. 150, 1837) described it under the name of *Cordylura flava*, from specimens taken at Holywood near Belfast in the month of June, and its record as a British insect probably rests on this, for no subsequent account of its occurrence can be traced, nor do specimens of it exist in any of our great collections. *Leptopa filiformis* was not uncommon at Porthcawl from May 26th to June 4th of this year; it frequented meadow-sweet under the shade of some old poplars, where the capture of a chance specimen led to a thorough overhaul of the neighbourhood both by searching and sweeping, resulting in a bag of twelve specimens (10 ♂ and 2 ♀). Though a shade-loving insect, it was only to be caught between the hours of 12 noon and 2 p.m., many attempts made both earlier and later in the day being alike unsuccessful. Exhibiting (2.) *Thyreophora furcata*, F., Col. Yerbury said that though probably not an uncommon insect, this was one of the least known of our native Diptera; it stood in italics in the first edition of Verrall's List, but was confirmed from specimens taken in Mount Edgecumbe Park (17th and 24th April, 1889), on a dead donkey. The late Dr. Meade (E. M. M., Oct. 1889, p. 224) referred to a specimen found by the Rev. L. Jenyns near Ely, and to this specimen its reputed occurrence in the British Isles was probably due. Dr. Meade was apparently ignorant of its subsequent capture, though the three specimens referred to above had been in the British Museum collection since 1893. The attractions for *Thyreophora furcata* appear to be an open space and the carcase of a large animal; it occurred in some numbers on the Kenfig Sand Hills (Porthcawl) from 13th to 18th May, 1903, on the carcass of a cart-mare; 7 ♂, 7 ♀ being taken between those dates. In Verrall's List this species was included among the *Cordyluridæ*, but as its affinities appeared to be with the *Helomyzidæ* near *Blepharoptera modesta*, probably the best plan would be to give it a family heading Thyreophoridæ all to itself. Hendel (Zeit. f. Hym. u. Dipr. iii, Jahrg Heft. iv, p. 215, July 1903) had recently proposed the new genus "Centrophlebomyia" for this species, and with reason, for the two species *Thyreophora furcata* and *T. cynophila* seemed to be generically distinct. In our present knowledge of diptera, where genera could only be looked upon as artificial groups got together for the purpose of facilitating identification, this separation of single species from numerically weak genera was of doubtful utility.

As regards collecting *T. furcata*, it might be pointed out that a stern sense of duty was necessary to keep one for any length of time in the neighbourhood of its haunts.

Colonel Yerbury also exhibited 13 *Pelidnoptera nigripennis*, F., and said that although only two or three records existed of the occurrence of this species within the British Isles, still it was very abundant at Porthcawl from 24th May to 3rd June of this year. The species was first recorded as British by Mr. Verrall (E. M. M., July 1894, p. 145) from two specimens taken as follows: Dolgelly, June 13th, 1887, and Muchalls, near Aberdeen, June 4th, 1884; a third specimen taken May 17th, 1893, has been in the B. M. collection since 1893. In April 1899 (E. M. M., p. 102), under the heading "British Diptera unrecorded or undescribed by English Authors," Dr. Meade recorded a specimen taken by Miss Prescott-Decie at Chagford, Devon, in 1881. He had apparently overlooked Verrall's previous record, while it is probable that he was ignorant of the existence of the third specimen referred to above. Of (4) *Lucina fasciata*, also shown by him, Col. Yerbury said that this was another rare insect which had almost been lost sight of. Recently however Mr. Lamb had met with it in some numbers at Padstow and Weston-super-Mare, while it was stated still to exist in Haliday's old locality, Portmadoc near Dublin. The specimen exhibited was taken at Porthcawl (11th May, 1903), seated on a blade of marram grass, but neither searching nor sweeping produced further specimens, though the attempt was repeated again and again.

Dr. T. A. Chapman exhibited specimens of *Chrysophanus phlæas*—(1.) a ♀ captured at Reigate; small spots and narrow hind margin to fore-wing, broad copper band to hind-wing running up the veins, the copper bright and rather pale. (2.) 15 specimens reared from eggs laid by this ♀, and kept at a temperature of 85° Fahr. (egg and larva), rising to 95° for the pupæ. These were a little smaller than the parent. The black spots were much enlarged, forming in some specimens an antemarginal band by confluence, and much restricting the copper area. Hind-margin broader than in the parent, but still not broad. Copper of hind-wing more or less reduced, in one specimen almost to four or five spots. The tails in nearly all specimens were very long; the copper bright, somewhat suffused basally, but in only two or three was it suffused on the apical half of the wing. The dark costal shade almost wanting in the parent was marked, and to the series of three most apical spots two more were added between the more costal veins; of these the parent had no trace. All the spots were in most specimens very well defined—three specimens whose pupæ were kept very damp are not distinguishable from the others whose pupæ were kept very dry. The exhibit also included (3.) three specimens taken at Locarno in May 1902, just after a very cold, wet spell, that affected the whole district. These had the spots small; the copper area large. One large specimen (34 mm.) was reminiscent of the Lapland form which Staudinger identifies with the American representative *hypophlæas*. (4.) Three specimens from Locarno, April 1903, after ordinary weather, one of which, with the copper a little reduced, might be an ordinary British specimen. The other two had the spots more or less confluent, the margins of the fore-wing are very wide, leaving very little copper outside the spots. The tails also were short and there was little suffusion. (5.) 16 specimens from various parts of Spain illustrating various forms of suffusion and darkening, but none perhaps typical *eleus*. The darker ones differed from (2) and (4) in the spots being ill-defined, surrounded by a ring of less deep black (suffused), and in the black hind-margin of the fore-wing being very broad. In few were the tails as well-developed as in (2). In the darkest the copper still preserved some brightness along the discal cell and the two cells beyond it, whilst two or three might have been ordinary English specimens.

Mr. G. J. ARROW showed specimens and diagrams in illustration of a point mentioned in his paper on "The Laparostict Lamellicorn Coleoptera of St. Vincent and Grenada." This had reference to a remarkable kind of variability noticed in beetles of the Trogid genus Acanthocerus. These beetles have the faculty of rolling themselves into a ball in the interior of which all the vulnerable parts are enclosed. The head forms a large triangular plate in which the eyes appear half on the upper and half on the lower surface. In some examples of the species exhibited (*Acanthocerus relucens*, Bates) the upper division of the eyes forms a large, nearly circular mass, while in others it is reduced to a mere thin vestige, and in extreme examples of another species of the genus Mr. ARROW had even found it to vanish altogether.

The PRESIDENT showed an exhibit sent by Mr. A. H. Thayer, of Monadnock, N.H., U.S.A. The greyish silhouettes of two butterflies were represented in a tint nearly the same as the background, but sufficiently distinct to be easily recognizable. On one side of one silhouette a row of white spots had been placed in a submarginal position. It was evident that the adjacent border was thereby rendered far less distinct than that of the opposite side of the silhouette, or of both sides of the other silhouette. The spots in position and shape were approximately as in *Papilio polydamas*, and Mr. Thayer considered they possessed a similar significance in this butterfly. The dark ground-colour of many Rhopalocerous species he thought represented shadow under vegetation, the white submarginal lines and dots a generalization of flowers and flower-masses. But these markings also had a second meaning in that they tended to obliterate the tell-tale margin of the wings.

Professor POULTON also exhibited specimens of *Drurya antimachus*, together with the butterflies which he suggested as forming a group synaposematic with it. The central species appeared to be *Acræa egina*, round which clustered a number of other species of the same genus so much alike as to be probably indistinguishable upon the wing. Examples of these were exhibited, viz. *A. zetes, perenna, rogersi*, and *pharsalus*. Another beautiful Papilionine member of the group, *P. ridleyanus*, was also shown. Its pattern, in both sexes, was nearest to that of the male *A. egina*. In fact, so close was the resemblance that Godart had been entirely misled by it, and had described the *Papilio* under the name of *zidora* as the female of *Acræa egina*. Mr. Roland Trimen, F.R.S., had recently called the speaker's attention to this, and had informed him that the specimen of the *Papilio* in the Dufresne Collection at Edinburgh bears the MS. label "*zidora*, fem., *Egina*, Cram.," probably in Godart's handwriting. Godart's mistake had been recently pointed out by Mr. Percy H. Grimshaw, and Mr. Trimen had himself recognized it from Godart's description, and had made a note of it in his copy of the work.

An obvious Nymphaline member of the group was *Pseudacræa boisduvalii*, the male, like the last-named *Papilio*, resembling most closely the male of *Acræa egina*. It was the under-side of the female *Pseudacræa* which first suggested to the speaker the idea that *antimachus* was a member of the same group. While the upper-side of the *Papilio* seemed obviously mimetic of the male of *Acræa egina*, the under-side of its hind-wings possessed a remarkable and characteristic ochreous ground-colour distinguishing it from any other member of the group except the female *Pseudacræa*, in which a distinct resemblance was manifest. That the approach has been from the side of the latter seemed clear on comparing the female of the western form with that of its south-eastern close ally *Pseudacræa trimeni*, in which no trac of this peculiar tint was to be found. Such deutero-synaposematic resemblance between these two mimics of the *egina* type of colouring and pattern had been doubtless encouraged by the fact that they were the two largest members of the whole group, the female *Pseudacræa* serving as a link between the immense *Papilio* and the comparatively small but dominant and central Acræine members. The inclusion of *antimachus*, in spite of its size, in this powerful combination seemed more satisfactory than Mr. Trimen's supposition in 1868 that it "is possibly an instance of special modification in imitation of some gigantic *Acræa* as yet unknown, or perhaps extinct" (Trans. Linn. Soc., vol. xxvi, 1870, p. 503). Professor POULTON suggested that it was possible that the remarkable bluish-grey patches on the underside of the fore-wing of *antimachus* were traces of descent from an ancestor common to it and the other equally extraordinary and equally isolated species of the genus *Drurya*,—*D. zalmoxis*.

In the discussion which followed the exhibit Professor POULTON suggested that the struggle for existence against the attacks of young, inexperienced enemies,—the kind of selective attack to which *ex hypothesi* Müllerian (synaposematic) resemblance was due—was in reality far more severe than appeared at first sight because of the pressure of the struggle upon the enemies themselves. This pressure was chiefly felt by the young, and it was so excessive that comparatively few individuals in the fresh wave sent forth at each breeding season, survived to become mature and experienced. It followed from this fact that the amount of selective pressure exerted by inexperienced enemies of insects was ten, twenty, a hundred, at any rate many times as great as that which was due to the educational period of the mature enemies existing at any moment.

With reference to the PRESIDENT's remarks, on the great size of *Drurya antimachus* compared to that of the other members of the synaposematic group, Mr. F. A. HERON suggested that, in the recognition of prey by sight, size,—within considerable limits,—might be of minor importance to coloration,—the term being used to cover every kind of pattern and marking. The size of an insect, as correlated with the idea of its distance, was, in natural surroundings, under varying atmospheric conditions, extremely difficult of exact estimation, though it might be easily observable in a group of other insects of known size in a standard cabinet drawer. Distance, and its correlative size, might perhaps be especially hard of determination by animals which, like the majority of insect-hunting birds, had their eyes placed somewhat laterally and not frontally, as in the anthropoids in carnivora and in owls and similar predatory birds.

For, unless the two eyes could be simultaneously focussed on the same object the estimation of distance, which determined the idea of size, could only take place by the knowledge of the effort made to secure the focus of one eye, instead of by the system of unconscious trigonometrical survey, which was one of the main sources of the knowledge of distance employed by frontal-eyed animals; unless, indeed, it were considered that the angle was measured first with one then with the other eye by quick movement of the head.

With monocular vision, where the distance was not exactly known, a small object nearer the beholder might subtend a greater angle than a larger similar one further off, and, if unfamiliar, be mistaken for the greater.

The idea of distance was one of the more slowly-acquired concepts; but the eyes of the young of all animals were quickly taken by conspicuous pattern.

Coloration, at one extreme, served to break up the apparent mass and protectively obscure it, while at the other it invited attention as some glaring label; a POISON label, which would denote danger to the consumer of the contents of the object bearing it, and, as in the case of the POISON label, the danger would exist irrespective of the size of the "label" and the object it protected. Perhaps it might not be too strong an assumption to consider that the young inexperienced enemy, tasting the gaudily-coloured, distasteful *Acraea*, would be impressed, more by the coloration—by the POISON label—than by the size of the object, and afterwards would avoid similarly-coloured objects which crossed its field of vision, without taking any conscious account of their size.

Paper.

Mr. EDWARD SAUNDERS, F.R.S., contributed "A Supplementary Note to a Paper entitled 'Hymenoptera Aculeata collected by the Rev. A. E. Eaton, M.A., in Madeira and Tenerife, in the Spring of 1902.'"

Wednesday, December 2nd, 1903.

Professor EDWARD B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Election of Fellows.

Mr. F. H. Day, of Carlisle, The Rev. Thomas Prinsep Levett, of Frenchgate, Richmond, Yorkshire, and Parkington Hall, Lichfield, and Mr. Robert C. L. Perkins, B.A., of Honolulu, were elected Fellows of the Society.

Nomination of Officers and Council for 1904.

Mr. H. Goss, one of the Secretaries, again read the names of the Officers and Members of the Council proposed for election at the General Meeting.

Exhibitions.

Mr. G. T. Porritt exhibited, on behalf of Mr. T. Ashton Lofthouse, a specimen of *Xylophasia zollikoferi* taken at Sugar, near Middlesbrough, Yorkshire, on the 26th September last. He said he believed that this was only the second specimen which had been recorded as having been taken in Britain. Mr. McLachlan, F.R.S., said the strongest evidence existed that a very large immigration of insects from the nearest Continental coast took place during the exceptional (for this year) spell of warm and calm weather prevailing towards the end of September, and he was of opinion that the specimen of *Xylophasia zollikoferi*, taken by Mr. Lofthouse in Yorkshire, formed an item in this migratory swarm. Mr. Eagle Clarke had witnessed such immigration when staying on board the Kentish Knock lightship for the purpose of studying bird-migration. He had witnessed a considerable immigration of *Vanessa cardui*, for instance, amongst many other insects, and not the least remarkable of his observations was the fact that *V. cardui* flies at night during migration as well as by day. Mr. McLachlan remarked that the laws governing migration in insects were at present little understood, and urged upon entomologists the necessity of obtaining a clearer insight into their working. The President and Mr. Jacoby continued the discussion.

Mr. Malcolm Burr exhibited, and remarked on, a specimen of *Dinarchus dasypus*, Illig., belonging to a family of five or six species confined to the Balkans.

The President exhibited a series of photographs sent by Mr. A. H. Thayer to illustrate his views on the significance of the colours and patterns of butterflies' wings. The insects had been photographed on masses of foliage and flowers, and it was obvious that the dark ground-colour harmonized with the dark shadow behind and under the vegetation, while the light markings stood out as conventionalized representations of single flowers and flower-masses.

The PRESIDENT also exhibited the eyeless imagines and pupa-cases of *Ennomos autumnaria*, in illustration of his remarks at the meeting on November 18th. Imagines produced by unblinded larvæ were also shown for comparison.

Dr. CHAPMAN made some remarks on the specimens exhibited by the President.

Papers.

The Rev. FRANCIS D. MORICE, M.A., read a Paper entitled "Illustrations of the male terminal segments and armatures in thirty-five species of the Hymenopterous genus *Colletes*."

ANNUAL MEETING.

January 20th, 1904.

Professor EDWARD B. POULTON, M.A., D.Sc., F.R.S., President, in the Chair.

Mr. ROBERT WYLIE LLOYD, one of the Auditors, read the Abstract of the Treasurer's accounts, showing a balance in the Society's favour of £47 2*s.* 7*d.*

Mr. HERBERT GOSS, one of the Secretaries, read the following

Report of the Council.

During the Session 1903–1904 five Fellows have died, viz. Mr. Frederick Bates, the Rev. John Hocking Hocking, M.A., the Rev. Thomas A. Marshall, M.A., Mr. Philip Brookes Mason, M.R.C.S., F.L.S., and Mr. John S. Stevens; eight Fellows have resigned; and twenty-three new Fellows have been elected.

As was the case last year, the number of Fellows who have died is below the average, as is also the number of those who have resigned; whilst the number of new Fellows is the same as last year, and six less than in 1901. The Council hope that the Fellows will during the coming Session display more energy and secure a considerable addition to the Society's list of members.

At present the Society consists of twelve Honorary Fellows, and four hundred and seventy-one Life and Subscribing Fellows, making a total of four hundred and eighty-three, which, notwithstanding the losses by death and resignation, is an increase by eleven on last year's list, and represents a membership greater than in any previous year of the Society's existence of seventy-one years.

The Transactions for the year 1903 form a volume of 575 pages, containing twenty-seven Memoirs, contributed by the following authors: Mr. Gilbert J. Arrow, Mr. Peter Cameron (two papers), Mr. G. C. Champion and Dr. T. A. Chapman, Mr. G. C. Champion, Dr. T. A. Chapman, Mr. Lionel Crawshay, Mr. W. L. Distant, Dr. Frederick A. Dixey, Mr. Henry J. Elwes, F.R.S. (two papers), Mr. F. Du Cane Godman, F.R.S., Sir George Hampson, Bart., Mr. Martin Jacoby, Mr. Oliver Janson, Mr. Percy I. Lathy, Professor Edward B. Poulton, F.R.S. (two papers), Mr. Ambrose Quail, Mr. G. A. James Rothney, Mr. Edward Saunders, F.R.S. (two papers), Colonel Charles Swinhoe (two papers), Mr. T. H. Taylor, Mr. Abbott H. Thayer, and Mr. Charles Owen Waterhouse.

Of these twenty-seven papers, six relate to Coleoptera, one to Diptera, one to Hemiptera, six to Hymenoptera, and nine to Lepidoptera. In addition, there are four papers which cannot be identified with any one order of insects, viz. Mr. Champion's paper entitled "An Entomological Excursion to Bejar," which, in addition to an account of his travels with Dr. Chapman in Central Spain, contains lists of his captures of *Coleoptera* and *Hemiptera-Heteroptera*; Professor Poulton's very interesting paper on his experiments upon "The Colour Relation between Lepidopterous Larvæ and their Surroundings," Mr. Abbott H. Thayer's paper on "Protective Coloration in its Relation to Mimicry, Common Warning Colours, and Sexual Selection," and Professor Poulton's paper entitled "A Brief Discussion of A. H. Thayer's Suggestions as to the meaning of Colour and Pattern in Insect Bionomics."

It is to be regretted that no papers on Neuroptera or Orthoptera have been published during the year, and only one paper on Diptera and one on Hemiptera; but it is satisfactory to have published so many papers relating to Coleoptera, Hymenoptera, and Lepidoptera, in addition to several papers of interest to students of insect bionomics.

The Memoirs above referred to are illustrated by twenty-three plates, of which fifteen are coloured. Towards the cost of Plate VIII Mr. Herbert Adams and Mr. Lathy contributed the greater portion. Half the cost of Plates IX, XII, XIII, XIV, and XV was paid by Mr. H. J. Elwes, F.R.S., two-thirds of the cost of Plates XVI, XVII, and XVIII have been contributed by Professor Poulton, F.R.S., and the entire cost of Plates XX, XXI, XXII, and XXIII has been defrayed by Mr. F. Du Cane Godman, F.R.S.

The interest shown by the Fellows during the past year by their exhibitions and discussions has enabled the Secretaries to double or treble the Reports of the Proceedings, which up to the present date extend to sixty-four pages, and thus compare very favourably with those for any previous year of the Society's existence.

During the past year twenty-six volumes—in addition to periodicals, pamphlets, and reprints—have been added to the Society's Library. The increased use of the Library is proved by the fact—according to the Resident Librarian's Report—that three hundred and thirty-four volumes have been borrowed by Fellows during the year.

The Treasurer reports that after carrying forward to 1904 the sum of £18 18*s.* 0*d.* for subscriptions paid in advance in 1903, and investing in Consols the sole Life Composition received during the year, making the total sum so invested £744 18*s.* 0*d.*, there remains a genuine cash balance in the Society's favour of £47 2*s.* 7*d.* The subscriptions received for 1903 slightly exceed those for 1902, and are therefore the highest on record. The amount of arrears received has exceeded expectations. The admission fees have been less than usual, not because a fewer number of new Fellows were elected, but because many of these are resident in the Colonies, and are therefore exempt from admission fees. The most notable feature of the balance sheet is the large sum received for Sales of Publications. The increase under this heading came opportunely during the last quarter. On the whole the financial position is perfectly satisfactory, and the Fellows have to be congratulated on the increased and increasing prosperity of the Society.

ENTOMOLOGICAL SOCIETY,
11, CHANDOS STREET, CAVENDISH SQUARE, W.
20th January, 1904.

The Secretaries not having received any notice proposing to substitute other names for those contained in the list prepared by the Council, the following Fellows constitute the Council for 1904–1905: Lieut.-Colonel Charles Bingham, F.Z.S.; George C. Champion, F.Z.S.; Dr. Thomas A. Chapman, M.D., F.Z.S.; Arthur John Chitty, M.A.; James Edward Collin; Dr. Frederick A. Dixey, M.A., M.D.; Hamilton H. C. J. Druce, F.Z.S.; Herbert Goss, F.L.S.; William John Lucas, B.A.; Robert McLachlan, F.R.S.; The Rev. Francis D. Morice, M.A.; Professor Edward B. Poulton, M.A., D.Sc., F.R.S.; The Hon. N. Charles Rothschild, M.A., F.L.S.; Henry Rowland-Brown, M.A.; Dr. David Sharp, M.A., F.R.S.; Colonel Charles Swinhoe, M.A., F.L.S.; Colonel John W. Yerbury, R.A., F.Z.S.

The following are the Officers elected: *President*, Professor Edward B. Poulton; *Treasurer*, Robert McLachlan; *Secretaries*, Herbert Goss and Henry Rowland-Brown; *Librarian*, George C. Champion.

The Balance Sheet and Report having been unanimously adopted, Professor Poulton, the President, delivered his Address. A vote of thanks to the President for his Address and for his services as President during the past year was moved by Dr. F. A. Dixey, seconded by Canon Fowler, and carried. The President replied. Mr. G. H. Verrall moved a vote of thanks to the other Officers of the Society. This was seconded by Mr. A. J. Chitty, and carried. Mr. Goss and Mr. Rowland-Brown replied.

ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1903.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
Balance in hand, 1st Jan., 1903	26	10	7	Printing Transactions, etc.	242	5	6
Subscriptions for 1903 ...	370	13	0	Plates, etc.	152	17	6
Arrears	33	12	0	Rent and Office Expenses	195	5	7
Admission Fees	33	12	0	Books and Binding	28	17	1
Donations	59	12	2	Investments in Consols ...	15	15	0
Sales of Transactions, etc.	117	7	10	Subscriptions in advance, per contra, carried to 1904	18	18	0
Interest on Investments:— Consols ... ... £18 4 8; Westwood Bequest 6 16 0	25	0	8	Balance	47	2	7
Subscriptions in advance	18	18	0				
Life Composition	15	15	0				
	£701	1	3		£701	1	3

ASSETS.

	£	s.	d.
Subscriptions in arrear considered good (say)	£21	0	0
Investments:—			
Cost of £752 6*s.* 6*d.* Consols	£744	18	0
Cost of £239 12*s.* 4*d.* Birmingham 3 per cent.	250	0	0
Balance in hand	47	2	7

NO ASCERTAINED LIABILITIES.

ROBERT MCLACHLAN,
Treasurer.

Examined and found correct.

A. HUGH JONES.
GEO. S. SAUNDERS.
HAMILTON H. DRUCE.
J. W. YERBURY.
R. WYLIE LLOYD.

13th January, 1904.

THE PRESIDENT'S ADDRESS.

GENTLEMEN,

It is a great pleasure to congratulate the Society at the close of another successful year. The repetition of this congratulation in successive Annual Addresses is happily almost monotonous. It is a monotony which will never weary us, and in itself an indication that no other monotony has prevailed.

The meetings have been well attended, there have been numerous, varied, and interesting exhibits leading to animated discussions. Our Transactions do not reach the phenomenal dimensions attained in 1902, but still form a noble volume, containing 23 plates and well over 600 pages. There is a pleasing variety in the papers, and the domination of the Lepidoptera is less pronounced than usual. An important share of the space is occupied by memoirs on the Coleoptera, Hymenoptera, and Insect Bionomics, while the Diptera and Rhynchota are also represented.

I should wish to refer again to the warmth of the greeting received as your President at a meeting of the Entomological Society of France on April 22nd. The cordial friendship between the followers of science in all lands is of happy augury for the advancement of the researches in which we find common aims and mutual sympathy and respect.

On this, the first occasion on which I have the honour of addressing you formally, I cannot resist the temptation of calling attention to a remarkable coincidence of a personal nature—the fact that the present occupant of this Chair and his immediate predecessor should be members not only of the same University, but of the same College, and that not a large one. When this fact was explained to a friend he said it was easily understood, because the study of natural history is infectious. This suggestion, plausible as it is, fails to account for the fact; inasmuch as Canon Fowler left Jesus College, Oxford, in June 1873, while I did not matriculate until October of the same year, so that, as undergraduates, we never saw each other.

Before speaking of the losses which have fallen so heavily upon our community during 1903,—the brother Fellows who have gone from our midst,—I feel bound to allude to the grief which we share with the whole intellectual world at the passing away, towards the close of the old year, of the great thinker to whom we owe far more than we can realise. I well remember the sudden access of light received when, between the age of seventeen and eighteen, Herbert Spencer's works were first placed in my hands. The whole of science seemed illuminated, the whole outlook broadened. It was the most sudden and by far the greatest intellectual awakening I have ever experienced. And, as we know well, it has been the same with thousands. After Shakespeare, no man has done more to bring together the English* of the Old World and the New. And not only among ourselves, but everywhere in the civilised world the writings of Herbert Spencer have stirred enthusiasm and compelled admiration. They have left strong, indelible, beneficent after-effects even in those who are unable to believe in the enduring stability of the Synthetic Philosophy—a fabric as fair and stately as any created by the mind of man.

Since the above paragraph was written Mr. Herbert Spencer's will has been made known in the *Times* for January 14th. I am sure that every Fellow of our Society keenly appreciates the expression of confidence which is implied in the gift which will hereafter be offered to us by the Trustees of the will—a gift which we shall regard as a solemn trust, to be so carried out as to secure the greatest possible advantage to the science we serve.

Frederick Bates, F.E.S., joined the Society as a "subscriber" in 1867. Subsequently withdrawing, he again entered the Society as a Fellow in 1897. He was born at Leicester in 1829, and his death occurred at Chiswick on the 6th of October, in his 74th year. Like his distinguished

* For the justification of this use of the word see Sir Michael Foster's Presidential Address to Section D of the British Association at Toronto (Report for 1897).

brother, H. W. Bates, F.R.S., he was especially devoted to the Coleoptera, although his interests were wide and embraced many aspects of natural history, both zoological and botanical He was the author of many papers, chiefly dealing with the Heteromera, in our Transactions and in the "Entomologist's Monthly Magazine." His exceedingly fine collection of Heteromera is now in the British Museum, while his collection of British Coleoptera was a gift to his intimate friend Mr. Horace Donisthorpe. Many friends mourn the loss of a keen and able naturalist, a many-sided and genial personality.*

The Rev. John Hocking Hocking, M.A., J.P., F.E.S., Rector of Copdock-with-Washbrook, near Ipswich, was elected a Fellow in 1896. His death occurred on the 10th of December last, at the age of 69. He was an ardent collector of the Lepidoptera, but having only recently joined the Society was unfortunately known to but few of the Fellows.†

The Rev. Thomas Ansell Marshall, M.A., F.E.S., joined the Society in 1865. By his death on April 11, 1903, at Ajaccio, one of the few authorities upon the parasitic Hymenoptera is lost to science. Mr. Marshall was born at Keswick on March 18, 1827, the son of Thomas Marshall, an original member of the Entomological Society. He took a scholarship at Trinity College, Oxford, and passed through the Classical Honours course. With great powers as a linguist, and a student of Hebrew and Sanskrit, he worked for a time on the staff of the British Museum Library. Subsequently he took Holy Orders, and after engaging in scholastic work, held livings in various parts of England, interrupted only by his appointment as Bishop's chaplain in Antigua. In this island he was bereft of his wife, and was himself in serious danger from an attack of fever. Upon his return to England he was presented, in 1889, to the living of Botus Fleming, Cornwall, which he retained until 1897, when he retired to Corsica, and devoted the remainder of his life to his favourite science. T. A. Marshall's earliest important work dealt with the Coleoptera (Journ. Linn. Soc. 1865). The first of the series of memoirs

* See the Obituary notice in the "Entomologist's Record," vol. xv, No. 12, by Horace Donisthorpe; and that in the "Entomologist's Monthly Magazine," Nov. 1903, p. 286.

† See also the Obituary notice in the "Entomologist's Monthly Magazine" for Jan. 1904, p. 19.

by which his name will be chiefly known was published in 1870, "Ichneumonidum Britannicorum Catalogus," followed by the valuable monographs on the British Parasitic Hymenoptera, which appeared in the Transactions of this Society between 1872 and 1889. He published an important volume on a portion of the *Braconidæ* in André's "Species des Hyménoptères d'Europe," and was still at work on the subject at the time of his death. He was an accomplished draughtsman and a clear and admirable writer. The loss of so able a student of an important but much-neglected group will be long and deeply deplored.*

Philip Brookes Mason, M.R.C.S., F.L.S., F.E.S., a Fellow of our Society since 1874, died on November 6, 1903, at Burton-on-Trent. His death is a sad loss to his profession, to the neighbourhood in which he laboured, and to a wide circle of naturalist friends. Mr. Mason was born at Burton on January 2, 1842. After a medical education of unusual distinction and variety of valuable experience, he made his permanent home at his native town in the Midlands. The British fauna and flora formed the chief interest of his life, and he possessed magnificent collections of both. With his sympathetic genial nature, it was his delight to welcome his brother naturalists to share in the well-nigh unique advantages which he possessed. And as he was a skilled and honoured member of the healing profession, so he was ever ready to lend the weight of his influence and the power of his persuasion to promote peace and friendliness. As the Society concerned with the branch of natural history to which he was chiefly devoted, we recognise, with grief, that a strong influence for good has passed from us.†

John Sanders Stevens, F.E.S., became a Fellow in 1862. His death at Woking, on July 15, makes a sad break in the ranks of the senior Fellows of the Society.‡

* See also the Obituary notice in the "Entomologist's Monthly Magazine," June 1903, p. 152, by R. McLachlan, F.R.S.; and that in the "Entomologist's Record," vol. xv, No. 7, p. 190, by G. C. Bignell.

† See also the Obituary notice in the "Entomologist's Monthly Magazine," Jan. 1904, pp. 17, 18, by the Rev. Canon W. W. Fowler; also "The Lancet" for Nov. 13, 1903.

‡ See also the Obituary notice in the "Entomologist's Monthly Magazine," Sept. 1903, p. 229.

Outside the number of our own Fellows, we miss four well-known names from the ranks of British entomologists:—WILLIAM DUPPA CROTCH, M.A., F.L.S., a keen student of the Lepidoptera, Coleoptera and Hemiptera; EDWARD ROBERT DALE, son of the eminent J. C. Dale, and himself an eager entomologist in his younger days; THE VERY REV. CANON BERNARD SMITH of Great Marlow, an enthusiastic collector and breeder of the British Lepidoptera; SAMUEL JAMES WILKINSON, author of the celebrated "British Tortrices," published in 1859.

We sympathise deeply with our brethren on the continent in their grief for the eminent men who have passed away in 1903:—JOHANNES FAUST, the eminent authority upon the *Curculionidæ*, whose collection contained over 13,000 species, of which more than 2000 were described by himself; PROFESSOR AUGUSTUS RADCLIFFE GROTE, A.M., the celebrated student of the Lepidoptera.

"WHAT IS A SPECIES?"

The late Professor Max Müller, in an eloquent speech delivered at Reading in 1891, spoke of the necessity of examining, and, as time passes by, re-examining the meaning of words. He referred as an illustration to the man at the railway station who taps the wheels with his hammer, testing whether each still rings true or has undergone some change that may mean disaster. In almost the same way, the speaker maintained, a word may slowly and unobtrusively change its meaning, becoming, unless critically tested to ascertain whether it still rings true, a danger instead of an aid to clear thinking, a pitfall on the field of controversy. He then went on to say, that Darwin had written a great work upon the Origin of Species, and had never once explained what he meant by the word Species. So decided an utterance —the statement was made emphatically—ought to have involved a careful and critical search through the pages of the work that was attacked. However this may be, it is quite certain that the search was unsuccessful; and yet a few minutes' investigation brought me to a passage in which the meaning attached by the author to the term Species is set down in the clear, calm, and simple language which did so much to convince an unwilling world.

Darwin is speaking of the revolution which the acceptance of his views will bring about. "Systematists will be able to pursue their labours as at present; but they will not be incessantly haunted by the shadowy doubt whether this or that form be in essence a species. This, I feel sure, and I speak after experience, will be no slight relief. The endless disputes whether or not some fifty species of British brambles are true species will cease. *Systematists will have only to decide (not that this will be easy) whether any form be sufficiently constant and distinct from other forms to be capable of definition, and if definable, whether the differences be sufficiently important to deserve a specific name.* This latter point will become a far more essential consideration than it is at present; for differences, however slight, between any two forms, if not blended by intermediate gradations, are looked at by most naturalists as sufficient to raise both forms to the rank of species. *Hereafter we shall be compelled to acknowledge that the only distinction between species and well-marked varieties is, that the latter are known, or believed, to be connected at the present day by intermediate gradations, whereas species were formerly thus connected.* Hence, without quite rejecting the consideration of the present existence of intermediate gradations between any two forms, we shall be led to weigh more carefully, and to value higher, the actual amount of difference between them. It is quite possible that forms now generally acknowledged to be merely varieties may hereafter be thought worthy of specific names, as with the primrose and cowslip; and in this case scientific and common language will come into accordance. In short, we shall have to treat species in the same manner as those naturalists treat genera, who admit that genera are merely artificial combinations made for convenience. This may not be a cheering prospect, but we shall at least be freed from the vain search for the undiscovered and undiscoverable essence of the term species." I have quoted from pages 484, 485 of the original edition (1859), and have italicised the sentences in which Darwin defines a species and distinguishes it from a variety.

Max Müller's special criticism falls to the ground, but his general exhortation remains, and I think we shall do well to be guided by it, and attempt to apply it to this difficult and elusive word SPECIES.

The passage I have quoted was Darwin's prediction of the meaning which would be attached to the word "species" by the naturalist of the future. Nearly half-a-century has passed since those words were written. For more than a generation the central ideas of the "Origin" have been an essential part of the intellectual equipment, not only of every naturalist, but of every moderately intelligent man. What then is the meaning of the word "species" to-day, and how does it differ from that of the years before July 1, 1858, when the Darwin-Wallace conception of natural selection was first launched upon the world?

The present occasion is especially favourable for this inquiry, because we have just been given two additional volumes of the letters of Charles Darwin. After the three volumes published in 1887, naturalists were certainly unprepared for the welcome revelation of such a mine of wealth. The work is all the more valuable because it contains many letters from Alfred Russel Wallace and Sir Joseph Hooker, thus giving both sides of a part of their correspondence with Darwin. Then in 1900 the "Life and Letters of Thomas Henry Huxley" appeared, so that we are now admitted "behind the veil," and can read, as never before, the central thoughts of the great makers of biological history. On the publication of the last-named work, I took occasion to combat the view that the thousand closely-printed pages might have been reduced by omitting and condensing many of the letters. The serious student of those stirring years requires the opportunity of thinking over and comparing all the available thoughts and opinions of the chief actors in the memorable scene; and the very repetition of certain ideas, which proves their persistence and dominance in the writer's mind, is a matter of deep importance and interest. However it may be to the general reader, the student would deprecate the omission or condensation of any of the writings of Darwin or Huxley. The special interest and value in the letters of these men depend on the fact that their inmost convictions on matters of the deepest scientific importance are to be read, often in the compass of a brief sentence. There we find, as we cannot find in any other way, the real core of the matter, with all accessory and surrounding considerations stripped away from it.* A careful study of the two recent volumes of Darwin's letters, and a re-study of the three earlier volumes, with a view to this Address, have shown how Darwin's thoughts were again and again occupied upon subjects bound up with the problem I have ventured to bring before you this evening. The interest reaches its height when we find that strongly-marked differences of opinion on fundamental questions are threshed out in the correspondence, when we see, as I shall have occasion to point out in greater detail in the later pages of this Address, Darwin differing sharply from Huxley on the one hand, and with Wallace on the other, as to the significance and history of sterility between species.

In such episodes we are permitted to become the witnesses of a supremely interesting struggle, where the central figure of modern biological inquiry is contending with his chief comrades in the great fight,—with the co-discoverer of natural selection, with the warrior hero who stood in the forefront of the battle.

The correspondence of Charles Darwin has a further deep interest for us. We see the means by which a gentle, sympathetic, intensely human nature overpassed the stern limits imposed by health, and was able to impart and to receive fresh ideas, and a stimulus ever renewed—the impulse to varied and unceasing research. I have lately been studying with keen interest the life of another great Englishman, William John Burchell,† than whom no better equipped or more learned traveller ever explored large areas in two continents. When I state that searching inquiry has only brought to light a dozen of his letters, and that he was known to hardly any of the great naturalists of his day, we see the reason for the sad, unproductive, brooding close of a career which opened with almost unexampled brilliancy and

* "Quarterly Review," January 1901, p. 258.
† "Ann. and Mag. Nat. Hist.," January 1904, p. 45.

promise. The time which we give to Societies such as this—time we are sometimes apt to grudge—is well spent. Here, and in kindred communities, a "man sharpeneth the countenance of his friend," and there is born of the influence of mind upon mind thought which is not a mere resultant of diverse forces, but a new creation.

The scientific man who shuts himself away from his fellow-men, in the belief that he is thereby obtaining conditions the most favourable for research, is grievously mistaken. Man, scientific man perhaps more inevitably than others, is a social animal, and the contrast between the lives of Darwin and Burchell shows us that friendly sympathy with our brother naturalists is an essential element in successful and continued investigation.

I do not suppose that it is necessary to justify a discussion of the term "species" as the subject of the Anniversary Address to the Entomological Society of London. The students of insect form and function hold an exalted place among naturalists. The material of their researches enables them, almost compels them, to take the keenest and most active interest in broad questions affecting the history and course of life on our planet. Naturalists engaged upon other groups may reasonably inquire why *insects*, above all other animals, should be so especially valuable for the elucidation of the larger problems which deal, not only with the species of a single group, but with every one of the innumerable and infinitely varied forms, vegetable no less than animal, in which life manifests itself. The answer is to be found in the large number of offspring produced by each pair of insects, and the rapidity with which the generations succeed each other, many cycles being completed in a single year in warm countries; in the severity of the struggle for life which prevents this remarkable rate of multiplication from becoming the cause of any progressive increase in the number of individuals; and finally, in the character of the struggle itself, which is precisely of that highly specialised kind between the keen senses and activities of enemies, and the means of concealment or other modes of defence of their insect prey, which leads, by action and answering reaction, to a progressive raising of the standard in both pursuer and pursued. This is why it is that insects mean so much to the naturalist or to the philosopher who desires to look beneath the surface for the forces which have moulded existing forms of life out of earlier and very different forms. The wings of butterflies, it has been said, serve as a tablet on which Nature writes the story of the modification of species.* But the careful study of insects tells us even more than this; for it gives us the clearest insight we as yet possess into the forces by which these changes have been brought about. Light is thrown upon the causes to which organic evolution is due no less than upon the course which organic evolution has pursued.†

And I think we shall find that a consideration of the numerous distinct categories of forms presented by the insect world is especially advantageous in an attack upon the difficult question—"What is a species?", while properly-directed observation of insects, and experiments upon insects afford the most hopeful prospect of a final answer.

And here I am compelled to say a word in defence of the Lepidoptera from this point of view. Undoubtedly it is most unfortunate that the obvious attractions of the group have led entomologists to neglect other Orders; for this can be the only explanation why naturalists have so often preferred to do over again what others have done already, apparently oblivious of fields comparatively empty and unexplored. It must further be admitted, that the greater visibility of structure, and the more urgent necessity for the study of structure in other groups, render them better instruments of zoological education. But although the Lepidoptera are inferior in this respect, although they lack the unique interest of the Hymenoptera and the social Neuroptera, and cannot claim any of the respect due to venerable age like the Aptera, Orthoptera and Neuroptera—in spite of their many demerits they stand at the head, not only of all insects, but

* H. W. Bates, quoted by A. R. Wallace in "Natural Selection," London, 1875, p. 132. The original passage may be found in "The Naturalist on the Amazons" (London, pp. 347, 348 of the 1879 edition).

† This justification for the study of insects was urged by the present writer in the Hope Reports, vol. iii, 1903, preface, pp. 4, 5.

of the whole organic world, as the registers of subtle and elusive change—ever going on, yet never seen,—by means of which forms are slowly becoming different from what they have been in the past. It is the existence of a complex pattern composed of several colours, which renders butterflies and to a less extent moths such a remarkably delicate record of change. As we trace the representative individuals of a community of butterflies over any wide range, the trained eye, and often the inexperienced eye, can detect differences which are not seen to anything like the same extent in the individuals of other Orders with corresponding ranges. If the wings of Hymenoptera, Diptera, or Orthoptera possessed the same elaborate patterns as the Lepidoptera, we cannot doubt that they too would exhibit the same differences in various parts of their areas. These continual changes which we find as we study the distribution of Lepidopterous forms in space, is undoubtedly a measure of the speed with which they have occurred in time. Rapidity of change is essential if it is to keep its adjustment with nicety to the fleeting details of distribution.* Hence we may confidently believe, that if we

* It is to be observed that I speak of the *details* as fleeting. The *general* area of distribution is doubtless extremely ancient in most cases. Thus, although a species of *Heliconius*, etc., may have originated within the South American tropics, and never have wandered beyond them, the complex shape of its actual area of distribution at any one time cannot be regarded as fixed or ancient. Yet in many a species the variation of the constituent individuals is adjusted with precision to the geographical details of the existing range.

Mr. Roland Trimen, on reading the above footnote, writes to me January 24, 1904:—"Your note reminds me of the recent appearance on the Natal coast of several conspicuous East-African butterflies, *vid.*: *Pieris spilleri*, *Crenis rosa*, and *Godartia wakefieldii*, all of which are shown to have not only extended their range to a point where they were previously quite unknown, but to have also *established* themselves in the fresh area. This is a good case, as Durban has had, for the last twenty-five years at least, a number of keen collectors of Lepidoptera, whom such conspicuous forms could not possibly have escaped had they inhabited the neighbourhood. Besides these species, the last butterfly that my friend and collaborator, the late Colonel Bowker, sent to me (1898) was the large and extremely conspicuous black-and-white *Acræa satis*, which he took at Malvern, near Durban. This is the only example known to me to have occurred in Natal; but Bowker, who noted the resemblance on the wing to *Papilio morania*, wrote that he had seen one other for certain, and thought that he might very possibly have passed over more examples for the common *Papilio* named. This last case is of special interest (should it prove one of extended range like the three mentioned), because the *Acrææ* are so exceptionally slow-flying and gregarious, that they must spread *very* slowly indeed into fresh areas."

could wake up in say a thousand years, we should be able to detect changes in the patterns of some butterflies. Although I am afraid the advance of science is not likely to be sufficiently rapid in our time for me to hold out any prospect of such an experience for any of you, there is every reason why we should afford this opportunity to posterity. A critical examination of the fragments of many species of butterflies captured ninety years ago by Burchell in S. Africa, and gnawed to pieces during his Brazilian travels from 1825 to 1830, renders it probable, nay, almost certain, that with moderate care, insect pigments will endure for an indefinite period in our museums. One important justification for the great and permanent outlay required to bring together and maintain large collections of insects is, that we are allowing our successors the chance of detecting and measuring the rate of specific change.* And, as I have already said, for this purpose the Lepidoptera stand pre-eminent.

For the purpose of the inquiry this evening, our instances will be drawn from the Lepidoptera rather than other Orders of insects, because of the numberless examples of subtle distinction between forms which but yesterday, so to speak, became separate; because of our knowledge, insufficient but considerable, of their geographical ranges; because of our experience, excessively imperfect and scanty, but still much larger than in other Orders, of inter-breeding and of descent from parent to offspring.

First among the attempts to define species must be placed that which we rightly associate with the name of Linnæus.

It has been admirably pointed out by the late Rev. Aubrey L. Moore,† that the dogma of the fixity of species is entitled to none of the respect which is due to age. "It is hardly credible to us," he wrote, "that Lord Bacon, 'the father of

* Karl Jordan argues with great force in favour of specialisation in this direction by our museums. (See "Novitates Zoologicæ," vol. iii, December 1896, pp. 431–433.) The Burchell collection from Brazil is only seventy-four to seventy-nine years old, but the species are numerous, and often represented by long series. An account of the butterflies by Miss Cora B. Sanders will shortly appear in the "Annals and Magazine of Natural History"; and it will then be seen that the evidence of change in certain forms is by no means wanting.

† "Science and the Faith," London, 1889, pp. 174 *et seq.*

modern science' as he is called, though he was only a schoolman touched with empiricism, believed not only that one species might pass into another, but that it was a matter of chance what the transmutation would be. Sometimes the mediæval notion of vivification from putrefaction is appealed to, as where he explains the reason why oak boughs put into the earth send forth wild vines, 'which, if it be true (no doubt),' he says,* 'it is not the oak that turneth into a vine, but the oak bough, putrefying, qualifieth the earth to put forth a vine of itself.' Sometimes he suggests a reason which implies a kind of law, as when he thinks that the stump of a beech tree when cut down will 'put forth birch,' because it is a 'tree of a smaller kind which needeth less nourishment.'† Elsewhere he suggests the experiment of polling a willow to see what it will turn into, he himself having seen one which had a bracken fern growing out of it! ‡ And he takes it as probable, though it is *inter magnalia naturæ*, that 'whatever creature having life is generated without seed, that creature will change out of one species into another.' Bacon looks upon the seed as a restraining power, limiting a variation which, in spontaneous generations, is practically infinite, 'for it is the seed, and the nature of it, which locketh and boundeth in the creature that it doth not expatiate.'" And the author also shows that much earlier than the date at which Bacon wrote, theologians were by no means unanimous in accepting "special creation"; that St. Augustine even distinctly rejected it, and propounded an idea which was evidently considered tenable by the greatest of the schoolmen, St. Thomas Aquinas. St. Thomas' words, quoted by Mr. Aubrey Moore, are as follows:—"As to the production of plants, Augustine holds a different view. For some expositors say that, on this third day (of creation), plants were actually produced each in his kind—a view which is favoured by a superficial reading of the letter of Scripture. But Augustine says that the earth is then said to have brought forth grass and trees *causaliter*—*i. e.* it then received the power to produce them."§

* "Nat. Hist." *Cent.* vi, 522, fol. ed.

† *l. c.* p. 523.

‡ *l. c.* p. 112.

§ St. Thomas Aquinas, "Summa Theol." Prima Pars. Quaest., lxix, Art. 2.

How then did the fixity of species become an article of belief in later years? Aubrey Moore traces it to the influence of Milton's account of creation in the seventh book of "Paradise Lost" (l. 414, *et seq.*), and Professor Huxley had still earlier suggested the same cause in his "American Addresses." I cannot help thinking that the belief had even more to do with the spirit of the age which spoke, and spoke for all time, with Milton for its interpreter,—the spirit of the Puritan movement, with its insistence on literal interpretation and verbal inspiration.

John Ray was Milton's younger contemporary, and many writers, including Aubrey Moore, have thought that with him began the idea of the fixity of species. Sir William Thiselton Dyer has, however, recently pointed out, that a conception similar to Ray's may be traced to Kaspar Bauhin (1550–1624) and to Jung (1587–1657).*

From Ray we pass to Linnæus with his often-quoted definition, "Species tot sunt, quot diversas formas ab initio produxit Infinitum Ens, quae formae, secundum generationis inditas leges produxere plures, at sibi semper similes." Of the Ray-Linnæus-Cuvier conception of species, which found its most precise and authoritative expression in the above-quoted latin sentence, Dr. F. A. Dixey has well said that it "left order where it found confusion, but in substituting exactness of definition for the vague conceptions of a former age, it did much to obscure the rudimentary notions of organic evolution which had influenced naturalists and philosophers from Aristotle downwards." † At the same time it is by no means improbable, as Dixey has suggested, that the Linnean conception "of the reality and fixity of species perhaps marks a necessary stage in the progress of scientific enquiry." ‡

The Linnean idea of special creation has no place in the realm of science; it is a theological dogma. The formation of species, said Darwin in a letter to Lyell, "has hitherto been viewed as beyond law; in fact, this branch of science

* "The Edinburgh Review," Oct. 1902, p. 370.

† "Nature," June 19, 1902, p. 169. For the history of these early ideas upon evolution see "From the Greeks to Darwin," by H. F. Osborn, New York, 1894.

‡ "Church Quarterly Review," Oct. 1902, Art. II, p. 28.

is still with most people under its theological phase of development." * And this explains the intense opposition at first encountered by the principles of the "Origin." The naturalist whose genius sympathised most fully with the Linnean conception would feel that he was admitted, like a seer of old, into the presence of the Maker of the Universe. His convictions as to species were to him more than the conclusions of the naturalist; they were a revelation, stirring him to "break forth and prophesy." Do we not sometimes recognise a lingering trace of this phase of thought in the serious shake of the head and tone of profound inner conviction with which we are sometimes told that the speaker is decidedly of the opinion that so-and-so is a perfectly good species?

We recognise the same sharp antagonism between two irreconcilable sets of ideas when the late W. C. Hewitson expressed such horror at Roland Trimen's remarkable discovery of the polymorphic mimetic females of the *Papilio merope* group. The wonderfully acute detection of minute but significant resemblance hidden under the widest possible superficial difference, which enabled the great South African naturalist to unravel the tangled relationships, was to Hewitson but one of "the childish guesses of the . . . Darwinian School." To meet the carefully-thought-out argument, the only objections that could be urged were that the conclusion stretched too severely the imagination of the writer, and that it shocked his notion of propriety! †

* Letter 132 to C. Lyell, Aug. 21, 1861. "More Letters of Charles Darwin," London, 1903, i, p. 194.

† See an account of the controversy in Trans. Ent. Soc. Lond., 1874, p. 137. The passages I have alluded to are as follows:—"*P. merope*, of Madagascar, has a female the exact image of itself; and it would require a stretch of the imagination, of which I am incapable, to believe that the *P. merope* of the mainland, having no specific difference, indulges in a whole harem of females, differing as widely from it as any species in the genus. . . . In the two species of *Papilio* which have lately been united, *Torquatus* and *Candius*, and *Argentus* and *Torquatinus*, though much unlike each other, there is quite sufficient resemblance not to shock one's notions of propriety." A little later Mr. Hewitson himself received evidence of the truth of the conclusion he so disliked; for he told how his collector Rogers had sent "*Papilio merope* and *P. hippocoon*, taken by him in copulation, another illustration of the saying that 'truth is stranger than fiction.' I find it very difficult (even with this evidence) to believe that a butterfly, which, when a resident in Madagascar, has a female the image of itself, should, in West Africa, have one without any resemblance to it at all" ("Entomologist's Monthly Magazine," Oct. 1874, p. 113).

In leaving the dogma of "special creation," and the assumption of "fixity of species" with which it is bound up, it is only right to point out how completely the logical foundations of both were undermined by the great thinker who has just passed away. Years before the appearance of the Darwin-Wallace essay, and of the "Origin," Herbert Spencer wrote on "The Development Hypothesis." * Although of course wanting the great motive power to evolution supplied by natural selection, this essay is a powerful and convincing argument for evolution as against special creation. It is astonishing that it did not produce more effect. I may appropriately conclude this section of the Address by quoting the results of Herbert Spencer's critical examination, from every point of view, of the Linnean conception of species. "Thus, however regarded, the hypothesis of special creations turns out to be worthless—worthless by its derivation; worthless in its intrinsic incoherence; worthless as absolutely without evidence; worthless as not supplying an intellectual need; worthless as not satisfying a moral want." †

If then the Linnean conception of species—separately created and fixed for all time at their creation—has been abandoned, what have we to put in its place? In a letter to Hooker, Dec. 24, 1856, Darwin gave a list of the various definitions he had met with. "I have just been comparing definitions of species, and stating briefly how systematic naturalists work out their subjects. . . . It is really laughable to see what different ideas are prominent in various naturalists' minds when they speak of 'species'; in some, resemblance is everything, and descent of little weight—in some, resemblance seems to go for nothing, and creation the reigning idea—in some, descent is the key—in some, sterility an unfailing test, with others it is not worth a farthing. It all comes, I believe, from trying to define the indefinable." ‡

As regards the work done by the systematist, we find that Darwin did not agree with those of his friends who thought

* In the *Leader*, between January 1852 and May 1854, reprinted in "Essays Scientific, Political, and Speculative." London, 1868, vol. i, p. 377.

† "The Principles of Biology." London, 1864, vol. i, p. 345.

‡ "Life and Letters of Charles Darwin" London, 1887, vol. ii, p. 88.

that a belief in evolution would entirely alter its character. Thus he wrote to Hooker, Sept. 25, 1853:—"In my own work I have not felt conscious that disbelieving in the mere *permanence* of species has made much difference one way or the other; in some few cases (if publishing avowedly on the doctrine of non-permanence) I should *not* have affixed names, and in some few cases should have affixed names to remarkable varieties. Certainly I have felt it humiliating, discussing and doubting, and examining over and over again, when in my own mind the only doubt has been whether the form varied *to-day or yesterday* (not to put too fine a point on it, as Snagsby would say). After describing a set of forms as distinct species, tearing up my MS., and making them one species, tearing that up and making them separate, and then making them one again (which has happened to me), I have gnashed my teeth, cursed species, and asked what sin I had committed to be so punished. But I must confess that perhaps nearly the same thing would have happened to me on any scheme of work." *

The essentially subjective character of the results reached by the systematist stands out with remarkable force in this as in other passages of Darwin's letters.

A few years later, on July 30, 1856, he wrote to the same friend:—"I differ from him [Lyell] greatly in thinking that those who believe that species are *not* fixed will multiply specific names: I know in my own case my most frequent source of doubt was whether others would not think this or that was a God-created Barnacle, and surely deserved a name. Otherwise I should only have thought whether the amount of difference and permanence was sufficient to justify a name." †

Disregarding for the moment the term species, it is convenient to consider the various groupings of individual animals and plants.

1. Forms having certain structural characters in common distinguishing them from the forms of other groups. Groups thus defined by *Diagnosis* may be conveniently called *Syndiagnostic* (σύν, together; διάγνωσις, distinction).

* "Life and Letters," vol. ii, p. 40.
† *Ibid.* vol. ii, p. 81.

2. Forms found together in certain geographical areas and not in other areas. Such groups may be called *Sympatric* (σύν, together; πάτρα, native country). The occurrence of forms together may be termed *Sympatry*, and the discontinuous distribution of similar forms *Asympatry*.

3. Forms which freely inter-breed together. These may be conveniently called *Syngamic*. (σύν, together; γάμος, marriage). Free inter-breeding under natural conditions may be termed *Syngamy*; its cessation or absence, *Asyngamy* (equivalent to the *Amixia* of Weismann).

4. Forms which have been shown by human observation to be descended from common ancestors. Such groups may be called *Synepigonic* (σύν, together; ἐπίγονος, descendant). Breeding from common parents may be spoken of as *Epigony* or the production of *Epigonic* evidence.*

My friend, Professor E. Ray Lankester, to whom I owe so much, in this as in many other subjects, is inclined to think that we should discard the word species not merely momentarily but altogether. Modern zoology having abandoned Linnæus' conception of "species" should, he considers, abandon the use of the word. In his opinion the "origin" of species was really the abolition of species, and zoologists should now be content to describe, name, draw, and catalogue *forms*. Furthermore, the various groups of forms briefly defined above should be separately and distinctly treated by the zoologist, without confusion or inference from one to the other. The systematist should say, "I describe and name certain forms *a*, *b*, etc."; and then he or another may write a separate chapter, as it were :—"I now show that the forms *ab*, *ac*, *ad* (form names) are syngamic:" at another time he may give reason for regarding any of them as related by epigony.

I fear that this suggestion is a "counsel of perfection," impossible of attainment, although there would be many

* My friend Mr. Arthur Sidgwick has kindly helped me by suggesting the appropriate Greek words. The use of ἐπίγονος I owe to my friends Mr. Arthur Evans and Mr. R. W. Macan. The adjectival termination is made *-ic* throughout for the sake of convenience, although *Sympatriote* or *Sympatrid* would have been more correct.

and great advantages in thus making a fresh start and in the abandonment of "species," or the restriction of the word to the only meaning it originally possessed before it was borrowed from logic to become a technical term in zoology.*

Professor Lankester in former years published (I cannot at this moment lay my hands upon the communication) the suggestion that the term species should be limited to a group which includes all the forms derived from common ancestors within human experience, or inferred to be so derived within the possible period of human observation. Thus if the common ancestry of two forms has to be traced back to a period beyond the late pre-historic times (or beyond any other arbitrary line which is agreed upon), then they are not members of the same species. Professor Lankester is the first to admit that the practical application of this as of every other conception of species would very often mean a great deal more than we can prove, in fact, hypothesis.

It is evident too that Darwin regarded persistence of form as an important criterion of a species. We recognise this in the definition I have quoted from the "Origin" (see p. lxxviii), and it is stated with even greater force in the following passage, where persistence is placed beside other distinguishing marks of a species and given the pre-eminence. In a letter to Hooker (October 22, 1864) Darwin says:—"I will fight to the death that as primrose and cowslip are different in appearance (not to mention odour, habitat, and range), and as I can now show that, when they cross, the intermediate offspring are sterile like ordinary hybrids, they must be called as good species as a man and a gorilla. The power of remaining for a good long period constant I look at as the essence of a species, combined with an appreciable amount of difference." †

It is now necessary to examine in some detail the most usual conception of a species, a conception based upon distinguishing structural characters, or diagnosis.

This idea of a species is clearly expressed by Sir William Thiselton Dyer, when he speaks of the older writers who

* See F. A. Dixey in "Nature," June 19, 1902, p. 169.
† "More Letters," vol. i, p. 252, Letter 179.

employed "the word species as a designation for the totality of individuals differing from all others by marks or characters which experience showed to be reasonably constant and trustworthy, as is the practice of modern naturalists." *

This conception of a species is founded upon transition. Whenever a set of individuals can be arranged, according to the characters fixed upon by the systematist, in a series without marked breaks, that set is regarded as a species. The two ends of the series may differ immensely, may diverge far more widely than the series itself does from other series; but the gradual transition proclaims it a single species. If transitions were all equally perfect of course there would be no difficulty. But transitions are infinite in their variety; while the subjective element is obviously dominant in the selection of gaps just wide enough to constitute interspecific breaks, just narrow enough to fuse the species separated by some other writer,—dominant also in the choice of the specific characters themselves.† Looking back upon the interval between Linnæus and Darwin, it seems remarkable that the mutability of species was not forced upon systematists as the result of their own labours. It is astonishing that many a naturalist was not driven by his descriptive work to the conclusion which Darwin stated to Asa Gray on July 20, 1856: "— as an honest man, I must tell you that I have come to the heterodox conclusion, that there are no such things as independently created species—that species are only strongly defined varieties." ‡

For, as I have said above, every describer of species made continuity and transition in characters the test of a variety, discontinuity the test of a separate species. And in difficult cases no two of them agreed in their conclusions. Many passages in Darwin's correspondence convincingly prove how essential an element is this continuity, and how inevitable

* *l. c.* p. 370.

† How important this choice may be is well shown by Karl Jordan in "Novitates Zoologicæ," vol. iii, Dec. 1896, pp. 428–430. Characters are subject to *independent variation* as well as *correlated variation.* Hence there may be the widest discrepancy between the transitions constructed by naturalists making use of different characters.

‡ "Life and Letters," vol. ii, p. 79.

is the dominance of the subjective element. Thus he writes about his descriptive work on Cirrhipedes to Hooker, October 12, 1849:—"I have of late been at work at mere species describing, which is much more difficult than I expected, and has much the same sort of interest as a puzzle has; but I confess I often feel wearied with the work, and cannot help sometimes asking myself what is the good of spending a week or fortnight in ascertaining that certain just perceptible differences blend together, and constitute varieties and not species. As long as I am on anatomy I never feel myself in that disgusting, horrid, *cui bono*, inquiring humour." *

On another occasion, when Darwin was anxious to ascertain the "close species" in the North American Flora, and wrote for information to Asa Gray, he frankly adopted the subjective criterion in order to explain exactly what he meant. He wrote, June 8, [1855]:—"The definition I should give of a '*close species*' was one that *you* thought specifically distinct, but which you could conceive some other *good* botanist might think only a race or variety; or, again, a species that you had trouble, though having opportunities of knowing it well, in discriminating from some other species." †

Asa Gray's reply is also very interesting from the same point of view. He wrote, June 30, 1855:—"Those thus connected" [he had bracketed the "close species" in a list of the Flora], "some of them, I should in revision unite under one, many more Dr. Hooker would unite, and for the rest it would not be extraordinary if, in any case, the discovery of intermediate forms compelled their union." ‡

Darwin was evidently in high spirits when he wrote the following passage which bears on the same subject. The "Origin" had been published on November 24, 1859, and the whole edition of 1250 copies sold on the day of issue. On November 29 he wrote to Asa Gray:—"You speak of species not having any material base to rest on, but is this any greater hardship than deciding what deserves to be called a variety, and be designated by a Greek letter? When I

* "Life and Letters," vol. i, p. 379.
† *Ibid.*, vol. ii, p. 64.
‡ "More Letters," vol. i, p. 421, Letter 324.

was at systematic work I know I longed to have no other difficulty (great enough) than deciding whether the form was distinct enough to deserve a name, and not to be haunted with undefined and unanswerable questions whether it was a true species. What a jump it is from a well-marked variety, produced by natural cause, to a species produced by the separate act of the hand of God! But I am running on foolishly. By the way, I met the other day Phillips, the palæontologist, and he asked me, 'How do you define a species?' I answered, 'I cannot.' Whereupon he said, 'At last I have found out the only true definition—any form which has ever had a specific name!'" *

The idea of a species as an inter-breeding community, as syngamic, is, I believe, the more or less acknowledged foundation of the importance given to transition. This will become clearer from the consideration of a concrete example. The common black-and-white Danaine butterfly, *Amauris niavius* of West Africa, is represented on the East and South-East Coasts by a very similar butterfly, distinguished by the greater size of the largest white patch, and of the white spot in the cell of the fore-wing. Both forms are very constant in the areas over which they were known, and on these constant easily recognisable characters the eastern butterfly was described as a distinct species under the name of *A. dominicanus*. Aurivillius, however, in his valuable Catalogue refuses to recognise this latter as a distinct species, and considers it as the *dominicanus* variety of *niavius*. Through the kindness of Mr. C. A. Wiggins and Mr. A. H. Harrison, the Hope Department has recently been presented with an exceedingly fine series of butterflies from both east and west of the northern shores of Lake Victoria Nyanza. These have been carefully studied by Mr. S. A. Neave, B.A., of Magdalen College, Oxford, who finds that the typical *niavius* occurs in great abundance to the west of the lake, while on the east he meets, in both collections, with varieties beautifully intermediate between it and *dominicanus*. These varieties, occurring precisely in the zone where the eastern form meets the western, complete for the systematist the transition which

* "More Letters," vol. i, p. 127, Letter 79.

renders *dominicanus* a variety of *niavius* and not a distinct species. But it is clear that they do more than this; they make it almost certain that the two forms freely interbreed, and constitute but a single syngamic community.

This is one of the remarkably clear examples. In many cases we know the transition, but the extremes are not sorted out in different parts of the total area of distribution. Nevertheless if complete enough the transition of forms on the same area always raises the strong presumption that we are dealing with a syngamic community.

Probably the most remarkable series of transitional varieties ever depicted is that shown in the eleven quarto plates of the last part of Monsieur Charles Oberthür's great "Études d'Entomologie," entitled "Variation des *Heliconia thelxiope* et *vesta*" (Rennes, February, 1902).

The method of diagnosis, at its clearest and simplest, is always consistent with, and often strongly suggests, an underlying syngamy. There are, however, numberless examples belonging to various categories in which a rigid adherence to diagnosis cannot avail. In these cases the systematist frankly appeals to syngamy or synepigony as decisive; and if he has not direct proof of the existence of either of these, indirect evidence is, at any rate provisionally, regarded as sufficient.

I. *Dimorphism, Polymorphism:*—In an ever-increasing number of examples an assemblage of individuals is regarded as a single species, although split up into two or more widely different and sharply separated groups, between which transitional varieties are excessively rare or even unknown. For instance, the extremely abundant, widely distributed butterfly *Limnas chrysippus* includes among other forms one in which the black-and-white tip is wanting from the fore-wing, the *dorippus* (= *klugii*) form. This variety is sharply cut off from the type form. Although faint traces of a former white bar can be made out in *dorippus*, I have never seen, among thousands of individuals, the material out of which a good transitional series between it and *chrysippus* could be constructed. In this case the evidence of syngamy is strong and complete; for Col. Yerbury has recorded the fact that the two forms certainly occur *in copulâ*.* But if this evidence were wanting there would still be strong presumptive evidence that the forms are associated by syngamy and synepigony. Thus, so far as our knowledge extends, *dorippus* occurs as the only form in certain parts of N.E. Africa alone. From this, its metropolis, *dorippus* spreads on all sides, its individuals existing intermingled with those of *chrysippus*, becoming less and less numerous until they finally die out. Thus if we trace the two forms eastward we find them both abundant at Aden; further east, at Karachi, *dorippus* is well known, but very scarce as compared with *chrysippus*; in Southern India it is a great rarity, if indeed it is known at all on the mainland; in Ceylon a single specimen was captured by Col. Yerbury in 1891, and since then others have been taken.† Further east I have never heard of a specimen. Similarly when it is traced southward in Africa, *dorippus* is dominant in the coast strip of British East Africa, where it constitutes about three-quarters of the total number of individuals. Further to the south it becomes rarer and rarer, until in Natal and the Cape, if it occurs at all, it is even rarer than in Ceylon.‡ Such a distribution is consistent with the interpretation that *dorippus* and *chrysippus* are two forms in one syngamic community. It is difficult on any other hypothesis to account for the facts which we observe on the outskirts of

* Speaking of his experience at Aden, Col. Yerbury says: "I have taken them [the forms of *chrysippus*] *in coitu* in every possible combination." (Journ. Bomb. Nat. Hist. Soc., vii (1892), p. 209.)

† See Major N. Manders, F.Z.S., in Journ. Bomb. Nat. Hist. Soc., xiv (1902), p. 716:—

"The first specimen of this insect [*dorippus=klugii*] in Ceylon was captured by Lieut.-Colonel Yerbury at Trincomalie, April 15th, 1891 . . ." Of five or six more recent examples Major Manders writes, "These specimens were captured by Mr. Pole at Puttalam on the east coast and Hambantotte on the south coast in the dryest and perhaps most arid portion of the island. It is evidently widely distributed in the desert portion of the island and is possibly not uncommon."

"The distribution of this insect in India cannot yet be fully known; it is rare in Canara, but is not yet reported from the plains of the Deccan, or Southern India, so far as I am aware, though it probably exists." The occurrence of *dorippus* at Bombay, Kutch, and Sind had been previously published by Major Manders and the late Mr. de Nicéville in Journ. As. Soc. Bengal, vol. lxviii, Pt. ii, No. 3, 1899, p. 170.

‡ Mr. Roland Trimen tells me that he knows of only three South-African *dorippus*:—two from Durban and one from Pretoria. The latter and one of the former were taken by Mr. W. L. Distant (Ann. Mag. Nat. Hist. (7), vol. i, 1898, pp. 48, 49).

the range of *dorippus*—the occasional appearance of single individuals in the swarms of the type form. And if the two are syngamic on the outskirts, the gradual transition in proportions towards the metropolis of *dorippus* suggests that they are syngamic throughout. Common as the species is—probably the commonest butterfly in the world,—the evidence from epigony has never been obtained, although from the point of view of heredity the investigation promises to be of the deepest interest.

The remarkable forms of the females of the *Papilio merope* group already alluded to afford another excellent example, although in this case good transitional series can be constructed. The evidence of syngamy was first obtained by Hewitson (see p. lxxxvii), but is now well known. The evidence of epigony has fortunately been obtained in 1902 and again within the last few weeks by one of our Fellows at Durban, Mr. G. F. Leigh. Eggs from a female of the commonest *cenea* form yielded a synepigonic group, including a large majority of forms like the parent, but also examples of the very different *hippocoon* form. Still more recently seven eggs from the rarest of the forms, *trophonius*, produced, in addition to males, two females of the *cenea* variety, and not one resembling the parent.

These differences, although only of colour and pattern, greatly exceed those between ordinary close species. When we deal with other kinds of dimorphism or polymorphism involving important structural differences, such as those of the social Hymenoptera and Neuroptera, the discriminating characters between nearly related genera are commonly equalled or exceeded.

II. *Seasonal Dimorphism* :—In certain exceedingly interesting examples of dimorphism the relation between the forms is epigonic and not syngamic ; for rare and occasional inter-breeding is not syngamy. I refer to the most strongly-marked cases of seasonal dimorphism in butterflies, especially the wonderful examples proved to be epigonic by Guy A. K. Marshall. In some of the forms the two seasonal phases were not even regarded as closely related species. In these extraordinary cases, where the widest difference in colour and pattern exists, in combination with others which are far more deep-seated, I urged upon Mr. Marshall that the few recorded examples of capture or observation *in coitu* were insufficient evidence of specific identity, and that nothing short of epigony would suffice.

In seasonal dimorphism, in the dimorphism of social insects, and doubtless in a large proportion of other examples, it is probable, indeed often certain, that the different forms are produced in response to some stimulus which acts at a specially susceptible period of the life-history; but from the point of view of the systematist the mature individuals can only be known as forms which, structurally widely different, must nevertheless be placed within the limits of a single species. The investigation of the probable physiological causes of difference is, however, of the utmost importance from other points of view. Altogether apart from its bearing upon dimorphism, the effect of individual susceptibility to stimulus requires treatment in a separate category.

III. *Individual Modification:* *—One of the most striking developments of recent years has been the growth in the number of these very cases in which an individual animal or plant has been rendered by natural selection susceptible to some stimulus associated with each one of its possible normal environments. Every individual of such species comes into the world with two or more very distinct and very different possibilities before it, each of which will be realised only in the appropriate environment—realised as the response to some stimulus provided by the environment itself. We can see clearly that this idea was in Darwin's mind, although there were then but few facts which pointed in its direction. Thus in Schmankewitsch's experiments Crustacea of the species *Artemia salina* were described as gradually changing in the course of generations, as the result of a progressive freshening of the water in which they were kept, until they took on the characters of the genus *Branchipus.* On this subject Darwin wrote to Karl Semper, February 6, 1881:—"When I read imperfectly some years

* "A structural change wrought during the individual's lifetime (or acquired), in contradistinction from variation, which is of germinal origin (or congenital)." Dict. of Phil. and Psych., ed. by J. Mark Baldwin, New York and London, vol. ii, 1902, p. 94.

ago the original paper, I could not avoid thinking that some special explanation would hereafter be found for so curious a case. I speculated whether a species very liable to repeated and great changes of conditions might not assume a fluctuating condition ready to be adapted to either conditions." *

I venture to express the prediction that this class of cases, already very numerous, will hereafter be immensely enlarged, and will become especially important in the vegetable kingdom.† Although Hooker at one time took the opposite side, and thought that plants were never "changed materially by external conditions—except in such a coarse way as stunting or enlarging," ‡ Darwin considered that "physical conditions have a more direct effect on plants than on animals." § Undoubtedly the view at the time was that of Buffon, the idea of an operation of the environing forces almost as direct as those which produce the weathering of rocks or the whitening of an exposed flint. But it is probable that the more intimately we know of the conditions of plant-life, the more fully it will be recognised that all such changes are adaptive.

* "More Letters," vol. i, p. 391, Letter 303.

† See "Stimulus and Mechanism as Factors in Organisation" by J. Bretland Farmer, F.R.S. (the New Phytologist, vol. ii, Nos. 9 and 10, Nov. and Dec. 1903). Professor Farmer speaks of the probable prevalence in the plant-world of "a constant specific mechanism that is able to be actuated in different ways by different kinds of stimuli." Although for the purpose of his paper Professor Farmer is concerned with the train of physico-chemical sequences which is set going, utility or no utility, whenever the mechanism of an individual is stimulated, he fully admits that the mechanism itself has come to be a character of the species by the operation of natural selection. "Naturally," he says, "only those species whose inner character expressed itself in making these 'suitable' adjustments to the environment were able to survive."

Toward the close of his paper Professor Farmer seems to bring the considerations that have regard to the species into somewhat unnecessary conflict with those that have regard to the individual. Thus he says that "current literature still teems with teleological explanations that really explain nothing, but rather bar the way of scientific enquiry."

A properly loaded, well-constructed modern gun goes off, for disadvantage no less than for advantage, when its trigger is pulled ; but the very existence of the gun depends upon a long succession of past stages, each of which was more advantageous than its predecessor. The recognition of this history does not bar the way of enquiry, but rather stimulates and suggests a searching and intelligent study of the latest mechanism with all its intricacy.

‡ See the letter from Hooker to Darwin, March 17, 1862, in "More Letters," vol. i, p. 197.

§ See the letter from Darwin to Lyell [June 14, 1860], "Life and Letters," vol. ii, p. 319.

I will mention merely by way of illustration, that my attention has been called in recent years to the dwarfing effect of the prevalent south-western winds on the vegetation of the exposed chalk downs of the Isle of Wight. It has occurred to me as a mere suggestion, but one worth investigating, that the effect of wind upon a tall flower-head might be such as to render less easy and less frequent the visits of insects. If this were so, it would perhaps explain why certain species of entomophilous plants liable to grow in such situations have gained a special susceptibility to the stimulus provided by constant winds during some particular period of growth. The absence of this stimulus would also correspond to a condition in which the plants would gain in the conspicuousness brought about by increased height.

The further growth of a class already proved to be large, would play havoc with a definition of species rigidly based upon discriminating structural characters alone.

IV. *Geographical Races or Sub-Species* :—If we depend upon unaided diagnosis there is no means of discriminating between species and those sub-species of which the whole mass of individuals are distinguished by recognisable characters. Here again the mere beginning of the difficulty is in sight; for as museums recognise more and more the necessity for long series of specimens with exact geographical data, so will the comparatively simple conception of the single species be replaced again and again by the far more complex but much truer idea of sub-specific groups still fused by syngamy into a single species, but as it were trembling on the edge of disruption, ever ready, by the development of pronounced preferential mating or by the accumulated incidental effects of isolation prolonged beyond a certain point, to break up into distinct and separate species.

V. *Results of Artificial Selection* :—These obvious difficulties encountered by a mechanical adherence to definition by diagnosis naturally lead to the consideration of the further difficulties presented by domestic races of animals and plants. The wide structural differences between the forms accumulated by human selection greatly impressed Darwin. Thus he wrote to Hooker, September 8, [1856]:—" By the way, I have been astonished at the differences in the skeletons of domestic rabbits. I showed some of the points to Waterhouse, and asked him whether he could pretend that they were not as great as between species, and he answered, 'They are a great deal more.' How very odd that no zoologist should ever have thought it worth while to look to the real structure of varieties. . . ." * Then again, the differences between many of our domestic breeds, and between them and the nearest wild species, are, as is well known, generic rather than specific. Why do we not consider such races to be of different species and genera? Because of the criterion suggested by Lankester; because we have reason to believe in their descent from common parents within the historic period; because, in spite of their wide differences, they are still syngamic.

What is the practical bearing of these criticisms upon the definition of species by diagnosis and diagnosis alone? The systematist, confronted by his series of specimens in a museum cannot do otherwise than arrange them in groups which he will describe and name as species. But much would be gained if he admitted at the outset that his conclusions are provisional, if he said with Dr. Karl Jordan, "The actual proof of specific distinctness the systematist as such cannot bring; . . . we work, or we ought to work, with the mental reservation that the specific distinctness of our *species novæ* deduced from morphological differences will be corroborated by biology." †

The advantage of this attitude is obvious. Work would go on as at present. Powers of acute observation and good judgment would still furnish descriptions of species to be hereafter confirmed, or confirmed at the time by observation and experiment upon the living material. But the systematist would not only receive our gratitude for the performance of these important and necessary duties: he would also be seeking in every direction for the evidence of syngamy and of epigony. The museum would become a centre for the inspiration of researches of the highest interest to the investigator himself, of the greatest importance to the whole body of naturalists.

* "More Letters," vol. ii, p. 210, Letter 543.

† "Novitates Zoologicæ," vol. iii, Dec. 1896, pp. 450, 451. I here desire to express my indebtedness to the author of this learned and valuable paper.

We now turn to the consideration of interspecific sterility, which many have supposed to be an infallible criterion. Huxley himself felt this so strongly that he was, in consequence, never able to give his full assent to natural selection. The grounds of his objection were the subject of prolonged correspondence with Darwin. In order to prove that natural selection has produced natural species separated rigidly, as he believed, by the barrier of sterility, Huxley maintained that we ought to be able to produce the same sterility between our artificially selected breeds; and until this had been done he could not thoroughly accept the theory of natural selection. This objection he expressed, or implied, in many speeches and writings up to within a few months of his death. One of the simplest statements is contained in a letter to the late Charles Kingsley. Huxley wrote, April 30, 1863, "Their produce [viz. that of Horse and Ass] is usually a sterile hybrid.

"So if Carrier and Tumbler, *e. g.*, were physiological species equivalent to Horse and Ass, their progeny ought to be sterile or semi-sterile. So far as experience has gone, on the contrary, it is perfectly fertile—as fertile as the progeny of Carrier and Carrier or Tumbler and Tumbler.

"From the first time that I wrote about Darwin's book in the *Times*, and in the *Westminster*, until now, it has been obvious to me that this is the weak point of Darwin's doctrine. He *has* shown that selective breeding is a *vera causa* for morphological species; he has not yet shown it a *vera causa* for physiological species.

"But I entertain little doubt that a carefully devised system of experimentation would produce physiological species by selection—only the feat has not been performed yet."*

It was against this same view, as expressed in Huxley's "Lectures to Working Men" in 1863, that Darwin argued with convincing force in many letters. The main facts with which he confronted Huxley again and again were the artificially selected races of certain plants which are sterile *inter se*. The position is clearly expressed in the following amusing, vehement passages from two letters:—

* "Life and Letters of Thomas Henry Huxley," vol. i, p. 239.

"*Dec.* 18, [1862.]

"Do you mean to say that Gärtner lied, after experiments by the hundred (and he a hostile witness), when he showed that this was the case with *Verbascum* and with maize (and here you have selected races): does Kolreuter lie when he speaks about the varieties of tobacco? My God, is not the case difficult enough, without its being, as I must think, falsely made more difficult? I believe it is my own fault—my d——d candour: I ought to have made ten times more fuss about these most careful experiments." *

"[*Jan.*] 10, [1863.]

"In plants the test of first cross seems as fair as test of sterility of hybrids, and this latter test applies, I will maintain to the death, to the crossing of varieties of *Verbascum*, and varieties, selected varieties, of *Zea*. You will say, Go to the Devil and hold your tongue. No, I will not hold my tongue; for I must add that after going, for my present book [Variation under Domestication], all through domestic animals, I have come to the conclusion that there are almost certainly several cases of two or three or more species blended together and now perfectly fertile together. Hence I conclude that there must be something in domestication,—perhaps the less stable conditions, the very cause which induces so much variability,—which eliminates the natural sterility of species when crossed. If so, we can see how unlikely that sterility should arise between domestic races. Now I will hold my tongue." †

Darwin made attempts to "produce physiological species by selection," and thus meet his friend's criticism. He thought out and suggested a plan of experiment to W. B. Tegetmeier,‡ and gave a brief account of the scheme to Huxley, December 28, [1862]:—"I have —— given him [Tegetmeier] the result of my crosses of the birds which he proposes to try, and have told him how alone I think the experiment could be tried with the faintest hope of success—namely, to get, if possible, a case of two birds which when

* "More Letters," vol. i, p. 230, Letter 156.
† *Ibid.* vol. i, pp. 231, 232, Letter 157.
‡ *Ibid.* vol. i, pp. 223, 224, Letter 153, [1862, Dec.] 27.

paired were unproductive, yet neither impotent. For instance, I had this morning a letter with a case of a Hereford heifer, which seemed to be, after repeated trials, sterile with one particular and far from impotent bull, but not with another bull. But it is too long a story—it is to attempt to make two strains, both fertile, and yet sterile when one of one strain is crossed with one of the other strain. But the difficulty . . . would be beyond calculation." *

The experiment was evidently unsuccessful,—perhaps was never seriously undertaken,—and a few years later Darwin added the following postscript to a letter to Huxley, January 7 [1867].

"P.S.—Nature never made species mutually sterile by selection, nor will men." †

This was probably only an offhand expression of opinion, not intended to be taken seriously. An altogether hopeless attitude would not be reasonable until the suggested scheme had been applied many times, and in several parts of the animal and vegetable kingdoms.

But the positive results demanded by Huxley, even if obtained, would by no means justify his far-reaching conclusions. If the barrier of sterility were thus artificially produced, we should be very far from the proof that its existence in nature is due to the same kind of cause, viz. selection. If Darwin was right in his controversy with Wallace, if "Nature never made species mutually sterile by selection," the suggested experiment would merely do by artificial selection what is not done by natural selection.

It is by no means difficult to understand the mutual sterility which is usual between natural species as an incidental result of their separation by asyngamy for a long period of time. In the process of fertilisation a portion of a single cell nucleus from one individual fuses with a portion from another individual, the two combining to form the complete nucleus of the first cell of the offspring, from which all the countless cells of the future individual will arise by division. Each part-nucleus contains the whole of the hereditary qualities

* "More Letters," vol. i, pp. 225, 226, Letter 154.
† *Ibid.* vol. i, p. 277, Letter 197.

received from and through its respective parent, and must therefore be of inconceivable complexity. We can only speak in generalities about processes of which so little is known, but we cannot be wrong in assuming that sterility is sometimes due to the fact that the complex architecture of one part-nucleus fails in some way to suit the equally complex structure of the other. The individuals of an inter-breeding community form a biological whole, in which selection inevitably keeps up a high standard of mutual compatibility between the sexual nuclei. Individuals whose sexual nuclei possess a structure which leads to sterile combinations with those of other individuals are excluded from contributing to the generations of the future. As soon, however, as a group of individuals ceases, from any reason, to breed with the rest of the species, there is no reason why the compatibility of the sexual nuclei of the two sets should be retained. Within each set, selection would work as before and keep up a high standard of compatibility; between the sets, compatibility would only persist as a heritage of past selection, gradually diminishing as slight changes of structure in either or both of the sets rendered them less and less fitted to produce fertile combinations.*

It is probable that of all the nice adjustments required in the living organism, the mutual adjustment of these inconceivably complex part-nuclei is the most delicate and precise. Now, delicately adjusted organs, such as those of sight, rapidly become incapable of performing their functions when in any species they have been withdrawn from the operation of natural selection; similarly it is suggested, that the adjustment of sexual nuclei to each other would sooner or later give way

* I must guard against the inference that the only explanation of sterility is here set forth. It is indeed maintained that incompatibility of the sexual part-nuclei is the inevitable outcome of enduring asyngamy, and is the almost certain cause of the sterility of hybrids. And it may be suggested that sterility is a result of the combination of two incompatible germ-plasms in the sexual cells of the hybrid. When the incompatibility is not strongly marked we can understand how such sexual cells may be capable of fertile fusion with the cells of either parent, but not with those of another hybrid.

But short of these ultimate effects it must not be forgotten that there are many obscure factors of asyngamy—causes of various kinds which interfere with the fusion under normal conditions or entirely prevent the meeting of the sexual cells.

when no longer sustained by selection. If, then, mutual fertility be the result of unceasing selection, and mutual sterility the inevitable, even if long-postponed, consequence of its cessation, it is obvious that Huxley's difficulty is solved, while his suggested experimental creation of sterility by selection would not reproduce any natural operation: it would afford a picture of a natural result but would be produced in an unnatural way. This criticism of Huxley's contention was advanced by the present writer three years ago,* the final conclusion being stated in the paragraph printed below:—

"If, then, we cannot as yet reproduce by artificial selection all the characteristics of natural species-formation, but can only imitate natural race-formation, we can nevertheless appreciate the reasons for this want of success, and are no more compelled to relinquish our full confidence in natural selection than we are compelled to adopt a guarded attitude towards evolution because our historical records are not long enough to register the change of one species into another."†

It was therefore with intense interest and pleasure that I read the following sentences in a letter written by Darwin to Huxley, Dec. 28, [1862]—sentences which show that criticism practically identical had been made by the illustrious naturalist nearly forty years earlier.

"We differ so much that it is no use arguing. To get the degree of sterility you expect in recently formed varieties seems to me simply hopeless. It seems to me almost like those naturalists who declare they will never believe that one species turns into another till they see every stage in progress." ‡

After reading, in the first volume of "More Letters," the often-repeated refutation of Huxley's objection so clearly and strongly expressed in letters received by the objector himself, it is surprising that no effect was produced, and that reference should have been nearly always made to this supposed flaw in the theory of natural selection, whenever the great compara-

* "The Quarterly Review," No. 385, January 1901, pp. 368–371.
† *l. c.* p. 371.
‡ "More Letters," vol. i, p. 225, Letter 154.

tive anatomist had occasion to speak or write on the broader aspects of biological inquiry.*

Darwin also considered that there was something in the very conditions of domestication which tended to promote fertility between races and even between distinct species. Thus he followed Pallas in believing that the domestic dog has been derived from more than one wild species, although he did not trace existing differences to this cause but to artificial selection.† However, as regards the origin of the dog, "the evidence is, and must be, very doubtful," as he wrote to Lyell, August 11, [1860]. The fact which Darwin "considered the most remarkable as yet recorded with respect to the fertility of hybrids," was the fertility of the offspring of the Common and Chinese Goose, originally described by Eyton, and confirmed by Goodacre and by Darwin himself. "The two species of goose now shown to be fertile *inter se* are so distinct that they have been placed by some authorities in distinct genera or sub-genera." ‡

Another interesting and exceedingly difficult experiment in hybridisation has been carried through by the Rev. P. St. M. Podmore, F.Z.S., who in Sept. 1899, after numerous failures, succeeded in rearing a healthy male hybrid between the Ring Dove (*Columba palumbus*) and the domestic pigeon. On May 27, 1903, this male was mated with a Blue Homer hen, which produced healthy offspring. §

* For several instances see Poulton's "Charles Darwin and the Theory of Natural Selection," Lond. 1896, pp. 124–141.

† "Though I believe that our domestic dogs have descended from several wild forms, and though I must think that the sterility, which they would probably have evinced, if crossed before being domesticated, has been eliminated, yet I go but a very little way with Pallas & Co. in their belief in the importance of the crossing and blending of the aboriginal stocks.

* * * * * * *

"Although the hound, greyhound, and bull-dog may possibly have descended from three distinct stocks, I am convinced that their present great amount of difference is mainly due to the same causes [artificial selection] which have made the breeds of pigeons so different from each other, though these breeds of pigeons have all descended from one wild stock; so that the Pallasian doctrine I look at as but of quite secondary importance."

"More Letters," vol. i, pp. 127, 128, Letter 80, to Lyell, Oct. 31, [1859].

‡ "Life and Letters," vol. iii, p. 240.

§ "The Zoologist," Nov. 1903, p. 401.

A comparison between the difficulty of producing such a cross and that of obtaining hybrids between the Ring Dove and the Rock Pigeon, the ancestor of the domestic breeds, would probably throw much light on the Pallasian hypothesis.

If the view here proposed be sound—that syngamy lies behind, and is at least provisionally implied in the transition which means so much to the systematist, and is his only real evidence when the structural test breaks down, the conclusion is suggested that the real interspecific barrier is not sterility but asyngamy. Nevertheless, as argued on pages civ–cvi, asyngamy will infallibly lead to sterility, although the result may be long delayed. This latter view, which was that of Darwin, is the exact opposite of the "physiological selection" of Romanes, in which sterility is supposed to arise spontaneously, asyngamy being not the cause, but the consequence.

Asyngamy may be brought about in various ways, of which the most obvious is geographical separation. But asyngamy is by no means the necessary result of geographical discontinuity or asympatry. Thus Darwin considered that there is regular inter-breeding between Madeiran and continental birds of the same species. He wrote to Hooker, August 8 [1860]: "I do not think it a mystery that birds have not been modified in Madeira. Pray look at p. 422 of *Origin* [ed. iii]. You would not think it a mystery if you had seen the long lists which I have (somewhere) of the birds annually blown, even in flocks, to Madeira. The crossed stock would be the more vigorous." * An even more striking case is that of *Pyrameis cardui*, which ranges over nearly the whole world. The singular absence of local geographical races in this abundant butterfly is almost certainly due to the astonishing powers of dispersal which enable intermittent syngamy to prevail over the whole vast area of its distribution.

An interesting and curious cause of persistent asyngamy is the "Mechanical Selection" so thoroughly explained and abundantly illustrated by Karl Jordan.† The complex genital armature of Lepidoptera is during syngamy kept constant by

* "More Letters," vol. i, pp. 487, 488, Letter 370.
† *l. c.* p. 518–522.

unceasing selection. Comparatively brief isolation of a group of individuals may lead to a departure from the specific type of apparatus prevalent in other areas, and may thus mechanically prevent syngamy if from any cause members of the group became again sympatric with those of the parent species.

A very different but exceedingly interesting origin of asyngamy is suggested by observations which support the conclusion that varietal forms may show a tendency towards preferential inter-breeding.

H. W. Bates believed that he had strong evidence for the existence of this tendency in the races of certain tropical American butterflies. He stated this in his epoch-making paper on the butterflies of the Amazon valley,* and it is interesting to observe in the published letters how Darwin instantly fixed upon the point and tried to elicit the data upon which the conclusion was formed. Thus he wrote to Bates, Nov. 20 [1862]:—"No doubt with most people this [viz. the interpretation of Mimicry] will be the cream of the paper; but I am not sure that all your facts and reasonings on variation, and on the segregation of complete and semi-complete species, is not really more, or at least as valuable, a part. I never conceived the process nearly so clearly before; one feels present at the creation of new forms. I wish, however, you had enlarged a little more on the pairing of similar varieties; a rather more numerous body of facts seems here wanted." †

Then a few days later we find Darwin still thinking of the subject, and writing to Hooker [1862, Nov.] 24:—"I have now finished his [Bates'] paper . . .; it seems to me admirable. To my mind the act of segregation of varieties into species was never so plainly brought forward, and there are heaps of capital miscellaneous observations." ‡

He also again wrote to Bates, probably on the following day, Nov. 25 [1862?], asking for the solid facts which are so greatly wanted:—

"Could you find me some place, even a footnote (though

* Trans. Linn. Soc., vol. xxiii (1862), p. 495.

† "Life and Letters," vol. ii, p. 392.

‡ "More Letters," vol. i, p. 214, Letter 147.

these are in nine cases out of ten objectionable), where you could state, as fully as your materials permit, all the facts about similar varieties pairing—at a guess how many you caught, and how many now in your collection? I look at this fact as very important; if not in your book, put it somewhere else, or let me have cases." *

Remembering that Mr. Roland Trimen, F.R.S., had expressed the same opinion as the result of his wide and long experience of South African butterflies, I asked him if he would kindly furnish me with a statement. His reply, dated Dec. 28, 1903, is as follows:—

"*Dec.* 28, 1903.

"I have noticed the tendency of the sexes of a variety to pair together rather than with other varieties in the numerous cases of captured pairs sent to me by correspondents in South Africa, and sometimes in cases of the same kind which occurred to myself when collecting. The species which particularly attracted my notice in this way during my visit to Natal was *Hypanis acheloia* (= *Götzius*, Herbst, part), which is curiously variable on the underside, from pale creamy to deep chocolate. I did not know of its *seasonal* variation at the time, but I was in Natal just at the change of season from wet to dry, when the intermediate gradations were about, and I was struck with the close resemblance of the sexes in pairs that I caught. I am sorry to have nothing more definite to give on this head; it is a point much requiring exact and prolonged observation."

Mr. Trimen furthermore entertains no doubt that much, if not all, of the material upon which he based the conclusion that the individuals of the same race tend to interbreed, exists, distinctively labelled, in the South African Museum, at Cape Town. It is greatly to be hoped that collectors will in future carefully label all specimens captured *in coitu*, and that the fact will be recorded on the labels in museums and in private collections. It is tantalising to reflect upon the number of interesting and important questions which could be now decided if this practice had prevailed during the past fifty years. The question of the possible origin of species

* "More Letters," vol. i, p. 215, Letter 148.

from races by preferential syngamy is of such high importance that we may confidently hope that the attention here directed to the question, and especially the quotation of Darwin's letters to Bates, may lead to that "exact and prolonged observation," accompanied by careful records, without which a safe decision cannot be reached. In the meantime the decided impressions of two such naturalists as H. W. Bates in South America and Roland Trimen in South Africa render it in every way probable that the conclusion will be established on a firm foundation.*

It is also possible that asyngamy may be brought about by the breaking of what we may call "a syngamic chain." In the case of large and widely-distributed interbreeding communities, it is an open question whether syngamy would freely take place between the most distant of the outlying sections if directly brought into contact, and whether, even if syngamy prevailed, there would be any diminution in fertility.

Limnas chrysippus, perhaps the commonest butterfly in the world, forms a probably continuous syngamic chain stretching from the Cape of Good Hope at least as far as Southern China. It is even reported from Japan. The far Eastern forms are readily distinguishable by the greater size of a single white spot, giving quite a different appearance to the fore-wing. If pupæ or eggs were transferred from Hong-Kong or Macao to South Africa, would the perfect butterflies freely interbreed

* Dr. T. A. Chapman sends me the following interesting and suggestive note :—

"I met lately with a curious instance that deserves following up, of some bearing on the question of selective mating of varieties.

"I saw some broods of *P. phlæas* lately that differed from each other, but each brood was remarkably uniform. There were three broods, all bred in the same conditions, in a greenhouse (by Mr. Carpenter of Leatherhead). It seems difficult to explain this, unless *both* parents of each brood were very nearly identical.

"Mr. Frohawk, who has bred the species largely, tells me he has noticed similar facts.

"When I bred *Acronycta tridens* and *psi* largely, some fifteen or more years ago, I noticed that each brood had its own pairs, and suggested that *tridens* was now trying to break up into separate species just as some ancestor split into *psi*, *tridens* and *cuspis*.

"Another fact I observed in *Acronycta* rather bears on the other side of the question. Of *A. strigosa* I reared a large brood, which paired readily and frequently together, but no eggs were laid. I then got some captured males, which paired with equal readiness with the bred females, and as a result obtained plenty of fertile eggs."

with the indigenous forms of *chrysippus?* We do not know; but it is an experiment well worth trying, and one which would yield results valuable in many ways. If inter-breeding did not take place, or if the unions were sterile, then we should have the interesting case of a single species which would instantly become two if through any circumstance a central link dropped out of the chain. Even if *chrysippus* yielded negative evidence in this respect, it is highly probable that other widely-distributed species would, under these circumstances, fall into two or more groups, each held together by inter-breeding, and divided from others by asyngamy.

Sterility, if present in any degree, would have been brought about quite independently of selection; for in such cases each link of the chain would be freely syngamic with the links on either side, and asyngamy or sterility would only be revealed by artificially bringing together the widely-separated ends of the chain.

I cannot but think, therefore, that such experiments made upon many carefully-selected species would probably bring important additional evidence to bear upon the controversy as to whether sterility between species is, as Wallace believes, a selected quality, or, as Darwin held, an incidental one. The deep interest of this question is realised when we thus remember that the two discoverers of natural selection held widely different opinions about it. We cannot read the letters on both sides, printed in the first volume of "More Letters," without realising how deeply this divergence—one of the principal differences between them—was felt by the two great naturalists.

This is one of the many reasons for which I plead with Mr. Roland Trimen for the establishment of tropical biological stations where work of the kind could be carried on. Such establishments should be associated with and be under the control of museums at home, where the experiments could be directed and the results studied and made available for all time for the researches of the naturalist. Just as Harvard has her main Observatory at the University, but also maintains an outlying institution in the Peruvian Andes, where certain kinds of research, unsuited to New England, can be carried on under the most favourable conditions, so our chief museums should be provided with the means of establishing temporary stations in the most favourable parts of the tropics. When I say temporary, I do not refer to the means, but to the position of the station, which should be freely movable in response to the call of important problems as they present themselves for solution in other localities.

Another urgent reason for the establishment of biological stations is forced upon us by the inadequacy of diagnosis for the separation of very variable species, such as many of the African *Acræinæ.* I cordially agree with the view often expressed to me by my friend Mr. F. A. Heron, that we shall never reach a secure foundation until synepigonic series have been obtained on a large scale. To achieve this end a temporary station would be required. In this way our museums could receive, and should keep for permanent study, the *whole* of the offspring reared from the eggs of a single parent. If several species were thus represented by one or more large synepigonic series, we should know what to expect and what to allow for; and diagnosis in general would gain the most helpful guidance.

Asyngamy, as regards particular lines of union, has also been incidentally brought about by certain adaptations for cross-fertilisation in plants, and such asyngamy has in some cases persisted long enough to have led to sterility in greater or less degree. Of all Darwin's work, that upon the fertilisation of heterostyled plants threw most light, he considered, upon sterility between species. As Francis Darwin has stated, "He found that a wonderfully close parallelism exists between hybridisation and certain forms of fertilisation among heterostyled plants. So that it is hardly an exaggeration to say that the 'illegitimately' reared seedlings are hybrids, although both their parents belong to identically the same species. In a letter to Professor Huxley, given in the second volume [of 'Life and Letters'], p. 384, my father writes as if his researches on heterostyled plants tended to make him believe that sterility is a selected or acquired quality. But in his later publications, *e.g.* in the sixth edition of the 'Origin,' he adheres to the belief that sterility is an incidental rather than a selected quality. The result of his work on heterostyled plants is of importance as showing that sterility is no test of specific distinctness, and that it depends on differentiation of the sexual elements which is independent of any racial difference." *

The different forms of a heterostyled plant are adapted for cross-fertilisation by insects, and each individual of each form is by the same means excluded more or less completely from fertilisation by another of the same form. In the former case the sexual cells and the accessory apparatus have been kept by selection during long generations of syngamy in a high state of mutual compatibility; in the latter asyngamy, partial or complete, has produced a large measure of the sterility which is its inevitable even if long-delayed result.

This argument has, I admit, carried me much further than I originally intended, and it will be a pleasure to me if the following criticism can be overthrown.

If the special adaptation of heterostyled plants for particular lines of syngamy has incidentally resulted in lessened fertility, when the unions discouraged by these adaptations are artificially secured, and in this case without appeal to the physiologically injurious effects of self-fertilisation, why should we not similarly explain these effects whenever manifest in the self-bred † offspring of any plant especially adapted for cross-fertilisation?

Darwin tells us in the Autobiography that as soon as his "attention was thoroughly aroused to the remarkable fact that seedlings of self-fertilised parentage are inferior, even in the first generation, in height and vigour to seedlings of cross-fertilised parentage," ‡ he entered upon a series of experiments which lasted eleven years, appearing in 1876 as "Effects of Cross and Self-Fertilisation in the Vegetable Kingdom." Of this work he wrote in 1881, "the results there arrived at explain, as I believe, the endless and wonderful contrivances for the transportal of pollen from one plant to another of the same species." § It is here suggested that

* "Life and Letters," vol. iii, p. 296.

† See Francis Darwin on "The Knight Darwin Law," Nature, October 27, 1898, p. 630.

‡ "Life and Letters," vol. i, p. 96. § *Ibid.*, vol. i, p. 97.

these injurious results have been not the cause but the consequence of specialisation for cross-fertilisation. In such plants fertilisation is mainly brought about along the line for which special adaptation is made: self-fertilisation is relatively infrequent, often very rare, sometimes perhaps absent altogether. May not the less successful results have followed from a condition in which self-fertilisation is but little tried by the fires of selection?* It would be of much interest to compare a long series of experiments on the cross-fertilisation of plants which are habitually self-fertilised, and on the self-fertilisation of plants in which the adaptations for cross-fertilisation are made use of in widely different degrees.

This criticism, should it be sustained, would of course throw much light upon the case of the Bee Orchis and the numbers of tropical Orchidaceæ, etc., which are now known to be regularly self-fertilising without apparent physiological injury. It might also have a bearing upon an intrusive set of facts which must often have weighed upon the minds of naturalists, as they reflected upon the commonly received hypothesis that assumes the dangers of continued breeding between near of kin. A. R. Wallace speaks of these facts in "Darwinism,"† and I have drawn attention to them in discussing the meaning of insect migration, although, as will be seen in the following passage, without any serious doubt as to the physiological significance of cross-fertilisation.‡

"We may well inquire why it should be necessary for such emigration, with a possible successful issue in colonisation, to require the services of countless individuals when the importation of half-a-dozen rabbits or a few specimens of *Pieris rapæ* will, for the naturalist, change the face of a continent. The results of these unintentional, or intentional but ill-considered, experiments do indeed shake the belief in the paramount necessity for crosses and the dangers of in-and-in breeding; but the end is not yet, and the teeming colonies which have arisen from such small beginnings may in time vanish from the operation of deep-seated causes. The varied adaptations for cross-fertilisation and the prevention of in-and-in breeding

* See also A. R. Wallace in "Darwinism," London, 1889, pp. 321–326.
† p. 326. ‡ Trans. Ent. Soc. Lond., 1902, pp. 460–465.

are so evident in nature, that we are compelled to believe that they meet and counteract serious dangers which sooner or later would menace the very existence of the species. And among other adaptations it is significant that the instinct under discussion should lead to the streaming of large populations, and not of small batches of individuals, from an area of high-pressure." *

It is impossible to consider the advantages which may have favoured cross-fertilisation, if hereafter the generally accepted physiological necessity turn out to be a delusion. Brief reference may, however, be made to the special advantages of community which are possible through syngamy alone. By inter-breeding the favourable variations arising in one direction are combined with others arising in different directions; by the kaleidoscopic changes produced by inter-breeding more varied results are presented for selection, and the beneficial qualities arising in one part of the mass may quickly become the heritage of the whole; by inter-breeding excessive spontaneous variation is checked, and the whole community of the species advances surely and with stability into adjustment with the progressive changes of the environment.

We all remember Darwin's beautifully elaborated metaphor † by which the past history of evolution is shown forth in the form and branching of a great tree. Darwin represented species by the "green and budding twigs," and we may suppose that the leaves stand for individuals, and that syngamy is represented by the contact of leaf with leaf when the branches sway in the wind. And just as contact may run through large and small, irregular and compact masses of leaves, so syngamy binds together groups of varying size and distribution. So too a mass of foliage breached by a sudden storm pictures for us the splitting of a syngamic chain into two species by the disappearance of an intermediate link.

It has been a pleasure to me that the central idea which I have endeavoured to bring before you should be represented, I trust without violence to the imagery, by means of "the great Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever-branching and beautiful ramifications." ‡

* *l. c.* p. 464. † "Origin of Species," 1859, p. 129. ‡ *l. c.* p. 130.

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MARCH 16, 1904

CHARTER AND BYE-LAWS

OF THE

ENTOMOLOGICAL SOCIETY OF LONDON.

FOUNDED IN 1833.

INCORPORATED BY ROYAL CHARTER IN 1885.

CONTENTS.

CHARTER.

Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith. TO ALL TO WHOM these presents shall come Greeting:

WHEREAS JOSEPH WILLIAM DUNNING, of Lincoln's Inn, in the County of Middlesex, Barrister-at-Law, Esquire, Master of Arts, formerly Fellow of Trinity College, Cambridge, Fellow of the Cambridge Philosophical Society and of the Linnean and Zoological Societies of London, has by his Petition humbly represented unto US, That in the year 1833 certain of our loyal subjects formed themselves into a Society for the Improvement and Diffusion of Entomological Science, and subscribed and expended considerable sums of money for such purposes, and have collected and become possessed of a valuable library and other property, and have been and continue to be actively employed in promoting the objects for which the said Society was founded, especially by the publication of Volumes of Transactions composed of Original Memoirs, read before the Society. AND WHEREAS the said Petitioner, believing that the well-being and usefulness of the said Society would be most materially promoted by obtaining a Charter of Incorporation, hath therefore, on behalf of himself and the other Members of the said Society, most humbly prayed that WE would be pleased to grant a Royal Charter for incorporating into a Society the several persons who have already become Fellows, or who may at any time hereafter become Fellows thereof, subject to such Regulations and Restrictions as to US may seem good and expedient. NOW KNOW YE that WE, being desirous of encouraging a design so laudable, and of promoting the improvement and diffusion of Science in all its branches, have of Our especial Grace, certain Knowledge and mere Motion, given and granted, and We do hereby give and grant, That the said JOSEPH WILLIAM DUNNING and such others of Our loving subjects as are now Fellows of the said Society, or who shall at any time hereafter become Fellows thereof in pursuance of the provisions of this Our Charter and according to such Bye-Laws as are hereinafter mentioned, shall be a Body Corporate by the name of "The Entomological Society of London," having perpetual succession and a common seal, with power to sue and to be sued in their Corporate name, and to acquire and hold any goods and chattels whatsoever.

And our Will and Pleasure is, That JOHN OBADIAH WESTWOOD, Esq., Master of Arts, Hope Professor of Zoology in the University of Oxford, shall be Honorary President of the said Corporation during the term of his natural life. And that ROBERT MACLACHLAN, F.R.S., shall be the first President of the said Corporation and shall continue such until the Annual Meeting to be held in the month of January next.

And our Will and Pleasure is, And we do hereby declare, That there shall always be a Council to direct and manage the concerns of the said Corporation. And that the thirteen persons, who were elected to form the Council of the said Society at the Annual Meeting held in the month of January last, shall form the first Council of the said Corporation, and shall continue in Office until the Annual Meeting to be held in the month of January next.

And our Will and Pleasure is, And we further grant and declare, that the existing Bye-Laws of the said Society, as revised and amended at a General Meeting held on the 2nd day of May, 1883, shall be the Bye-Laws of the said Corporation, until the same shall be revoked or altered as hereinafter mentioned. And that it shall be lawful at General Meetings of the said Corporation to revoke or alter any former Bye-Laws, and to make such new Bye-Laws as shall be deemed useful and necessary for the regulation of the said Body Corporate.

Provided always: And we lastly declare it to be our Royal Will and Pleasure, That no Bye-Law or Resolution shall, on any account or pretence whatsoever, be made by the said Corporation in opposition to the general scope, true intent, and meaning of this our Charter or the Laws and Statutes of this Realm, and that if any such Bye-Law or Resolution shall be made, the same shall be absolutely null and void.

In Witness whereof We have caused these our Letters to be made Patent.

Witness Ourself at Westminster the twentieth day of July, in the Forty-ninth year of Our Reign.

THE SEAL.

By Warrant under the Queen's Sign Manual.

BYE-LAWS.

As Amended at a Special Meeting held 3rd December, 1902.

Chap. I. *Object.*

The Entomological Society of London is instituted for the improvement and diffusion of Entomological Science.

Chap. II. *Constitution.*

The Society shall consist of Honorary and Ordinary Fellows.

Chap. III. *Management.*

The affairs of the Society shall be conducted by a Council consisting of the Officers of the Society hereinafter mentioned —other than the three Vice-Presidents—and of twelve ordinary Members to be chosen annually from among the Fellows. No Fellow shall be eligible as an ordinary Member of the Council for more than three years successively. Five shall be a quorum.

Chap. IV. *Officers.*

The Officers of the Society shall consist of a President; three Vice-Presidents; a Treasurer; two Secretaries; and a Librarian. The Officers shall be chosen annually. No Fellow shall be President, or a Vice-President, more than two years successively.

Chap. V. *Removal or Resignation of Officers.*

1. For any cause which shall appear sufficient to a majority thereof, the Council shall have power to suspend any Officer of the Society from the exercise of his office, or to remove him and declare such office vacant.

2. In the event of any vacancy occurring in the Council or Officers of the Society, at the next meeting of Council after such vacancy has been made known, the Council shall elect some Fellow to fill the vacancy till the Annual Meeting.

Chap. VI. *President.*

1. The duty of the President shall be to preside at the Meetings of the Society and Council, and regulate all the discussions and proceedings therein, and to execute or see to the execution of the Bye-Laws and orders of the Society.

2. In case of an equality of Votes the President shall have a double or casting Vote.

Chap. VII. *Vice-Presidents.*

1. The Vice-Presidents shall be nominated by the President, from amongst the members of the Council. Such nomination shall be declared at the Ordinary Meeting next after the election of the President in every year.

2. In the absence of the President a Vice-President shall fill his place, and shall for the time being have all the authority, power, and privilege of the President.

3. In the absence of all the Vice-Presidents a Member of the Council shall preside; and if no Member of the Council be present at an Ordinary Meeting, the Fellows present shall appoint by a majority to be Chairman such Fellow as they shall think fit; and the Member of Council so presiding, or the Fellow so appointed, shall for the time being have all the authority, power, and privilege of the President.

Chap. VIII. *Treasurer.*

1. It shall be the duty of the Treasurer to demand and receive for the use of the Society all sums of money due or payable to the Society, and to disburse all sums payable by the Society out of the Funds in his hands.

2. No payment exceeding £5, excepting for rent or taxes, shall be made by the Treasurer without the consent of the Council.

3. The Treasurer shall keep a book of Cheque Receipts for admission fees and annual payments: each Receipt shall be signed by himself, the date of payment and name of the Fellow paying being written both on the Receipt and on the part of the Cheque which is left in the book.

4. The Treasurer shall demand all arrears of annual payment after such payment shall have been due three months.

5. The accounts of the Treasurer shall be audited annually, previously to the Annual Meeting, by a Committee of six Fellows (of whom three shall be Members of the Council), to be appointed by the President at the Ordinary Meeting in December, of which Committee three (or two, provided that one of them is not a member of the Council) shall be a quorum. The Treasurer shall furnish the Auditors with a detailed account of all receipts and disbursements down to the 31st December.

Chap. IX. *Secretaries.*

1. It shall be the duty of the Secretaries to keep a list of all the Fellows of the Society, together with their addresses; to summon Meetings (when necessary) of the Society and the Council; to conduct and produce to the Council all correspondence in any way connected with the Society at the next Meeting after such correspondence shall have been received or taken place; to take Minutes of the Proceedings at Meetings of the Society and the Council; to edit the Transactions and Journal of Proceedings; and, generally, to act under the direction of the Council in all matters connected with the welfare of the Society.

2. In the absence from any Meeting of the Society, or the Council, of both the Secretaries, Minutes of the Proceedings shall be taken by a Fellow whom the President shall appoint for the occasion.

Chap. X. *Librarian.*

1. It shall be the duty of the Librarian to take care of the Library and MSS., and keep a Catalogue thereof, with the names of the Donors; to call in all Books borrowed, and see that the Library regulations are carried into effect.

2. The Council may employ a Sub-Librarian, who shall receive such remuneration as the Council shall from time to time determine, and shall be subject to such Rules and Orders as shall from time to time be given to him by the Council.

Chap. XI. *Library Regulations.*

1. No Fellow shall, without special permission of the Council, be allowed to borrow from the Library more than four volumes at one time, or without leave of the Librarian, to retain any volume longer than one month.

2. If any book be torn, injured, lost, or not forthcoming when demanded by the Librarian, full compensation shall be made for the same by the borrower.

3. The Librarian shall call in all books borrowed from the Library on the 5th day of January and 5th day of July in each year: and in case the same be not returned on or before the Ordinary Meeting of the Society in the following month, notice thereof shall be given by him to the Council, who shall then direct a second notice to be sent to the Fellow retaining any book, and in case the same be not returned within the further space of four weeks from the date of such second notice so sent, such Fellow shall in future be disqualified from borrowing books from the Library without the special permission of the Council.

4. Subject to such Regulations as may be made from time to time by the Council, the Library shall be open to the Fellows between the hours of one and six p.m. on every week-day, except Saturday, and on that day between one and three p.m.

5. No stranger shall be allowed access to the Library unless introduced by a Fellow; but a note addressed to the Librarian or Secretary shall be deemed a sufficient introduction.

Chap. XII. *Election of Fellows.*

1. Every Candidate for admission into the Society shall be proposed by three or more Fellows, to one of whom he shall be personally known, and they must sign a Certificate in recommendation of him. The Certificate shall specify the name and usual place of residence of the Candidate.

2. The Certificate having been read at one of the Ordinary Meetings shall be suspended in the Library, read again at the following Ordinary Meeting, and the person therein recommended shall be balloted for at the next Ordinary Meeting.

3. The method of voting shall be by ballot, and two-thirds of the Fellows balloting shall elect.

4. Fellows shall sign the Obligation Book of the Society at the first Ordinary Meeting of the Society at which they are present, and shall then be admitted by the President.

CHAP. XIII. *Admission Fee and Annual Contribution.*

1. The Admission Fee shall be £2 2*s*., the Annual Contribution £1 1*s*.

2. Fellows permanently resident out of the United Kingdom shall pay the Annual Contribution, but shall be exempt from payment of any Admission Fee.

3. The composition for Life Fellowship, in lieu of the Annual Contribution, shall be £15 15*s*.

4. The Annual Contribution shall become due on the 1st day of January in advance; any Fellow elected after September will not be called upon for his Contribution for that year.

CHAP. XIV. *Withdrawing and Removal of Fellows.*

1. Every Fellow, having paid all sums due to the Society, shall be at liberty to withdraw therefrom upon giving notice in writing to the Secretary.

2. Whenever written notice of a motion for removing any Fellow shall be delivered to the Secretary, signed by the President or Chairman for the time being on the part of the Council, or by six or more Fellows, such notice shall be read from the Chair at the two Ordinary Meetings immediately following the delivery thereof, and the next following Ordinary Meeting shall be made a Special Meeting and the Fellows summoned accordingly, when such motion shall be taken into consideration and decided by ballot; whereat if a majority of the Fellows balloting shall vote that such Fellow be removed, he shall be removed from the Society.

3. In the month of November in each year the Council

shall cause to be suspended in the Library of the Society a list of the Fellows who owe more than two Annual Contributions. If the Contribution due from any Fellow named in the said list shall not have been paid within three months after the first suspension of the list, the Council may remove such Fellow from the Society, but notwithstanding such removal any Fellow so removed shall continue liable to pay, and may be sued for the recovery of any money due from him to the Society. The Council may remit wholly, or in part, the entrance fee payable by any former Fellow rejoining the Society.

Chap. XV. *Privileges of Fellows.*

1. Fellows have the right to be present, to state their opinions, and to vote, at all General Meetings; to propose Candidates for admission into the Society; to introduce Visitors at General Meetings of the Society; to have personal access, and to introduce scientific strangers, to the Library; and Fellows who have paid the Annual Contribution for the year shall be entitled to receive a copy of the Transactions published during the year.

2. A Fellow shall not be eligible to any office in the Society, or to the Council, unless he shall have paid his Annual Contribution for the year previous to that in which the Election takes place.

3. A Fellow shall not be entitled to vote on any occasion until he shall have paid his Contribution for the year last past.

Chap. XVI. *Honorary Fellows.*

1. Every person proposed as an Honorary Fellow shall be recommended by the Council; and shall be balloted for, and, if elected, be liable to be removed in the like form and manner, and be subject to the same rules and restrictions, as an Ordinary Fellow.

2. Honorary Fellows shall be exempt from the payment of Fees and Contributions, and shall possess all the privileges of Ordinary Fellows.

3. No British Subject shall be an Honorary Fellow.

4. The number of Honorary Fellows shall not exceed twelve.

Chap. XVII. *Ordinary Meetings of the Society.*

1. The Ordinary Meetings of the Society shall be held on the first Wednesday in each month (except January, July, August and September), beginning at eight o'clock in the evening, or at such other days or times as the Council shall from time to time direct.

2. At the Ordinary Meetings the order of business shall be as follows:—

(1.) The names of the Visitors present at the Meeting shall be read aloud by the President.

(2.) The Minutes of the last Meeting shall be read aloud by one of the Secretaries, proposed for confirmation by the Meeting, and signed by the President.

(3.) The Presents made to the Society since the last Meeting shall be announced and exhibited.

(4.) Certificates in favour of Candidates for admission into the Society shall be read, and Candidates shall be balloted for.

(5.) Fellows shall sign their names in the Obligation Book, and be admitted.

(6.) Exhibitions of specimens, &c., shall be made.

(7.) Entomological communications shall be announced and read either by the Author or by one of the Secretaries.

(8.) Business not specified in the above order and discussions arising out of the exhibitions and communications shall be taken at such times and in such manner as the President shall direct.

3. All Memoirs which shall be read at any Meeting of the Society, and accepted for publication, shall become the property of the Society, unless otherwise stipulated before the reading thereof.

4. No Motion relating to the Government of the Society, its Bye-Laws, the management of its concerns, or the election, appointment, or removal of its Officers, shall be made at any Ordinary Meeting.

Chap. XVIII. *Special Meeting.*

1. Upon the requisition of six or more Fellows, presented to the President and Council, a Special General Meeting of the Society shall be convened; a notice thereof shall be sent to every Fellow whose last known residence shall be in the United Kingdom, at least seven days before such Meeting shall take place: and any motion to be submitted to such Meeting which involves a substantive proposition and is not of the nature of an amendment shall be stated at length in such notice.

2. No vote shall be taken at any Special Meeting unless nine or more Fellows shall be present.

Chap. XIX. *Annual Meeting.*

1. The Annual Meeting of the Society shall be held on the third Wednesday in January.

2. The objects of the Meeting shall be to receive from the Council, and hear read, their Annual Report on the general concerns of the Society; and to elect the Council and Officers for the ensuing year.

3. The Council for the time being shall annually cause to be prepared a list which shall contain the names of such Fellows being eligible as they shall recommend to fill the offices of President, Treasurer, Secretaries, and Librarian for the year ensuing; and also the names of such Fellows as they shall recommend to be re-elected, and of other Fellows to be elected into the Council. The list shall include the names of not less than twelve Fellows recommended as ordinary members of the Council.

4. The list prepared by the Council shall be read at the Ordinary Meeting next but one before the Annual Meeting. At the Ordinary Meeting preceding the Annual Meeting, the names of other candidates to fill any of the offices, or to serve as Members of the Council (each proposed and supported by at least four properly qualified Fellows of the Society), shall be received. Nominations by post made by four properly qualified Fellows, and received prior to this Meeting, shall also be accepted. These shall be added to the Council's

list, and copies of the complete list shall, before the 20th December, be transmitted to every Fellow whose last known residence shall be in the United Kingdom, and who shall have paid his subscription for the current year.

5. The election shall be by Ballot at the Annual Meeting, and copies of the final list shall be used as Ballot papers. The President shall appoint two or more Scrutineers from the Fellows present, not being Members of the Council, to superintend the Ballots and report the results to the Meeting. The Secretaries, assisted by the Treasurer, shall prepare a list of the Fellows entitled to vote, and each Fellow voting shall give his name to the Scrutineers to be marked on the said List, and shall then put his Ballot paper into the respective receptacles to be provided for such occasion.

6. A Fellow voting may strike out any name or names on the said List, and the Scrutineers shall record the votes accordingly, but any Ballot paper which shall contain a greater number of names for any Office or Position than the number to be elected to such Office or Position shall be wholly void, and be rejected by the Scrutineers. No Ballot shall be taken unless nine or more Fellows shall be present.

7. If from any cause any election which ought to take place at the Annual Meeting shall not take place, then such election shall be adjourned until the next convenient day, of which notice shall be given in like manner as is directed for the Annual Meeting.

8. The form given in the Schedule shall be used, with such variations as may be considered by the Council necessary or desirable.

Chap. XX. *Transactions and Journal of Proceedings.*

1. The Transactions shall consist of such papers communicated to the Meetings of the Society as the Council shall order to be published therein.

2. The Transactions shall be published quarterly, or at such other times, and at such prices as the Council shall direct for each Part or Volume.

3. Authors of Memoirs published in the Transactions shall be allowed twenty-five copies of their communications gratis.

If any additional number be required, the permission of the Council shall be first obtained, and the entire expense thereof shall be paid for by the Authors.

4. A Journal of Proceedings of the Society shall also be published, containing Abstracts of the Papers read and Notices of other Matters communicated at the Ordinary Meetings of the Society. The Proceedings shall be bound up with the Transactions.

Chap. XXI. *Alteration of the Bye-Laws.*

Any of the Bye-Laws of the Society may at any time be repealed or altered, or others adopted in lieu thereof, at a Special Meeting of the Society, to be held after a Notice given to the President and Council, signed by six Fellows at least, and specifying the intended repeal or alteration, has been read at three Ordinary Meetings of the Society.

THE SCHEDULE REFERRED TO IN CHAPTER XIX.

Balloting List for the Election of Officers and Council.

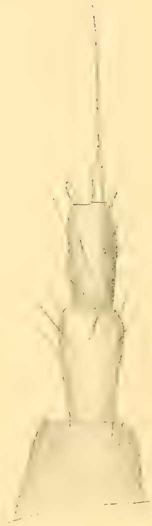
Office.	List.
President.	Z. A.
Treasurer.	W. D.
Secretaries.	T. G. S. H.
Librarian.	N. M.
Council.	A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X.

Instructions.

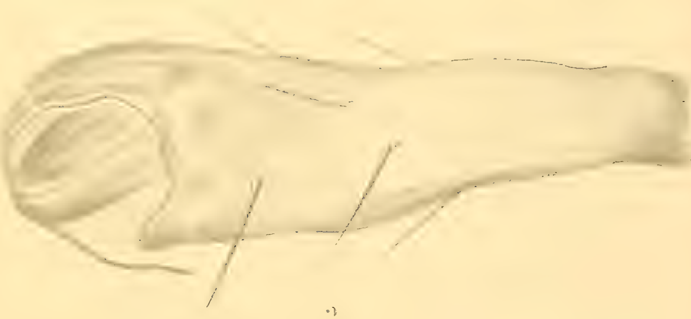
In using the above list as a Ballot paper a Fellow voting may strike out any name or names printed therein, but any Ballot paper which when placed in the receptacle shall contain a greater number of names for any Office or Position than the number to be elected to such Office or Position shall be wholly void and rejected by the Scrutineers.

3.

4.



1.



2.

L.R. Crawshay del.

Mintern Bros. lith.

Transformations of Drilus flavescens.

1.

1a.

2.

2a.

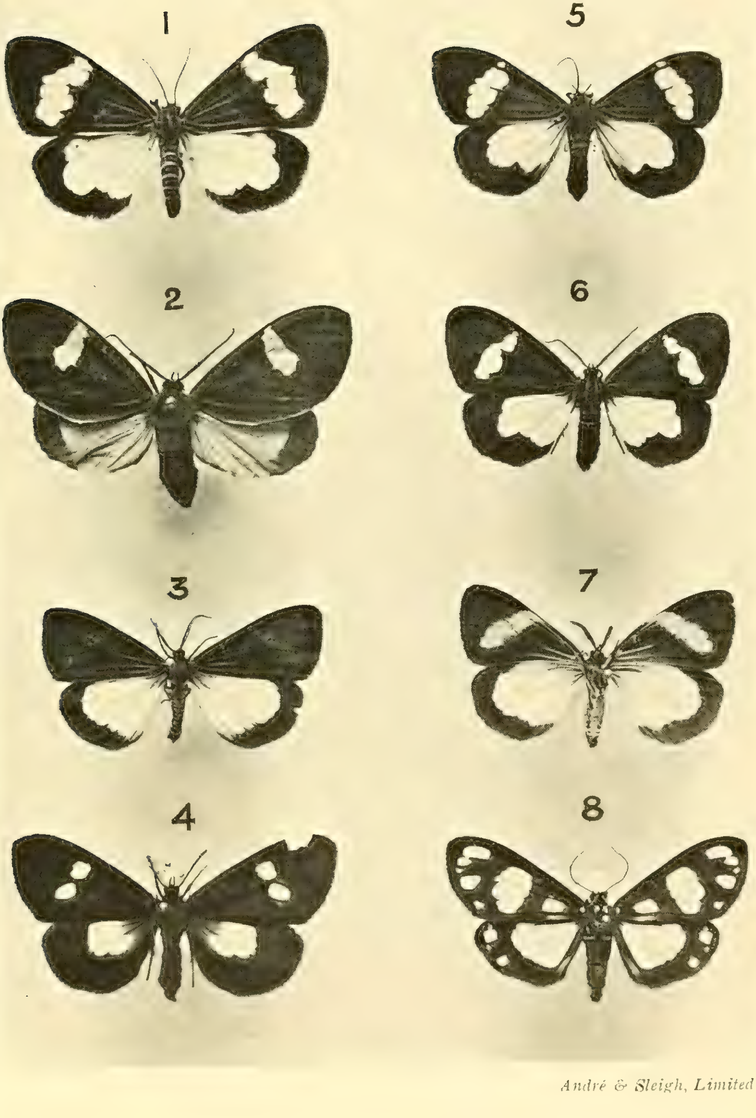
3.

3a

L. R. Crawshay del.

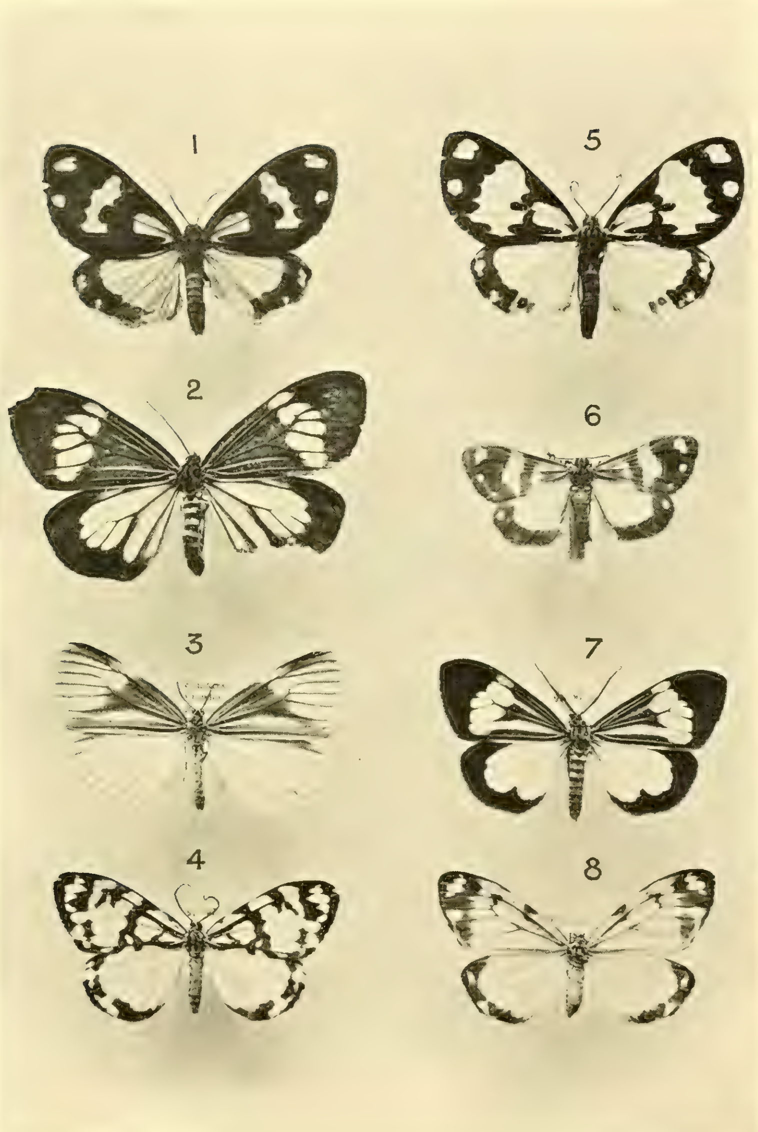
Mintern Bros. lith.

Transformations of Drilus flavescens.



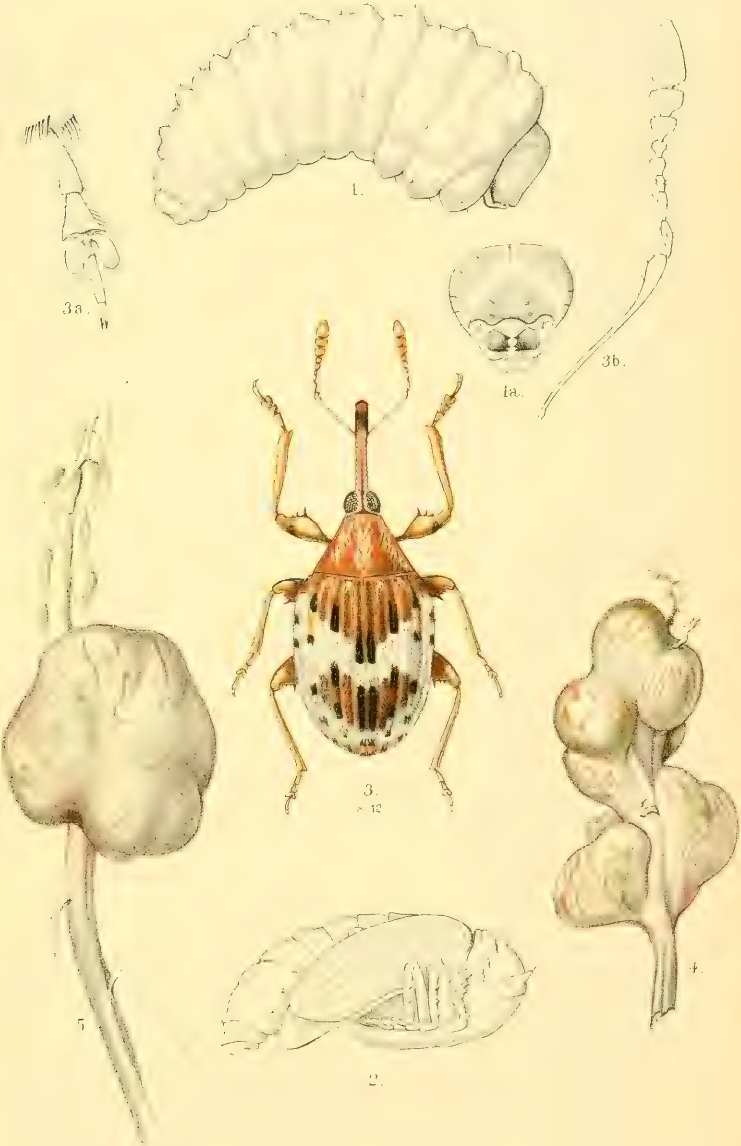
André & Sleigh, Limited

NEW SPECIES OF DEILEMERA.



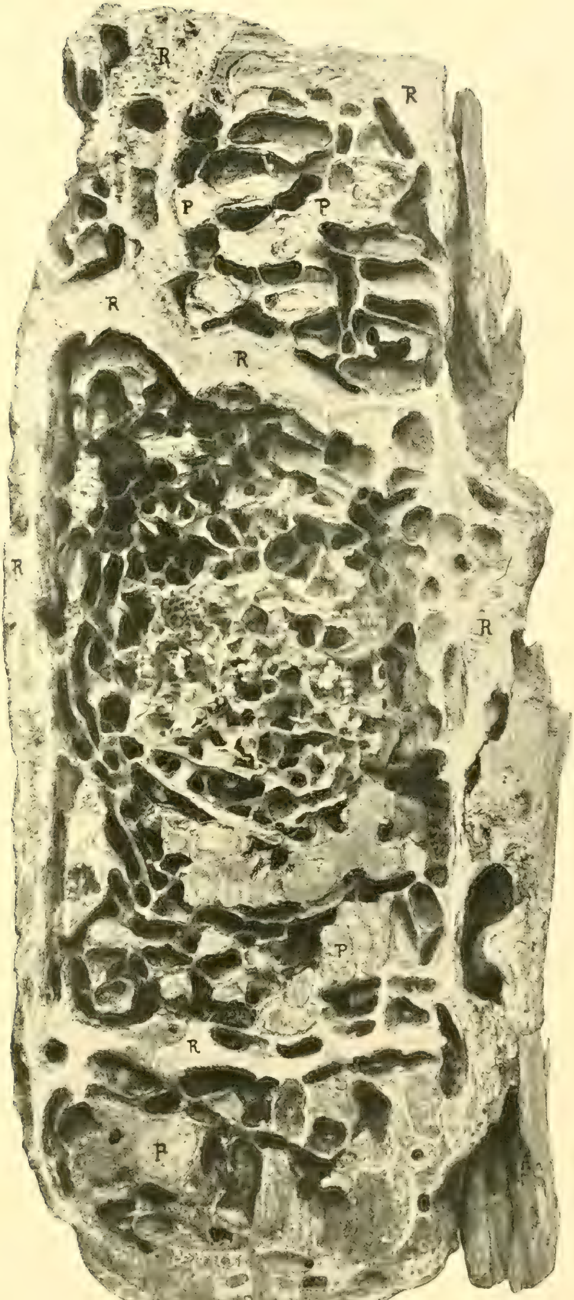
André & Sleigh, Limited

NEW SPECIES OF DEILEMERA.



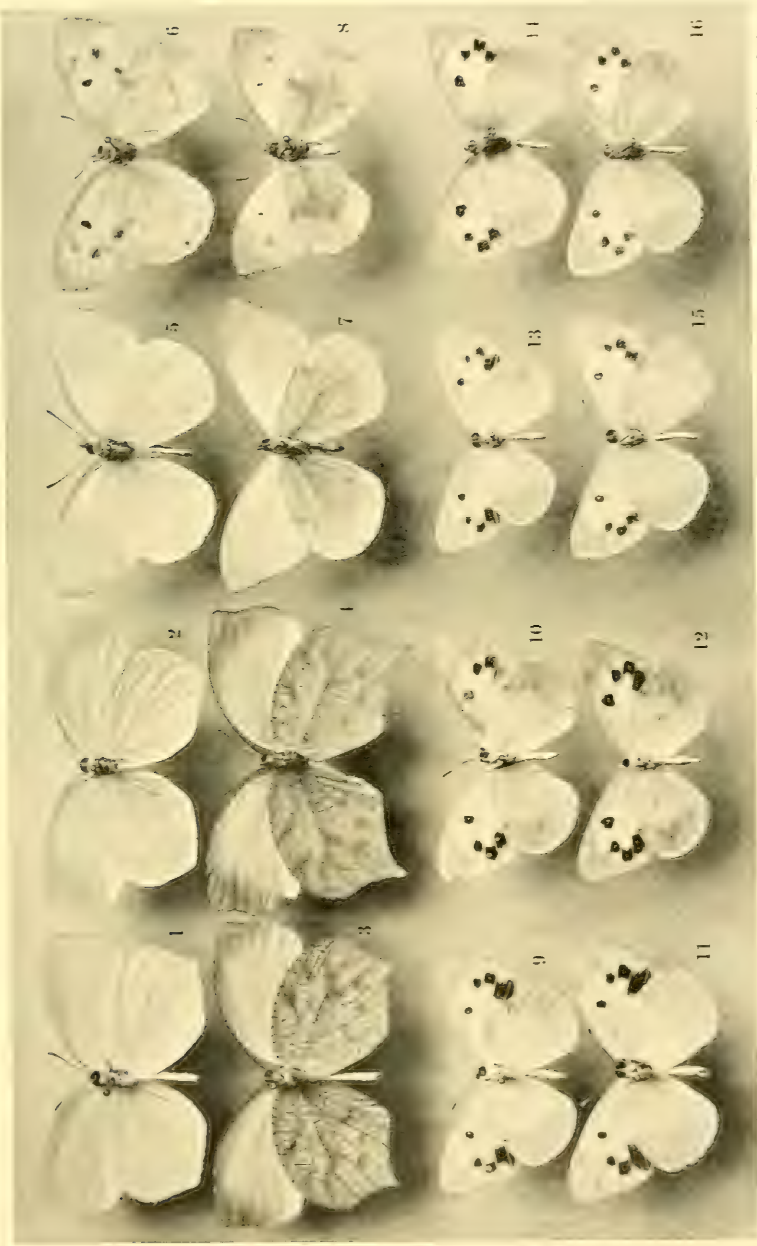
E. Wilson, Cambridge.

Nanophyes durieui,
with its larva, pupa &c.



Nest of Trigona collina.

Carl Hentschel, sculp.
et imp.



Dixey.

All the figures are about $\frac{8}{9}$ of the natural size.

Sexual and Seasonal Dimorphism in Pierinæ.

André & Sleigh, Limited.

R. Mintern del. et lith.

Mintern Bros. Chromo

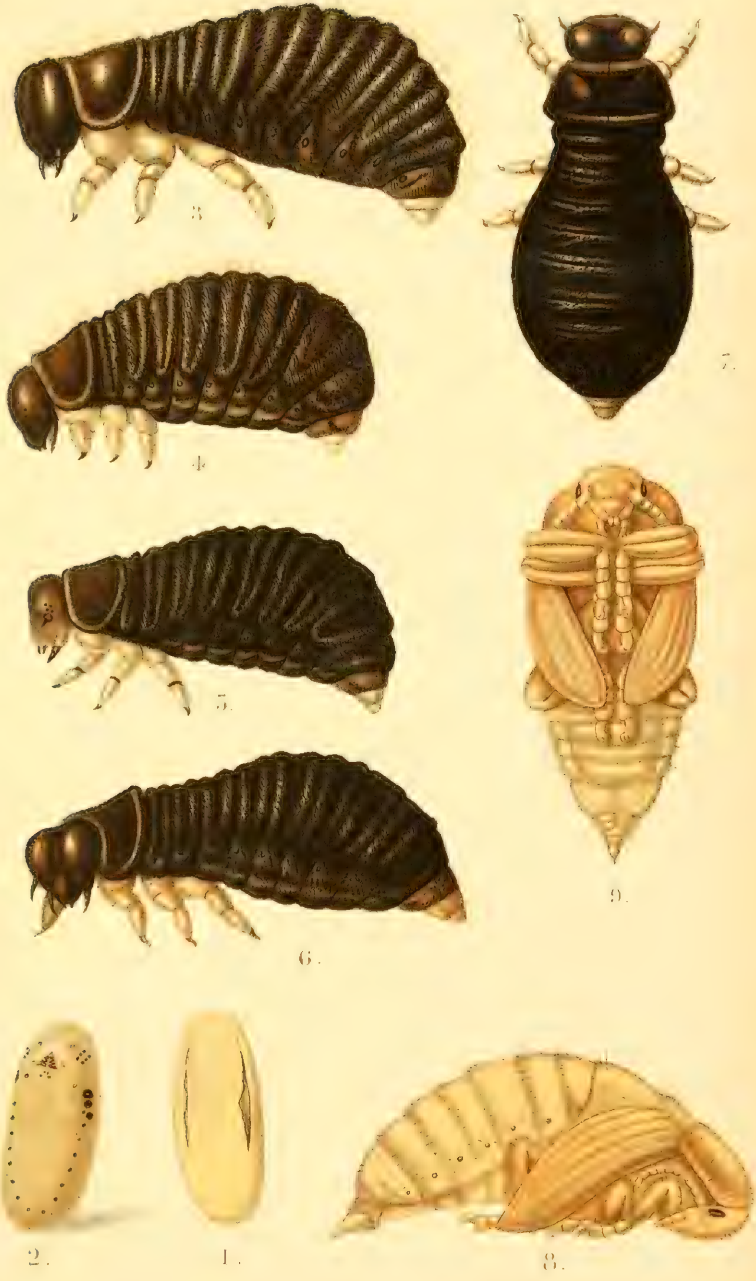
New Species of Rhopalocera from Nigeria.

Horace Knight del et lith.

Mintern Bros. chromo.

Arctic Butterflies.

"Westwood Bequest."



F. C. Knight del.

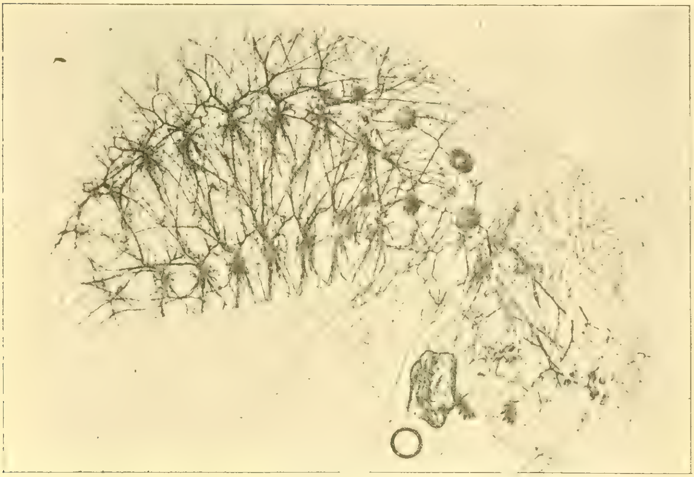


FIG. 1.

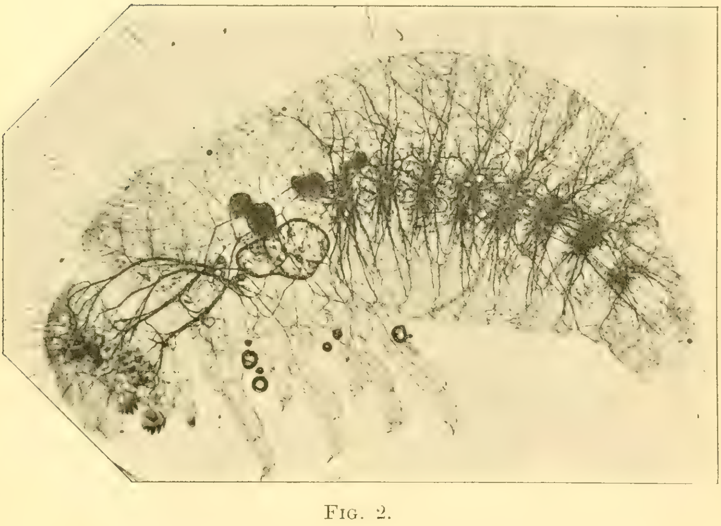


FIG. 2.

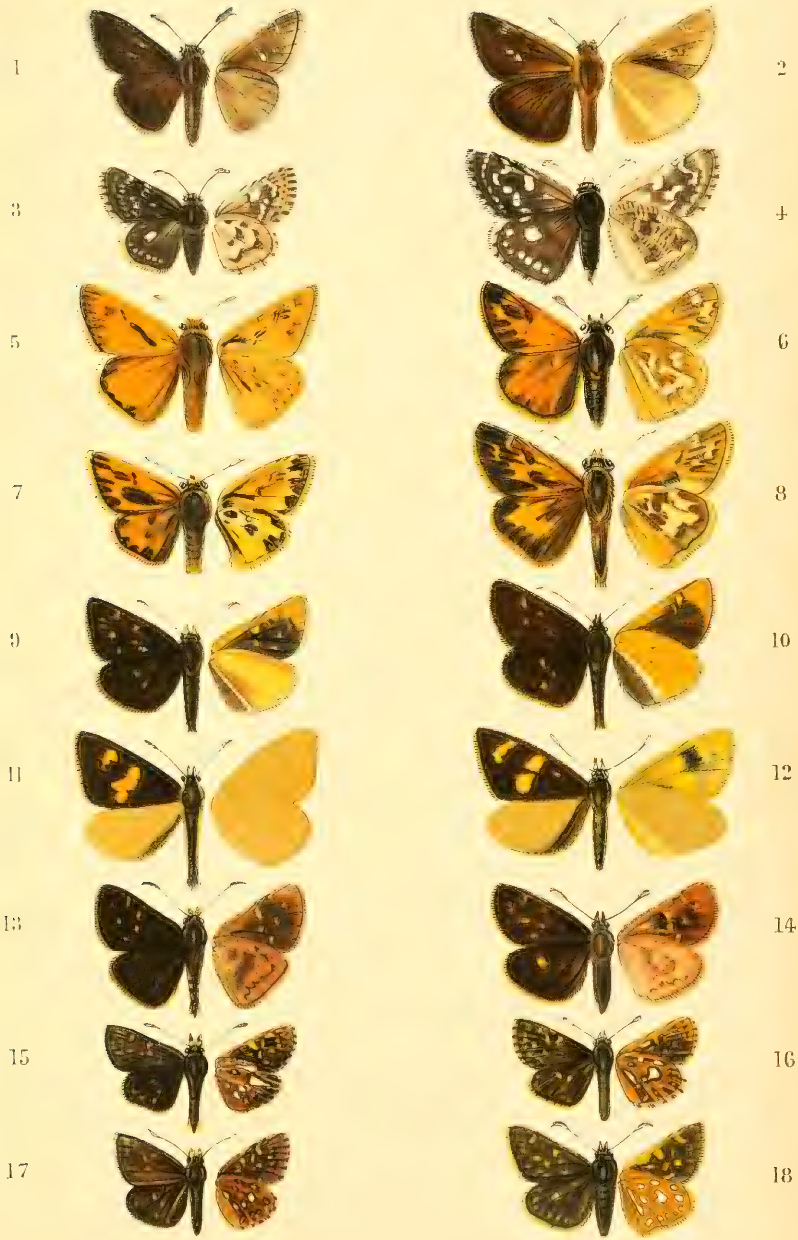
F. N. Clark, Phot. Mintern Bros., Eng.

Orina tristis, var. smaragdina.

Horace Knight, del.

André & Sleigh, Limited.

Chilean Butterflies.



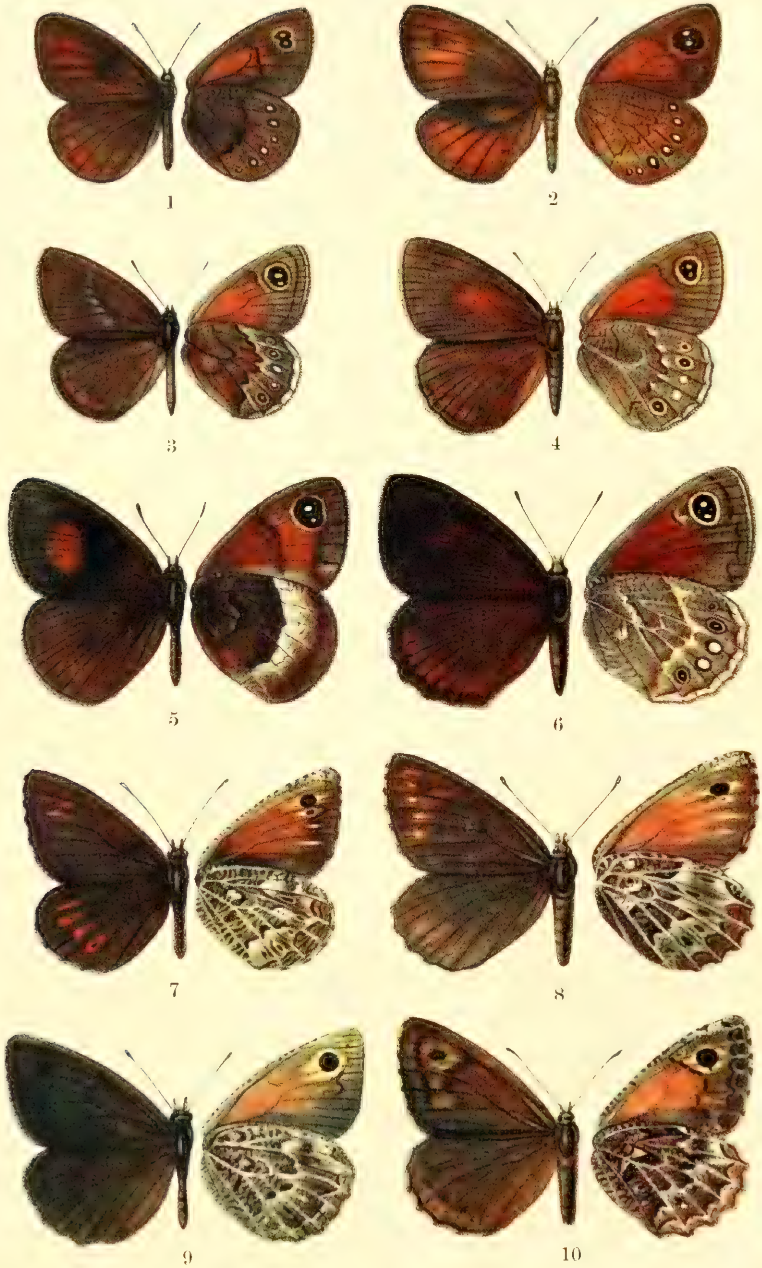
Horace Knight del.

Mintern Bros. Chromo

Chilean Butterflies.

Horace Knight, del. *André & Sleigh, Limited.*

Chilean Butterflies.



Horace Knight, del. *André & Sleigh, Limited.*

Chilean Butterflies.

P. J. Bayzand, del.

André & Sleigh, Limited

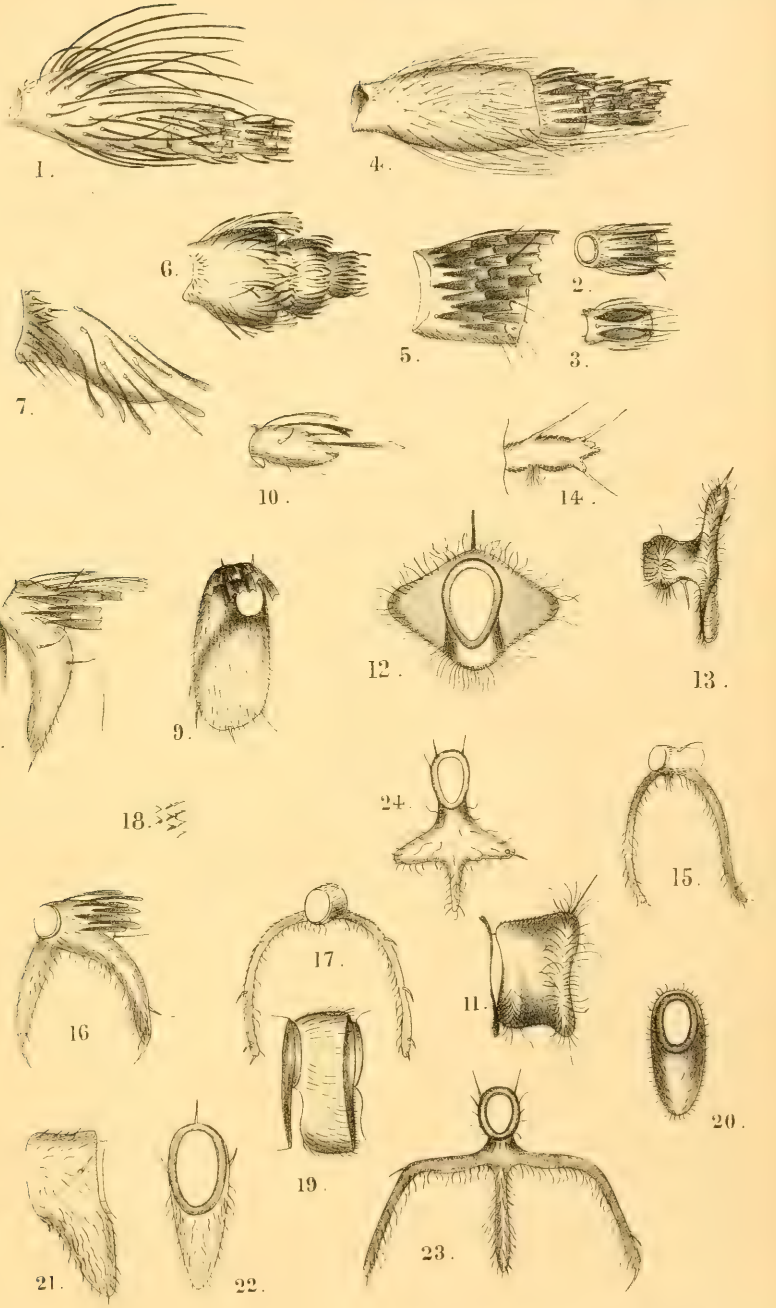
Results of Experiments in 1893 upon the Colour-relation between the larvæ of Odontopera bidentata and their environment.

P. J. Bayzand, del. *André & Sleigh, Limited.*

Effects of lichen, of black twigs, and of reddish brown sticks upon the larvæ of Gastropacha quercifolia (1893-4).

P. J. Bayzand, del. *André & Sleigh, Limite*

Effects of lichen and of reddish brown sticks upon the larvæ o
Gastropacha quercifolia (1893–4).



A. Quail del.

Mintern Bros. lith.

Segments of Antennæ of Hepialidæ.

H̶orace Knight ad nat. lith

Central and South American Erycinid[ae]

Central and South American Erycinidæ

Central and South American Erycinidae.

Horace Knight del.

Central and South American Erycinidae