

The mouth is placed at the anterior and superior part of the animal, between two thickish horizontal lips. The labial tentacles are two on each side, rather long, lanceolate, and slightly pectinated. The anus is placed posteriorly and superiorly between the gills, and just about the posterior adductor muscle.

The so-called "foot" is composed of two portions, an upper and quadrilateral (properly the abdomen), and a lower pointed part (the true foot), the two being set at right angles to one another.

The first portion is sharp-edged and slightly pectinated posteriorly, marked by a groove bounded by two folded lips anteriorly. The second portion is slightly pectinated along its lower edge, pointed anteriorly, prolonged behind into a curved process, where it joins the superior portion.

Visceral mass.—The mouth opens by a very short œsophagus into a wide pyriform stomach, surrounded by a dark dendritic liver. The stomach narrows into a long intestine, which descends for the whole length of the abdomen, and forms one or two loops in the substance of the generative gland; then passes up again above the stomach, penetrates the heart, and passing between the two small lateral muscles of the foot, terminates in the anus.

Fig. 1. View of the animal with the right valve of the shell removed, and the right lobe of the mantle turned back. *a*, mouth; *b*, anus; *c*, filamentous appendages of mantle; *d*, gill; *e*, grooved superior part of foot.

Fig. 2. View of the animal from behind, with the valves separated. Letters as before.

Fig. 3. Visceral cavity laid open. *a*, stomach, surrounded by the liver; *b*, intestine; *c*, heart; *d*, generative gland.

March 27, 1849.

William Yarrell, Esq., Vice-President, in the Chair.

The Secretary communicated to the Meeting a letter which had been addressed to the Council by Sir Roderick Impey Murchison, G.C.St.S., &c. &c., in which he gave the gratifying intelligence of his having been assured by the Count Kisselef, Minister of the Imperial Domains of Russia, that if it was possible to obtain another Male Aurochs, it would afford his Excellency the greatest pleasure to receive the high command of His Majesty the Emperor for its transmission to the Society. Although the communication of Count Kisselef did not amount to an absolute promise, Sir Roderick expressed his conviction, that with so earnest an intention of assisting the Society on the part of the confidential Minister of his Imperial

Majesty, there was still a chance of the Aurochs again living and reproducing its species in Britain.

Letters had also been received from M. Westerman, M. Vekemans, the Hon. C. A. Murray, A. N. Shaw, Esq., and H. N. Tweedie, Esq., Corr. Members, relative to collections already made or to be expected from Egypt, Bombay, and Hayti.

The following paper was read :—

MONOGRAPH OF THE LARGE AFRICAN SPECIES OF NOCTURNAL
LEPIDOPTERA BELONGING OR ALLIED TO THE GENUS SATURNIA.
BY J. O. WESTWOOD, F.L.S. ETC.

(Annulosa, Pl. VII. VIII. IX. X.)

Linnæus, in pursuance of the plan which he generally adopted, of placing the largest species of any group at its head, introduced as the first species of the Nocturnal Lepidoptera (the whole of which constituted in his System but one genus, *Phalæna*) those gigantic moths of which the *Phalæna Atlas* may be considered as the type, distinguished both by himself and Fabricius by the character "*alis patulis*." Placed thus at the head of this great division, and being in themselves some of the most gigantic and at the same time most beautiful of the insect tribes,—valuable also to the human race on account of the product obtained from several of the species,—I have thought that a synopsis of the African species (a considerable number of which are now for the first time described and figured, and several of which, being inhabitants of Southern Africa, appear as likely to afford a supply of silk as their Indian relatives,) would not be without interest.

So little however has hitherto been effected in the classification of the nocturnal exotic Lepidoptera, even of the larger species, and in fact so completely have the chief characters, on which a real distribution of these insects can alone be established—I allude more especially to the arrangement of the veins of the wings and the transformations of the insects—been neglected, that it is impossible, without a revision of the whole of the family *Bombycidae*, to arrive at the most satisfactory plan of arrangement of a geographical selection of the species. It will however not be useless to notice the attempts which have been made relative to the arrangement of these insects. Dr. Boisduval, in his 'Genera et Index Methodicus,' has divided the *Heterocera* into a number of tribes of equal rank, amongst which is the *Saturnides**, characterized thus: "Larvæ obesæ arboricolæ, segmentis prominulis, modo tuberculis piligeris, modo spinis verticillatis vel pennatis instructæ. Folliculum tenax. Alæ patulæ latæ sæpius macula ocellari vel diaphana ornata: lingua nulla." The tribe comprises the single genus *Saturnia* of Schrank and Ochsenheimer (*Attacus*, Germar), with the four European species *Pyri*, *Spini*, *Carpini*, and *Cæcigena* as its types. The characters given by Boisduval are sufficiently precise, but those obtained from the peculiar structure of the

* Op. cit. p. 73.

antennæ and of the veins of the wings, which Boisduval has not noticed, are far more distinctive. M. Boisduval's next tribe, *Endromides*, is a very artificial one, consisting of the two genera *Aglaia* and *Endromis*, which possess but little in common: *Aglaia Tau*, in fact, possesses the broad, flat, pennate, male antennæ of *Saturnia*, with which it also agrees in each joint emitting four branches, two at the base and two at the apex, the latter pair being shorter and more slender than the former; moreover, each branch of the former pair has its fore-margin fringed with very delicate hairs, directed of course to the tip of the antennæ, and its apex is furnished with two stronger bristles, also extended in the same direction, and each of the latter pair of branches has its hinder margin similarly fringed, the hairs of course being directed towards the base of the antennæ, and nearly meeting the opposite row of hairs supplied by the basal branches of each joint. This very peculiar structure, also possessed by the giant *Saturniæ* (alone, as I believe), has not been previously noticed by any writer with whose works I am acquainted, and would most probably afford physiological peculiarities of much interest. The veins of the wings of *Aglaia* are also disposed on the same general plan as in the *Saturniæ*, namely the apical portion of the fore-wing is traversed by six branches, three arising from the great median vein and three from the post-costal vein, the two hindmost of the latter uniting together near the middle of the wing: there is however this difference between the wings of *Aglaia* and *Saturnia*; namely, that whereas in *Saturnia* the first branch of the post-costal vein is very minute, consisting of a scarcely visible, almost transverse veinlet, occurring halfway between the tip of the costal vein and the extremity of the wing, in *Aglaia* this first branch of the post-costal vein is longer than all the rest, arising at about one-third of the length of the wing from the base. Thus *Aglaia* and *Saturnia* agree in possessing a simple costal vein, a post-costal vein with five branches, a median vein with three branches, and a simple anal vein. We also find that, like *Saturnia*, all the wings in *Aglaia* are marked in the middle with an eye-shaped spot. Boisduval however appears to have considered that the transformations of *Aglaia* were the chief grounds for separating it from the *Saturnides*: he describes the larvæ of *A. Tau* as "rugulosæ, per juventutem spinigeræ; adultæ muticæ. Folliculum sub-nullum. Puppa muscis vel foliis demortuis oblecta*."

From the preceding considerations I am induced to regard *Aglaia* as belonging to the same subsection or tribe as *Saturnia*, considering the differences of metamorphosis existing between them as more than counterbalanced by the striking similarity of their more important characters in the perfect state. As to the connexion between *Aglaia* and *Endromis*, proposed by Boisduval, I cannot consider it as possessed of any real existence, *Endromis* having a totally different arrangement of the wing-veins, the apical portion of the fore-wings being traversed by seven branches, namely four arising from the median vein, and three simple ones arising from the post-costal vein, the

* Op. cit. supr. p. 74.

wing being furnished with a simple costal, a 5-branched post-costal, a 4-branched median and a simple anal vein. Now this is the typical number of branches which a lepidopterous wing ought to possess, according to the theory of Mr. Edward Doubleday, that we are to suppose the existence of a discoidal vein traversing the middle of the discoidal cell, and that this discoidal vein, as well as the post-costal and median, are respectively furnished with three branches. According to this theory therefore, the two branches of the post-costal vein which run to the tip of the fore-wing of *Endromis*, together with the first branch traversing the front of the disc of the apical portion of the wing, are the only real branches of the post-costal vein; the two following branches of the post-costal vein, as I have regarded them, and the first branch of the median vein, are the branches of the supposed discoidal vein, and the three remaining branches of the median vein are its only true branches. I do not intend in this place to enter into a detail of the reasons which induce me to refuse assent to this theory; I may however observe, 1st, that with regard to the functions of these branches, it is evident that the fourth branch of the median vein, where present, must form a portion of the system of circulation effected by the branches of the median vein, just as in like manner the three branches of the post-costal vein of *Saturnia*, which traverse the apical portion of the fore-wing, must be considered as effectually forming a portion of the post-costal vein; 2ndly, that it seems to me contrary to analogy to admit the existence of fully-developed branches of a vein, the base of which has no real existence; and 3rdly, that instances occur (e. g. *Psyche Stettinella*, *Cochleophasia tessellea*) in which the number of branches exceeds the supposed typical number of nine (i. e. three post-costal, three discoidal, and three median), those insects having ten branches, in which case one of the veins must have an extra branch; whilst in *Saturnia* for instance, the supposed discoidal vein can only have two branches,—hence I see no reason why cases may not be supposed in which one vein should have more, and another vein fewer, than the typical number of branches; or, in other words, why the median vein in *Endromis* should not have four branches, whilst there are only five branches for the post-costal and supposed discoidal veins.

The antennæ also of *Endromis*, as well as its transformations, are quite different from those of *Aglaia* and *Saturnia*; indeed the tribe *Endromides* of Boisduval seems to possess no single connecting character.

Hübner, in his 'Verzeichniss bekannter Schmetterlinge*,' has attempted an arrangement of these insects which appears to me unnatural, so far as the primary divisions are concerned, whereas his inferior groups (*Coitus*), founded almost entirely upon the form and marking of the wings, appear to bring together the closely allied species. His first tribe of the Bombycoid Nocturnal Lepidoptera is termed *Sphingoides*, and contains five stirpes:—1st, *Dimorphæ* (*Endromis*, *Chaoxia*, *Petasia*, &c.); 2nd, *Ptilodontes* (the Prominent Moths); 3rd,

* Augsburg, 1816, 8vo.

Andriæ (*Stauropus*, *Cerura*, &c.); 4th, *Platyptericides* (*Drepana*, *Platypteryx*, &c.); and 5th, *Echidnæ*, composed of *Aglaia* and a number of *Saturniæ*. The second tribe of the Bombycoid Nocturnal Lepidoptera is termed *Veræ*, and consists of the remainder of the *Saturniæ* (*S. Pavonia*, *Pyri*, &c.); *Apollonia*, Cram.; *Maia*, Drury; *perspicilla*, Stoll; *Cedo nulli*, Cram.; and *Pandiona*, Cram., in separate coitus, forming a first stirps *Herææ*; the remaining stirpes, composed of the *Penthophoræ*, *Lariæ*, *Orgyiæ*, *Lithosiæ*, *Arctiæ*, *Lasiocampæ*, *Gastropachæ*, &c.; and the third tribe of the Bombycoid Lepidoptera being composed of *Hepialus*, *Cossus*, and *Zeuzera*.

By this arrangement it will be seen that *S. Pavonia*, *Pyri*, &c., and the other species above named, are separated from the great body of the *Saturniæ*, a step for which I can see no real grounds, the characters of those species in the preparatory and perfect states agreeing with those of the stirps *Echidnæ* far more intimately than with any of the other Bombycoid Nocturna, constituting the tribe named *Veræ*.

Mr. James Duncan, in the volume of Exotic Moths forming part of Sir W. Jardine's Naturalist's Library (vol. vii. 1841), has suggested a mode of distribution of the *Saturniæ*, founded upon the form of the wings in the two sexes of the different species, of which the following is a sketch:—

1. Those with the hind-wings rounded in both sexes.

Genus 1. *Hyalophora* [or the *Speculares Attaci* and *Samia* of Hübner], with large vitreous spaces on the disc of the wings: *Atlas*, *Hesperus*, *Cecropia*, &c.

Genus 2. *Attacus*, with eye-like spots on the wings, containing the great majority of the species.

2. Those with the hind-wings furnished with an angular projection posteriorly.

Genus 3. *Arsenura* [*Rhescyntes* of Hübner]. Hind-wings of male alone angulated. Sp. *Erythrinx*, Fab.

Genus 4. *Lomelia* [*Imbrasia* of Hübner]. Hind-wings of both sexes angulated. Sp. *Epimethea*, Drury.

3. Those with the hind-wings produced into a long tail.

Genus 5. *Actias*, Leach [*Tropæa*, Hübner]. Tail about the length of the body. Sp. *Luna*, Linn.

Genus 6. *Eustera* [*Eudæmonia*, p. Hübner]. Tail very long; apical margin of fore-wings rounded. Sp. *Argus*, Fab.

Genus 7. *Copiopteryx* [*Eudæmonia*, p. Hübner]. Tail very long; fore-wings truncated. Sp. *Semiramis*, Cram.

The application of the character derived from the variation in the form of the wings in the two sexes of the different species is a step gained in their arrangement; it must however be admitted that the species with rounded hind-wings, forming Mr. Duncan's first section, must be cut up into a considerable number of subsections to place them on an equivalent footing with the species with angulated or tailed hind-wings. Moreover the existence of large vitreous patches on the wings is not sufficiently important for the formation of genera among

these insects, since it is found gradually obliterated in a series of the species by the space being more and more clothed with scales, until, as in our common *Saturnia*, all that remains of the vitreous spot is a narrow lunule at the base of the pupil of the eye-like spot. Although Mr. Duncan's observation, that "the species in which the fore-wings of the male are most decidedly falcate have this form much less strongly marked in the female; where the former are not very strongly falcate, in the female they become subfalcate (*H. Promethea* may serve as an example), while the females of subfalcate winged males have the exterior outline of their fore-wings either straight or slightly curved outwards"—is correct, yet he has carried it too far in proposing to unite together two insects belonging to different genera, and equally far removed in their geographical range, namely the curious *Saturnia Lucina* of Drury (which possesses very strongly falcate fore-wings, the veins of which, as is evident from Drury's figure, are arranged as in the typical *Saturnia*, and which I find recorded in Drury's MSS. to be a native of Sierra Leone) and the Assamese *Bombyx spectabilis**, described by Mr. Hope in the Linnæan Transactions (vol. xviii. part 3, figured in pl. 31. fig. 3. from my drawing), which possesses an outwardly rounded apical margin of the fore-wings, and which, as may be seen from my figure, has a different arrangement of the veins of the fore-wings, the apical portion of the disc of which is traversed by seven branches, the innermost pair of the post-costal vein not being united together in a fork on the disc; the insect in fact belonging rather to the group of which *Lasiocampa* is a good type†.

* This species is the *Bombyx Certhia*, Fabricius, Ent. Syst. iii. 412; *Bombyx Wallichii*, Gray in Zool. Misc. p. 39; and *Phalena maxima*, Chusan, Petiver. Gaz. t. 18. fig. 3.

† I may take this opportunity of describing a very fine new species of *Lasiocampa* from Tropical Africa, in my own collection.

LASIOCAMPA STRIGINA, Westw. *L. alis anticis pallide incarnato-albidis strigis quatuor fulvo-castaneis, posticis basi fuscis strigis tribus transversis albis, pone medium fulvo-castaneis.*

Expans. alar. unc. 6.

Hab. Sierra Leone. In Mus. nostr.

The general colour of this insect is a rich chestnut-fulvous or sorrel colour. The basal half of the fore-wings is of a pinkish buff, the pink tint being strongest at the base, and extending across the hind part of the thorax. Between the base and the distance of one-third of the length of the wing, are two straight, transverse, chestnut-fulvous strigæ, which are shaded off gradually to the pale ground colour of the wing; at the distance of one-third is another abbreviated striga of the same kind (indicating the situation where the discoidal cell is closed). Across the middle of the wing is a broad, more oblique chestnut-fulvous bar, shaded off in the same manner; and beyond this, and parallel with it, is another narrow, darker chestnut-fulvous, oblique striga, leaving a broad apical margin of chestnut-fulvous, slightly clouded with an obscure paler wave. The principal veins of the wing are indicated at a little distance beyond the middle by a double row of minute chestnut dots, and along the apical portion by a brighter tint. The fringe is claret-brown. The hind-wings are blackish-brown at the base, with three transverse white fasciæ, the outer ones being close together, and running nearly across the middle of the wing; the apical half of the wing being chestnut-fulvous, with a slight indication of a paler fascia. The antennæ are very pale buff and bipectinated; the tips are broken off in my specimen, the part remaining having seventy-three pairs of rays. Beneath, the wings are paler chestnut-fulvous, with a darker duplicated striga across the middle, and some slightly indicated waved strigæ beyond the middle.

As already stated, the insects of the genus *Saturnia* are among the largest of the Nocturnal Lepidoptera, a few *Hepialidæ* and *Erebi* alone equalling them in size. How far this circumstance gives them the character of a typical group may be reasonably questioned; to me indeed it appears that an increased size in the species of any group is in itself a proof of a certain degree of aberration: certainly if strength of flight and compactness of form be considered, we must regard the *Lasiocampæ* and allies as much rather the real representatives of the Linnæan *Bombyces*; just as in the Butterflies, no one would consider the species of *Papilio* on account of their large size as the types, but would confer that title on *Vanessa* and its allies, notwithstanding the want of well-developed fore-legs. Another circumstance which might be alleged as a proof of the typicality of the *Saturnia*, is the wide geographical range of the species, which occur in all quarters of the globe, which peculiarity extends even to the minor divisions of the genus; thus we have very closely-allied tailed species from North America, India and South Africa; I believe however that naturalists have at length agreed in refusing to this circumstance the right of conferring typicality on groups.

Saturnia in fact appears to me to be one of those groups like *Papilio* among the Diurnal Lepidoptera, *Carabus* among the *Carabidæ*, *Feronia* among the *Harpalidæ*, or *Cicindela* among the *Cicindelidæ*, which are of great extent and comprise a number of species, generally of comparatively large size, which it is difficult to group into well-defined sections or subgenera, although their forms are very varied. One or more species may be detached and characterized as distinct subgenera, but when the whole group is carefully studied, it is ascertained that these particular species do not possess more important characters than the rest. I shall not attempt therefore, in describing the African species alone of this group, to introduce a system of distribution among the species, further than the artificial division given below.

The beautiful markings of the wings, and especially of the hind-wings, of many of these insects, appear to indicate the character laid down by Linnæus and Fabricius, namely "*Alæ patulæ*," by which we are to understand, that when the insect is at rest the fore-wings do not closely cover the hind-ones, as is the case in the species with dingy-coloured hind-wings, but leave their beautiful markings exposed to view. Mr. E. Doubleday indeed informs me that the North American *S. Luna* generally sits with its wings perpendicularly elevated over its back, like a butterfly at rest. These beautiful eye-like markings of the wings are indeed a good character of the group, although that which is afforded by the arrangement of the veins above described is of higher importance. The latter indeed, together with the emission of four branches from each joint of the flat pennated antennæ, may be considered as the essential characters of the genus, although they have never hitherto been employed to distinguish it. Another character, also hitherto unemployed, which will I think prove of importance in determining the minor groups of *Saturnia*, consists of the difference in the number of branches in the antennæ of the different species; this I have carefully noticed in the following descriptions, as





1. SATURNIA VACUNA, W.

2. S. ARATA, W.

well as the differences in the formation of the female antennæ, in which sex some of the species possess those organs almost filiform, whilst in others they are nearly as strongly pennated as in the males.

In the following pages thirty-three African species are introduced, of which seventeen are now for the first time described.

For convenience the following artificial mode of division is employed in their arrangement :—

- A. Fore-wings very sickle-shaped; with a small eye-like spot near the tip.
 - a. All the wings with a glassy lunate central spot. Sp. 1.
 - b. Fore-wings with a central bean-shaped vitreous spot; hind-wings with large oval one. Sp. 2.
- B. Fore-wings less strongly sickle-shaped or rounded externally; all the wings with an eye-like spot.
 - a. Hind-wings not tailed. Sp. 3–10.
 - b. Hind-wings tailed. Sp. 11, 12.
- C. Fore-wings with a small triangular or quadrate vitreous central spot; hind-wings with a large eye. Sp. 13–24.
- D. Wings without eyes or vitreous spots. Sp. 25–28.
- E. Aberrant species. Sp. 29–33.

Section A.

Subsection a.

Sp. 1. SATURNIA VACUNA, Westw. (Pl. VII. fig. 1. ♂) *S. alis maris falcatis fuscis, fascia communi media alba, omnibus lunula magna media vitrea, utrinque albo flavoque marginata; anticisque macula ovali nigra subapicali (albo supra circumdata).*

Expans. alar. ♂ unc. $6\frac{1}{4}$; ♀ unc. $5\frac{1}{3}$.

Inhabits Ashantee. In the British Museum.

The male has the fore-wings considerably falcate at the tips, and the hind ones almost triangular. The female has the fore-wings somewhat emarginate in the middle of the hind margin, and the hind-wings less elongated. The general colour of the wings is brown, thickly irrorated, especially in the males, with white. The fore-wings have a broad suboblique bar, extending from the base of the inner margin and directed forwards in a right angle immediately in front of the central lunule, the margin of which is formed of a narrow brown bar, within which it is dirty yellow, internally edged with white, the central part being vitreous. This is followed by a white oblique nearly straight bar, the brown space beyond which is much-powdered with white; the apical margin is pale livid buff, traversed by a very slender undulating brown line, with a black oval dot near the apex, which is powdered at its base with white; the apex of the wings being rosy fulvous, separated from the livid brown antecedent part of the wing by a very much-angulated white line.

The hind-wings are white at the base, which extends on the outside and joins the central white fascia; the apical portion is coloured

as in the fore-wings. The lunule is smaller and more curved than in the fore-wings, but similarly coloured.

The antennæ are fulvous. The abdomen whitish buff.

The male antennæ are broad, and have forty-six rays on each side lying flat; the four rays of each joint of equal length. The female antennæ are of considerable breadth, and with forty-eight or fifty rays on each side.

The palpi are very short but distinct and rather slender, and the spiral tongue is also distinct and composed of two flattened free filaments.

Subsection A. b.

Sp. 2. SATURNIA MYTHIMNIA, Westw. (Pl. VIII. fig. 3.) *S. alis anticis subfalcatis, omnibus purpureo-fuscis albo-irroratis; et pone medium striga alba valde curvata; anticis lunula magna vitrea albo flavoque marginata; maculaque parva subapicali nigra albo irrorata; posticis ocello magno ovali vitreo albo flavoque marginato, serieque catenata submarginali punctorum nigrorum.*

Expans. alar. antic. unc. $4\frac{3}{4}$ – $5\frac{1}{2}$.

Hab. Port Natal. In Mus. Britann.

The fore-wings are considerably emarginate along the outer margin in the male, and more slightly so in the female. The veins agree in arrangement with the typical *Saturniæ*. The general colour of the wings is a dark livid brownish purple, thickly powdered with white atoms; the middle of each wing is occupied by a large transparent spot, kidney-shaped in the fore-wings and oval in the hind ones; the vitreous portion is surrounded by a slender line of white, which is succeeded by a yellow one, and this by a slender black line; these eyes are of nearly equal size. The fore-wings are also marked near the base with an oblique white fascia, extending from near the base of the fore-wings to the base of the large eye; beyond the eye is a curved white bar, internally edged with a darker bar of livid purple; the apical part of the fore-wings is brown shaded to fulvous and buff; the outer margin of the wing dusky buff, with a series of greenish buff spots edged with a slender brown deeply undulating line; near the tip of the wing is a black spot irrorated with white at the base, from which runs a very slender and much-angulated white line. The hind-wings have a fulvous edge gradually shaded to buff-brown, bearing a row of dark brown catenated spots followed by a slender dusky line. The under side of the wings resembles the upper side, with the costa of the hind-wings white. The body is purplish brown, the thorax behind with a white fascia, and the segments of the abdomen have the hinder margin white. The antennæ, head and legs are fulvous. The antennæ are broadly pennate, with the rays continued to the tip. The males have fifty-eight rays (arranged in double pairs to each joint), with single rays at the tip. The females have also fifty-eight long rays (four to each joint), with eight or ten single rays at the tip. The palpi are porrected, but do not extend beyond the hairs of the clypeus.

Section B.

Subsection *a*.

Sp. 3. SATURNIA ARATA, Westw. (Pl. VII. fig. 2.) *S. alis flavis; anticis apice acutis basi livide maculatis, medio ocello livido cincto circulo tenui albo, alteroque purpureo marginato, linea tenui dentata media, strigaeque obliqua subundata, posticis ocello magno multi-annulato ornatis.*

Expans. alar. unc. $4\frac{1}{2}$ – $5\frac{3}{4}$.

Hab. Ashantee, Sierra Leone and Port Natal. In Mus. Britann.

The fore-wings are nearly alike in both sexes, being but very slightly emarginated in the male, with the tips acute; wings rich yellow, with several livid or reddish patches near the base, followed by a much-waved livid striga; in the middle of the wing is a moderate-sized ocellus, the centre vitreous, outwardly edged with black, surrounded by a livid ring, and this by a white circle, outside of which is a narrow purplish or reddish ring. Connected with the outer edge of the ocellus is a slender, very strongly denticulated dark brown line; beyond this is a nearly straight purplish brown striga, extending from the fore-margin, where it is rather angulated and extending to the middle of the inner margin; beyond this line the outer margin of the wing is marked with confluent livid or reddish patches, the margin itself being of the same colour except at the tip.

The hind-wings are more or less tinged with red at the base, followed by an angulated dark denticulated striga arising from the anal margin. In the middle of the wing is a large brilliantly coloured ocellus; the pupil is black, with a slender vitreous line towards the base; the iris is livid, outwardly shaded to red, surrounded by a slender white circle and this by a red ring. From the inner margin of the eye runs a dentated brown line to the anal margin, and behind it is a waved or dentated brown striga, the apical portion of the wing being coloured as in the fore-wings. The thorax is yellow, with the head, collar and legs livid brown. The wings are much less brilliantly coloured on the underside, and the great ocellus of the hind-wings is almost obliterated. The vitreous part of the ocellus of the fore-wings is much smaller in the male than in the female; and the ocellus of the hind-wings in the female is much more vividly coloured than in the male.

The antennæ of the males are 32-jointed with forty-eight rays on each side, the two apical rays of each joint being rather shorter than the two basal ones.

The palpi are short, but distinct and broad; the basal joint with scales extending beyond the second joint. The antennæ of the female are 37-jointed, the rays being about three times as long as the thickness of the antennæ, and the two apical rays of each joint being quite short.

Sp. 4. SATURNIA BELINA, Westw. (Pl. VIII. fig. 2.) *S. alis anticis flavo-griseis, striga subangulata ante, alteraque fere recta pone medium; ocello mediano hyalino fulvo-cincto; alis pos-*

ticis rubidis ocello magno vitreo iride fulva nigro circumdata strigaeque subapicali alba, fusco externe marginata.

Expans. alar. antic. unc. $4\frac{1}{2}$ – $4\frac{3}{4}$.

Hab. Port Natal et Zoolu. In Mus. Britann.

The fore-wings are nearly alike in both sexes, the outer margin being scarcely emarginate. The general colour is uniform obscure yellowish grey, covered with minute black irrorations; at the distance of about one-third of the length of the wing from the base is a rather narrow white transverse striga, slightly angulated outwardly, having a dusky edge on the inside next the base of the wing. In the middle is a rather small ocellus, the centre being semi-oval and vitreous, edged with fulvous, and surrounded by a thin black circle; this is surrounded by a dull buff ring, and this by a white one; beyond the middle is an oblique nearly straight white striga, nearly parallel with the outer margin, outwardly edged with a dark brown line. Hind-wings pale livid pink at the base and along the anterior portion; near the base is an obscure white striga, and in the middle is a large oval ocellus, coloured in the same manner as the ocellus of the fore-wings, and followed by a curved white striga edged outwardly with brown.

The thorax is coloured as the fore-wings, with a narrow transverse white ring across the front. The abdomen is more strongly fulvous-coloured. Wings beneath grey, the fore-ones tinged with pink on the inner margin; across the middle is a fulvous cloud; the basal fascia and the eyelet of the hind-wings are wanting. The veins are arranged in the typical manner.

The male antennæ are 35-jointed with fifty-six rays on each side, the rays rather long; the two basal rays of each joint are obliquely porrected, so that the rays form four series instead of all being on the same plane; the six apical joints minute and not producing rays. The antennæ of the female are setaceous, the rays being scarcely visible without a lens. The palpi are flattened, short and deflexed.

Sp. 5. SATURNIA HERSILIA, Westw. (Pl. IX. fig. 1.) *S. alis maris integris flavis fusco subirroratis, striga angulata transversa ante medium alteraque ante apicem subundata fuscis; ocello magno mediano vitreo iride lata obscure lutea, linea tenui circulari nigra circumdata; alis posticis basi roseo-flavis, ocello maximo mediano vitreo circulis concentricis obscure luteo, nigro, late rufo, et albo cincto, strigaeque subapicali subundata fusca.*

Expans. alar. antic. unc. 5.

Hab. Congo. In Mus. Britann.

Male with the fore-wings entire, and slightly rounded along the outer margin. General colour yellow; fore-wings finely powdered with small brown scales, having a slender, angulated, brown striga before the middle, slightly tinged on the outside with rosy; in the middle of the wing is a large eye, having a subovate vitreous centre, surrounded by a broad dirty luteous brown ring, succeeded by a narrow black circle with a white outer ring; halfway between this and the outer margin is a narrow brown striga parallel with the outer margin, inwardly edged with rosy white. Hind-wings rosy yellow at



1. SATURNIA TYRRHENA W. 2. S. BELINA, W. 3. S. MYTHIMNIA, W.







the base, near which is an oblique, very pale brown striga; followed by a very large eye with an oval glassy centre, surrounded by a broad dirty luteous brown ring, and this by a narrow black circle: this is succeeded by a broad red ring, and this by a white one, the adjoining space being rosy buff: between the eye and the apical margin is a subundulated blackish striga, edged internally with white. The fore-wings beneath want the anterior, angulated, brown striga; the ocellus is coloured as on the upper side, and the hind-wings are fulvous yellow, with the ocellus smaller than above, the black ring being surrounded by a white one, and this by a narrow rosy one; the white waved subapical striga is also narrowly bordered within with rosy.

Antennæ of the male chestnut-yellow, rather broad and flat, with forty-eight rays on each side, the two apical rays being very short, four rays being produced from each joint.

Body entirely orange-yellow, the outside of the tibiæ and tarsi blackish.

Sp. 6. SATURNIA MENIPPE, Westw. (Pl. IX. fig. 2.) *S. alis integris testaceo-rufis apicibus fuscis, striga curvata ante alteraque pone medium angustis albis, communibus, alis omnibus ocello nigro (medio subvitreo) iride alba.*

Expans. alar. antic. unc. $5\frac{1}{3}$.

Hab. Port Natal et Africa Austral. In Mus. Brit. et Hope.

Fore-wings of the male entire and slightly rounded along the outer margin. Wings rich testaceous red; fore-wings with the costa pale buff-brown, base carmine-red, having a white slightly curved fascia running across all the wings, each of which is also marked in the middle with an equal-sized oval eye; the centre vitreous, but clothed with black scales, surrounded by a broad black ring, and this by a rather broad white one; this eye is followed by a uniform white bar, nearly parallel with the outer margin, which is rather dull buff, finely irrorated with brown scales; fringe dull buff. Wings beneath greenish buff, the anterior with the eye nearly similar to that of the upper side, followed by a white streak edged outwardly with black, and with a grey triangular patch near the tip of the wing, the outer margin somewhat paler, the middle dotted with brown. Hind-wings buff-white, irregularly clouded with dirty buff; across the middle is a nearly straight brown fascia, the apical half of the wing darker buff-brown, with two large lilac-grey spots, one near the anal angle, and the other towards the outer angle.

Antennæ dark brown; those of the male rather broad, with fifty-two joints in each, and about 100 rays on each side, extending consequently nearly to the extreme tip. Female antennæ nearly resembling those of the male.

Thorax dark carmine-red, brown in front, with a narrow white collar. Abdomen and under side of the body pale whitish buff. Head and legs pale buff-brown.

Sp. 7. SATURNIA TYRREHA, Cramer. *S. alis griseis nigro irro-*

ratis; anticis striga ante medium alba valde dentata; omnibus ocello mediano (majori in alis posticis) vitreo, iride griseo-fulva annulis concentricis nigro, fulvo et albo circumcincta; omnibus etiam striga versus marginem duplicata undata communi.

Expans. alar. antic. fere unc. $5\frac{1}{2}$.

Syn. *Phalæna Tyrrhea*, Cram. Ins. 4. tab. 46. fig. A. *Bombyx Tyrrhea*, Fabricius, Ent. Syst. iii. part i. p. 415.

Hab. Cap. Bon. Spei et Africa australi. In Mus. Britann.

The antennæ of the male are moderately broad and flat, with fifty-two rays on each side; the four or five terminal joints very short, and not producing any rays; the rays are for the most part of nearly equal length, so that the broad part of the antennæ has its sides nearly parallel.

The antennæ of the female are compressed, and with scarcely any rudiment of pectinations.

The palpi are distinct, but very short.

The outer margin of the fore-wings of the female is entire.

Sp. 8. SATURNIA CYTHEREA, Fabr. *S. alis anticis margine externo parum emarginato; griseis, strigis duabus albis, anteriore undata, omnibus ocello magno (in alis posticis majori) vitreo; parte vitrea in anticis magna ovali, in posticis parva rotundata; iride flava, annulo nigro alteroque albo circumdata.*

Expans. alar. antic. individui typici Banksiani unc. $6\frac{1}{8}$; individ. in Mus. Brit. unc. 5.

Syn. *Bombyx Cytherea*, Fabr. Ent. Syst. iii. a. p. 410. *Echidna communiformis Cytherea*, Hübner, Auss. Sch. F. 3, 4. *Phalæna Capensis*, Cramer, Ins. tab. 302. fig. A, B; tab. 325. fig. G (♀), (nec *Phalæna Capensis*, Linn.). Sulz. Hist. Ins. tab. 21. fig. 1.

Hab. apud Cap. Bon. Spei.

In Mus. Banks. (Soc. Linn. Lond.) et Britann.

The male antennæ are moderately broad, with 126 rays on each side, affixed obliquely, the joints being very short, the ten terminal joints very short, with only one ray on each side, gradually diminishing in size.

The female antennæ are slightly serrated, each joint emitting two oblique serrations on each side, the basal pair being the largest, the size of the serrations gradually diminishing to the tip.

The palpi are short and broad, but do not extend beyond the hairs of the face.

I have seen a variety from the Zoolu country much varied with yellow, especially on the thorax, at the base of the wings, and along the apical portion beyond the subapical striga.

Sp. 9. SATURNIA DIONE, Fabr. *S. alis sulphureo-flavis, anticis in mare parum falcatis, strigis duabus, anteriore antice recta, postice dentata carnea, posteriore (communi) recta obscuriore, anticis etiam plaga albo-carnea basali alteraque versus apicem costæ nubilaque lata undata pone strigam externam griseo-carneis, omnibus in medio ocello (in alis posticis majori), pupilla*

minuta vitrea, iride fulva annulis nigro, albo carneoque circumcincta.

Expans. alar. antic. unc. 5-5½.

Syn. *Phalæna Guineensis flava perelegans*, Petiver, Gazoph. pl. 29. fig. 3. c. 478. *Bombyx Dione*, Fabr. Ent. Syst. iii. a. p. 410. *Phalæna Paphia*, Linn. (*ex parte*).

Hab. Congo, Ashantee (Mus. Brit.), Sierra Leone (Mus. Hope).

The fore-wings in the female are not so subfalcate as in the male, but the apical margin is slightly emarginate. The male antennæ are rather broad and flat, with forty-four rays on each side, four being emitted from each joint; about six of the terminal joints are furnished only with short, gradually diminishing spurs. The female antennæ are almost filiform. The palpi are short, but distinct and deflexed.

The nomenclature of this species is involved in some difficulty. Old Petiver rightly figured it as above referred to, under the name of *Phalæna Guineensis flava perelegans et pulchre oculata*. Linnæus, in the 10th edition of the 'Systema Naturæ' (p. 496), described an insect under the name of *Bombyx Paphia*, thus: "*P. Bombyx elinguis flava alis patulis falcatis concoloribus ocello fenestratis. M. L. U.*," thus indicating that the typical specimen of his species was contained in the museum of the Queen of Sweden. But Linnæus referred not only to Petiver's figure, but also, in the second place, to Catesby's 'Carolina,' ii. p. 91. t. 91, where is represented an insect described by Catesby as "*Phalæna ingens Caroliniana oculata e luteo fusca lineis dilute purpureis insignita*," which Cramer and Fabricius subsequently figured and described under the name of *Polyphemus*. Linnæus however, in this 10th edition of the 'Systema Naturæ,' gave to his *B. Paphia* the "*Habitat in Guineâ*."

In his 'Museum Ludovicæ Ulricæ,' Linnæus however treated his *B. Paphia* in a different manner. Without altering his specific character, he refers in the first place to Catesby's 'Carolina' (*S. Polyphemus*); 2ndly, with a query, to Petiver's *Phalæna Guineensis*; and 3rdly, to an insect figured by Rumphius in his 'Herbarium of Amboyna' (iii. t. 75), which, from the observation of Rumphius, "*Folliculus est Erucae Bengalensis Tesser vocatæ*," is evidently the Tusseh silk moth of Roxburgh (*S. Paphia*), thus confounding three American, African and Indian species under one name. He moreover in this work gives the "*Habitat in Americâ Septentrionali*," and his detailed description evidently proves that he had the American species of Catesby in view in proposing the name of *Paphia*; indeed his reference to the "*M. L. U.*" in the 10th edition of the 'Systema Naturæ' likewise fully proves that, although giving in that work Guinea as the habitat of his *Paphia*, the American insect was the one before him.

But in the 12th edition of the 'Systema Naturæ,' we find Linnæus making the matter still more confused; for we now find the reference to Petiver restored to its first position, that to Catesby given with doubt, and the reference to Rumphius added in the third place, the locality being "*Habitat in Guineâ, Asia*."

Now if we are to regard the last work of an author as containing his matured opinions, and allow him at the same time the right to

modify his opinions to an extent involving the change of specific names, in the manner followed in this instance by Linnæus (which is however a power which I deny that an author ought to possess), we must remove from the Carolina species all right to the name of *Paphia* and confer it on the African insect; but I contend that as Linnæus clearly defined the American species under that name in the 'Museum Ludov. Ulr.,' and in his subsequent work made no attempt to discriminate the three species, we are warranted, 1st, in retaining the name of *Paphia* for the American insect, in which case it will be necessary to sink the Fabrician name of *Polyphemus* into a synonym of *Paphia*; 2ndly, in giving to the African one the Fabrician name of *Dione* (striking out the incorrect Fabrician reference of Petiver's Guinea insect to the Asiatic species); and 3rdly, in giving a different specific name to the Tusseh silk moth of India, to which Fabricius restricted the name of *S. Paphia*, but which it ought certainly not to retain, seeing that Linnæus, when he first proposed that name, knew only the African and American insects. Drury has however enabled us to clear up the difficulty as to this third species, having figured it in the second volume of his 'Illustrations' under the name of *Mylitta* (pl. 5. fig. 1 = *Paphia*, Cramer. Ins. 13. tab. 147. fig. A), which name Fabricius also adopted, giving the Asiatic species twice over under the names of *Paphia* and *Mylitta*.

The synonyms of the three species will stand thus:—

1. *Saturnia Paphia*, Linn. Mus. Lud. Ulr.
B. Polyphemus, Fabr.
Hab. North America.
2. *Saturnia Dione*, Fabricius.
Phalæna Guineensis, Petiver.
Ph. Paphia, Linn. Syst. Nat., ed. 10. *ex parte*.
B. Petiveri, Guérin, Ann. Soc. Sericicole.
Hab. Africa.
3. *Saturnia Mylitta*, Drury, Fabr.
B. Paphia, Cramer, Fabricius.
The Tusseh Silkworm Moth.
Hab. India.

SATURNIA WAHLBERGII, Boisduval in Delegorgue, Voy. dans l'Afr. Austr. ii. p. 600.

Of this supposed species, which inhabits Port Natal, I have seen specimens, but I cannot consider them distinct from *S. Dione*, of which they are highly coloured individuals. The following is M. Boisduval's description:—

“Elle est un peu plus grande que la *Saturnia Pyri* d'Europe, et son port est assez différent. Le dessus des quatres ailes est jaune, fortement saupoudré d'atomes bruns avec une bande étroite, brune doublée intérieurement de gris violâtre commune régulière; commençant près du sommet des supérieures et arrivant au bord interne des inférieures, juste au niveau de l'extrémité de l'abdomen. Vers le base des quatre ailes on voit une autre bande commune très-sinueuse irrégulière, violâtre précédé à la base des supérieures d'une espèce dé-

taché de sa couleur. L'œil des ailes supérieures est petit, transparent, cerclé de jaune et entouré d'un peu de violâtre surtout dans le mâle; l'œil des ailes inférieures est plus grand, jaune, à prunelle diaphane et à iris noir cerclé de violet. Dédié à M. Wahlberg, l'un des compagnons de M. Delegorgue."

In addition to the above characters, it may be noticed, that the bar beyond the middle of the wings is slender, grey, outwardly edged with a dusky line, and inwardly with purplish brown; outside the bar is a series of large, triangular, lilac-white patches united together, and the disc of the wings, especially towards the base, is much more irrorated with lilac-pink.

Sp. 10. SATURNIA APOLLONIA, Cramer, Ins. vol. iii. pl. 250 A.

S. alis pallide fuscis albo flavoque variis; anticis fascia subapicali flava extus fusca; alis posticis albis strigis duabus fuscis pone medium, exteriore flavo intus marginata; omnibus ocello nigro in medio subvitreo iride alba; in anticis etiam annulo flavo cincto: corpore albo thorace macula media fusca.

Expans. alar. antic. unc. $3\frac{3}{4}$.

Hab. Caput Bon. Spei et apud Portum Natalensem.

The antennæ are fulvous and short; the pectinations forming an elongate ovate outline, pointed at the tip, with only thirty-eight rays on each side, four being emitted from each joint. The rays lie flat, and several of the terminal joints are destitute of rays. The female antennæ are 24-jointed, the pectinations forming a much narrower oval outline than in the male; the pectinations of the basal part being short, each joint emitting four rays, of which the apical pair is not above half the length of the basal ones.

This species is well-figured in Mr. Angas's plate of Lepidoptera of the Zoolu country, fig. 14.

Subsection B. b.

Sp. 11. SATURNIA MIMOSÆ, Boisduval (Voy. de Delegorgue dans

l'Afrique Austr. p. 600). *S. alis glauco-viridibus, anticarum costa grisea linea vel striga undulata griseo-fusca paullo pone medium maculaque grisea ad angulum posticum; omnibus ocello æquali, flavo, iride tenui castanea anticeque lunula tenui grisea notata; posticis in caudam longissimam spatulatam basi griseo-fuscam, apice flavo-viridi productis.*

Expans. alar. antic. unc. $5\frac{1}{4}$, long. alar. postic. unc. $4\frac{1}{2}$.

Hab. apud Portum Natalensem. In Mus. Britann. &c.

This species belongs to the subgenus *Actias* of Leach, and is allied to *S. Selene* of India, *S. Luna* of North America, *S. Isis** of Java, *S. Cometes* of Madagascar, described by M. Boisduval in his 'Fauna of Madagascar,' (apparently identical with the species captured at Nosse Bé, on the east side of Madagascar, by M. Mitre, exhibited by M. Guérin at the Entomological Society of France (see Annales

* This very rare species, of which M. Boisduval was acquainted with only a single specimen in the collection of M. Robyns of Brussels, will require a new specific name to distinguish it from the *S. Isis* of this monograph.

de la Soc. Ent. 1846, p. civ.) ; *S. Mænas* of Silhet (figured in my Cabinet of Orient. Entomol. pl. 22), and *S. Leto*, Doubleday, also from Silhet (figured in the Trans. of the Entomol. Soc. vol. v. pl. 15. A very fine specimen of this last-named insect, with the markings on the wings much more distinct, is contained in the Ashmolean Museum at Oxford).

The wings of *S. Mimosæ* are pale yellowish-green with the apical margin waved, that of the fore-wings of the male being somewhat more emarginate than in the female. The costa of the fore-wings is broadly purplish-grey, much-irrorated with white ; beyond the middle arises on the costa an oblique dark chestnut spot, which emits an undulating line across the wing (which forms a waved fascia in the female), and near the tip of the wing the pale costa is separated from the green ground by a dark chestnut dash. In both sexes the anal angle of the fore-wings is occupied by a grey-brown patch which extends narrowly into the wing parallel with the outer margin ; the incisures of all the wings are tinged with chestnut-purple ; from the middle of the pale costa of the fore-wings arises a purplish-brown spot to which is attached the ocellus, which is rather small, oval and transverse ; the centre formed of a small glassy spot surrounded by fleshy-brown and this by yellow, more orange-coloured on the side towards the base of the wings, where it is also surmounted by a black-brown lunule powdered with white scales along its middle. The hind-wings are more uniformly green above, with an ocellus similar to that of the fore-wings, the anal angle produced into a slender tail longer than the body of the wing and spatulated at its extremity ; this tail is chestnut-brown throughout its narrow part, where it is much-powdered with white, the dilated apical part being green. The body is yellow and the antennæ are fulvous.

The underside resembles the upper, except that the undulating line beyond the middle of the wing is wanting, and is replaced by a similar one nearer to the outer margin of the wing, and running along the hind-wings.

The underside of the abdomen is marked with purple spots along the apical margin of the segments. The antennæ of the males are very broad, emitting 50 rays on each side, the five or six terminal joints with very short rays. The rays on each side of each joint arise at a little distance from the base and extremity of each joint, so that there is a more decided space between the second ray of one joint and the first ray of the next joint than usual.

The veins of the fore-wings are arranged as in the typical *Saturniæ*, and those of the hind-wings as in *S. Mænas* (as exhibited in my figure above referred to) and as in *S. Luna*, the peculiarity in the subgeneric group *Actias* of Leach containing the above-named species, being that the three branches of the median vein of the hind-wings are compressed closely together, arising on the inside of the ocellus and extending into the long tail, a transverse vein running across the middle of the ocellus, closing the discoidal cell, and uniting the inner branch of the post-costal vein with the outer branch of the median vein.

Boisduval informs us that this species "est très commune à quatre à cinq lieues dans l'intérieur du pays sur les Mimosa. Les cafres se servent du cocon qui est très-gros et très-solide pour se faire des tabatières. Pour cela ils y font un trou pour extraire la chrysalide, et ils le bouchent ensuite avec une cheville de bois."

A beautiful figure of this species is given by Mr. Angas in his plate of Zoolu Moths, fig. 18.

This is evidently the species alluded to in the following note, published by M. Signoret in the Journal of the Proceedings of the Entomological Society of France, Annales 1845, p. xcvii:—"M. V. Signoret présente à la Société un dessin d'une nouvelle espèce appartenant au genre *Saturnia*, et il communique une note à ce sujet. M. V. Signoret dit que le Chenille de cette espèce est inconnue, que les chrysalides en furent trouvées en Novembre 1844, sur un Mimosa près de la rivière Toogela, limite des frontières du royaume Aucayoolao, situé entre Lugoo-Baie et Port-Natal: l'insecte parfait a été rapporté par M. Campion de Douai, et notre collègue propose à la Société de lui appliquer le nom de *Saturnia Campionea*."

Sp. 12. SATURNIA ARGUS, Fabr. *S. omnibus pallide carneo-albidis, anticis margine postico rotundatis, disco punctis sex in medio approximatis, fenestratis, annulo fulvo nigroque cinctis; posticis punctis quinque sparsis ejusdem coloris; margine anali in caudam longissimam extenso.*

Expans. alar. antic. unc. 3, long. alar. postic. unc. 4.

Hab. the Isle of Banana (Smeathmann).

In Mus. Britann., Banks. (Linn. Soc.), Westwood, &c.

Syn. *Bombyx Argus*, Fabr. Ent. Syst. 111 a. p. 414; Stoll, 27. 1; Donovan. Nat. Repos. 5. 173; Oliv. Enc. Meth. 5. 29. 22; Drury, Ent. vol. iii. pl. 29. fig. 1. *Phalæna brachyura*, Cramer, Ins. pl. 29. fig. 1. *Eudæmonia Uroarge*, Hübner, Verz. No. 1586.

The fore-wings are considerably rounded along the apical margin, and the tails of the hind-wings are much longer in proportion than in *Mimosæ*, *Luna*, &c. The veins of the fore-wings are similarly arranged to those of *S. Mimosæ*, &c., but those of the hind-wings are peculiar in having the veinlet which connects the inner branch of the post-costal vein and the outer branch of the median vein closing the discoidal cell so oblique (as well as subangulated in the middle), that it seems like a real fourth branch of the post-costal, running down within the outer margin of the tail, the base of the outer branch of the median vein being so thin and short that it resembles the ordinary condition of the veinlet closing the cell, although its nearly longitudinal direction indicates its real nature as a branch of the median vein*.

* *Saturnia (Eudæmonia) Semiramis*, Cramer, pl. 13 A, differs materially in the veining of its wings from *S. Argus*. In the fore-wings the inner branch of the post-costal vein, instead of arising from the preceding branch in an acute fork, as in the typical *Saturniæ*, arises from the middle of the transverse vein closing the discoidal cell, whilst in the hind-wings the inner branch of the post-costal vein runs within the outer edge of the tail throughout its whole length, the first branch of the median vein arising nearly opposite to the base of the tail, and the second branch at some length down the tail.

No. CXCIH.—PROCEEDINGS OF THE ZOOLOGICAL SOCIETY.

The antennæ of the females (I have seen no male) are 26-jointed, each joint after the second producing only a pair of rays, arising close to the base of the joint. The palpi are also as long as the head and deflexed, with the terminal joint long and pendulous. In these respects it will be necessary to separate this insect at least subgenerically from the other *Saturniæ*; it may therefore be advisable to use Hübner's subgeneric name *Eudæmonia* for it.

Section C.

Sp. 13. SATURNIA EPIMETHEA. *S. alis anticis subfalcatis; subfuscis striga communi subapicali obscura extus pallide griseo marginata; macula minuta mediana triangulari vitrea; posticis acute angulato-caudatis, ocello magno medio fulvo iride nigra annulo puniceo cinereoque cincta, margine antico alarum obscuriori.*

Expans. alar. antic. unc. 5-6.

Hab. in Guinea. In Mus. Britann.

Syn. *Phalæna Attacus Epimethea*, Drury, vol. ii. pl. 13. fig. 1; Fab. Ent. Syst. iii. a. p. 414; Gmel. Linn. Syst. Nat. 2404; Cramer, Ins. t. 176 A; Oliv. Enc. Méth. v. 29.

The antennæ of the male are rather small, with only 34 rays on each side, thirteen of the apical joints being destitute of rays. The palpi are small and distinct, rather dependent, but not extending beyond the hairs of the face.

Sp. 14. SATURNIA ALCINOE, Cramer. *S. alis anticis falcatis rufo-badiis; anticis costa lata alba, striga communi recta transversa prope basin, fascia lata alba pone medium in qua striga recta fusca; anticis macula mediana vitrea subquadrata, posticis ocello ovali pupilla vitrea, iride lata fulva, annulo nigro circumdata.*

Expans. alar. antic. circ. unc. 6.

Syn. *B. Alcinoe*, Cramer, pl. 322 A. *B. Caffraria*, Stoll, Suppl. Cram. pl. 31. fig. 2 & 2 e. *Saturnia Caffra*, Boisduval in Delegorgue, Voy. dans l'Afrique Austr. ii. p. 601.

Hab. in Caffraria, Amazoolu. In Mus. Britann.

The palpi are distinct and slender, but do not extend beyond the hairs of the clypeus. The antennæ of the males have 54 rays on each side, the two basal rays of each joint converging inwardly and being bent more obliquely, so that the tips of the rays form four distinct rows; all the rays are moreover set on more obliquely than in the typical species. The antennæ of the female are moderately pectinated, the two apical rays of each joint being almost obliterated. A beautiful figure of this species is given in Mr. Angas's plate of Zoolu Moths, fig. 15.

Sp. 15. SATURNIA ALINDA, Drury. *S. alis rufo-brunneis margine externo saturatiori strigisque variis undulatis obscuris præsertim pone medium, macula semiovali mediana vitrea, posticis ocello magno pupilla vitrea iride fulva annulo nigro cincta.*

Expans. alar. antic. unc. $7\frac{3}{4}$.

Hab. Sierra Leone.

Syn. *Phalæna Attacus Alinda*, Drury, Illustr. iii. pl. 19; Oliv. Enc. Méth. v. p. 26. 10.

I have not seen a specimen of this species.

Sp. 16. SATURNIA PHÆDUSA, Drury. *S. alis anticis falcatis griseo-fuscis anticis strigis tribus transversis saturatioribus maculaque parva triangulari mediana vitrea; posticis obscurioribus ocello maximo pupilla minuta vitrea, iride lata nigra annulis concentricis anguste sanguinea, pallide punicea, et ferruginea circumcincta.*

Expans. alar. antic. unc. $7\frac{3}{4}$.

Hab. Sierra Leone. In Mus. Britann.

Syn. *Phalæna Attacus Phædusa*, Drury, Illustr. iii. pl. 24 & 25. *Bombyx Saturnus*, Fab. Ent. Syst. iii. a. p. 409; Oliv. Enc. Méth. v. 27. 11.

The palpi are short and thin, but distinct. The antennæ are short, each joint emitting four rays lying flat.

The specimen in the British Museum collection is pale russet-coloured beneath with a pinkish bloom, the centre of each wing with a group of brown spots much larger in the hind- than in the fore-wings; a small brown spot also occurs at the base of the hind-wings.

Sp. 17. SATURNIA TYRRHENA, Westw. (Pl. VIII. fig. 1.) *S. alis anticis falcatis griseo-fuscis basi rubidis, striga undulata prope basin alteraque lunulata subapicali fuscis, macula parva mediana subtrigona vitrea; limbo apicali rufo; alis posticis rufis ocello magno ovali nigra pupilla parva vitrea; striga undata obscuriori, limbo lato pallide griseo-fusco.*

Expans. alar. antic. unc. 4–5 $\frac{1}{4}$.

Hab. Port Natal. In Mus. Britann.

The fore-wings are pale greyish-brown, sometimes with a reddish tinge; they are acute at the tip in both sexes, but the outer margin is considerably more emarginate than in the female; the base of the wing is red, and near the base is a red, very much angulated striga almost suffused into the ground colour of the wing, and outwardly edged with a slight dusky striga; across the middle of the wing is a waved but nearly obsolete striga, and in the middle of the wing towards the fore-margin is a small subtriangular vitreous spot without any appearance of ocellus; beyond the middle is a row of reddish arches inwardly slightly edged with a thin dusky line.

The hind-wings are reddish, with a broad pale greyish-brown border; in the middle of the wing is a large round black spot, with a very small vitreous lunar spot in the middle, preceded and followed by a slight dusky waved striga. The body above is of the ground colour of the wings, with the hind part of the thorax marked with red. The underside of the body, collar, and spot at the base of the hind-wings are white. The head, antennæ and legs dark brown.

The wings beneath are very pale buff, with the centre of each marked by a large brown irregular spot, traversed by the pale veins.

Antennæ of the male with 32 rays on each side (four from each

joint). One-third of the apical part of each antenna is destitute of rays.

The antennæ of the female are slightly pectinated for two-thirds of the base, the two apical rays of each joint being almost obsolete. The tips are serrated.

The palpi are deflexed, and the tips appear just beyond the hairs of the lower part of the face.

Var. Smaller, with the fore-wings and body destitute of the red colour, and the hind-wings fulvous with the outer margin purplish-grey, with the eye as in the others.

Sp. 18. SATURNIA FORDA, Westw. *S. pallide griseo-fusca* ♂, *pallide cervino-lutea* ♀, *striga subobsoleta pone medium, posticis etiam ocello parvo subvitreo, fusco, medio; alis posticis maris angulato-subcaudatis; fœminæ rotundatis.*

Expans. alar. antic. unc. $4\frac{1}{2}$ – $4\frac{3}{4}$.

Hab. in Natalia. Mus. Brit.

Male with the fore-wings very slightly emarginate along the outer margin; hind-wings produced into a strong angle in the middle of the hind-margin; all on the upper side of a silky, pale brownish-grey, uniform colour, traversed by a slightly distinct, slender, brown striga beyond the middle. The hind-ones marked moreover in the middle with a small, round, dusky spot, having an indistinct vitreous lunule in the middle, and surrounded by an indistinct whitish circle. The antennæ are dark brown; those of the male are moderately bipectinated, each having about thirty-six rays on each side, a few of the apical joints being destitute of rays, and some of the preceding having the second ray gradually becoming obsolete. The female antennæ are only slightly serrated, the second spur on each side of each joint being obliterated. The veins are those of the typical *Saturnia*.

The female has the body and wings of a pale reddish buff, with the dusky striga beyond the middle almost obliterated, and the dusky spot in the middle semicircular. On the underside the hind-wings have also a small oval dark spot towards the base.

Sp. 19. SATURNIA ANGASANA, Westw. *S. alis anticis apice acutis isabellinis, fascia pallide grisea ante medium, strigae tenui oblique fusca pone medium maculaque parva semi-ovali vitrea mediana; posticis ocello magno nigro, pupilla minuta vitrea, annulis concentricis testaceo, puniceo-albo, et sanguineo cincta.*

Expans. alar. antic. unc. $5\frac{3}{4}$.

Hab. apud Portum Natalensem. In Mus. Britann.

Isabelle-coloured or pale rufous brown, with an irregular pale greyish bar before the middle, followed by an oblique darker fascia, on the outside of which is a small semi-oval talc-like spot; beyond this, extending from near the tip of the wings towards the middle of the inner margin, is a nearly straight, slender, darker line, edged with greyish on each side; the apical margin of the wing beyond the dark line becoming grey, shaded off to the ground colour of the wing. The hind-wings have a large ocellus, black in the centre, with a minute vitreous dot in the middle, with a red lead-coloured ring outside the

black, followed by a fleshy-coloured one, and this by a purple-carmine one : the outside of the ocellus rests upon a dark, slender, curved line. The collar and underside of the body whitish ; head and legs darker olive-brown ; antennæ black.

Wings beneath pale reddish buff, of a redder brown near the tip, with the dusky subapical line as above, and the vitreous spot preceded and followed by a dark claret-brown spot : hind-wings destitute of the ocellus, which is replaced by an indistinct claret-brown spot, followed by a red-brown fascia, widest at the anal margin. Near the base is also a small brown spot.

The antennæ of the female are serrated, the two terminal rays of each joint nearly obliterated, with one-fourth at the apex simple.

This species is figured by Mr. Angas in his plate of Amazoolu Lepidoptera, fig. 16.

Sp. 20. SATURNIA ACETES, Westw. *S. alis anticis apice acutis obscure fulvis striga valde undulata cinerea prope basin ocello mediocri mediano fusco et vitreo strigaeque recta fusca subapicali, posticis magis ferrugineis ocello magno medio pupilla vitrea, iride nigra annulo albo cincta strigaeque tenui transversa fusca recta prope medium* (♀).

Expans. alar. antic. unc. $6\frac{1}{2}$.

Hab. apud Caput Palmarum (D. Savage). In mus. nostr.

The fore-wings are of a dark reddish fulvous colour, tinged with red-brown between the middle and the apex. Near the base is a very irregular, rather indistinct, ashy-purplish striga, and in the middle of the wing is an oval moderate-sized ocellus, the basal half being brown, and the apical half vitreous, the latter surrounded by a slender brown line ; halfway between this ocellus and the apical margin of the wing is a straight, slender, brown line, running from near the apex of the wing towards the middle of the inner margin. The hind-wings are of a much redder hue, especially on the anterior portion, with a slight appearance of the sub-basal ashy striga of the fore-wings near the base ; the middle of the wing occupied by a large ocellus, with a vitreous centre, having a rather broad greyish-black iris surrounded by a white ring, the outer extremity of which rests on a slender dusky striga running from near the outer angle of the wing towards the middle of the anal margin. The body is rich brownish fulvous, with an ashy-brown collar and legs. The antennæ black and very slightly pectinated in the female, consisting of about thirty-five joints, the first twenty-five emitting a pair of short slender branches from the base, the tip of the joints being also slightly serrated ; the ten terminal joints are shorter, each emitting a single branch set on in front of each joint, the branches of the preceding joints being set on the upper and lower edges.

The wings beneath are paler buff-brown, with a broad, subapical, dusky bar, undulated externally ; the eye of the fore-wings less distinct, and that of the hind-wings replaced by two brown spots and a vitreous patch. Near the base of the wings is also a round brown dot.

Sp. 21. SATURNIA ISIS, Westw. *S. alis griseis nigro fuscoque irro-*

ratis, striga fusca valde dentata ante medium alterisque duabus nigris pone medium, ocello parvo vitreo antice nigro; posticis ocello maximo ornatis, pupilla nigra postice subvitrea, iride obscure fulva annulisque concentricis nigro, subluteo, pallide carneo, purpureo-rufescenti, iterumque carneo et pone hanc striga curvata nigra, apice obscure albido limbo griseo.

Expans. alar. antic. unc. $5\frac{3}{4}$.

Syn. *Saturnia Isis*, Westwood in Jard. Nat. Library, Entomol. vol. vii. p. 138. pl. 13. *S. Maia*, Klug, Neue Schmett. t. 5. fig. 1 (nec *Ph. Maja*, Drury, Ill. vii. pl. 24. fig. 3).

Wings of a very pale grey colour, especially the anterior pair, which are almost entirely covered with fine black and brown scales. The centre of these wings is ornamented with a small oval ocellus, the basal half of which is covered with black scales, and the outer half is vitreous: between this and the base is a very curved and irregularly dentate dark striga, and immediately behind the eye is a nearly straight, slender, brown bar. This is succeeded by slender black wavy bars, the space between which and the apex of this wing is divided as it were into three compartments, the first of which is covered with small brown scales; the second is paler, and covered with very fine black speckles, and the apical part is much darker, with large black speckles; the apical margin of the fore-wings is slightly waved. The hind-wings are entirely covered on the upper side by a most magnificent eye-like spot, surrounded by successive rings of various colours. The oval pupil is black, but the part furthest removed from the body is denuded of scales, and would be vitreous were not the underside of the wings clothed with scales: this is surrounded by a narrow fulvous iris; then black; then a broader oval ring of dirty clay colour; then a narrow oval of pale flesh-colour; then a broad, rich, claret, oval ring: between this and the base of the wing is first a bar of flesh-colour, then black, shaded into claret; towards the extremity of the wing the claret is succeeded by a half-ring of flesh-colour; then a narrow one of black; then of pale buff stone-colour, and another moderately broad of grey speckled with black, extending to the extremity of the wings. The thorax is dark and rich brown coloured, with two white bands across the neck and two across the extremity of the thorax whitish; the abdomen is buff, with black dots. The margin of the wings is scalloped.

Beneath, all the wings are very pale buffish white with dark speckles; the fore-wings are marked nearly as on the upper side, but the hind-wings have only a very small eye in the centre, having a black pupil with a fulvous orbit surrounded by a slender black circle; immediately connected with the posterior part of this eye is a curved row of brown arches, between which and the apex of the wings is another and more slightly marked series of black scallops. The palpi are distinct, forming a small brown muzzle, but they are not visible from above; they, as well as the rest of the head, are brown. The spiral tongue appears to be wanting. The antennæ of the male are considerably elongated, with the rays bent backwards instead of lying flat, and there are eighty-eight rays on each side of the antennæ, the rays ex-

tending to the tip, so that the antennæ are composed of about forty-four or forty-six joints. The antennæ of the female are setaceous, and only slightly bipectinated, being gradually more slender from about one-third of the distance from the base to the apex, each joint emitting four rays, the joint at each point of emission being swollen.

The female has the wings rather shorter, and not at all emarginate along the apical margin.

Sp. 22. SATURNIA NICTITANS, Fabr. *S. alis margine apicali integro, fusco incarnatis medio obscuriore, striga tenuissima angulata prope basin alteraque recta subapicali fuscis punctoque parvo medio vitreo; posticis concoloribus ocello magno medio pupilla parva vitrea, iride flava, annulis nigro, puniceo et albo cincta, strigaeque transversa nigra subapicali.*

Expans. alar. antic. fere unc. 5.

Hab. in Africa tropicali. In Mus. Banks. (Soc. Linn. Lond.), Mus. Britann. et nostro.

Syn. *Bombyx nictitans*, Fab. Ent. Syst. iii. a. 413.

The antennæ of the male are 39-jointed, with fifty-eight rays on each side (four from each of the twenty-nine or thirty basal joints), the rays lying nearly flat.

The antennæ of the female are about 42-jointed, only slightly serrated, each joint having two serratures on each side, the basal one being most prominent, the antennæ becoming gradually more slender to the tips. The palpi are short, but distinct and deflexed.

Sp. 23. SATURNIA ALOPIA, Westw. *S. alis anticis fusco-albidis, striga recta puniceo-alba ante medium maculaque parva triangulari mediana vitrea, strigaeque postica recta fusca externe puniceo-tincta, posticis etiam bistrigatis ocelloque parvo vitreo, iride obscure lutea circulo nigro alteroque late puniceo-albo circumdata.*

Expans. alar. antic. unc. $4\frac{1}{4}$.

Hab. — ? In Mus. Britann.

Fore-wings brownish buff, with a pale pinkish white, nearly straight fascia across the wings before the middle, edged towards the base with a fine dark line, the other side shaded off to the ground colour of the wings; beyond the middle is a small triangular vitreous spot, bounded at the base by the transverse veinlet closing the discoidal cell; beyond the middle is a straight, slender, dark striga, edged with pale pinkish white; the outer margin of these wings slightly emarginate; hind-wings entire, somewhat oval, brownish buff, the middle with a pale rosy tint, bearing an ill-defined whitish fascia towards the base, and another, followed by a dusky line, beyond the middle; the middle of the wing occupied by an ocellus, with a small glassy centre, surrounded by dirty buff, and this by a black circle and a larger, pale pinkish white one; thorax in front with a white transverse fascia; antennæ dark brown.

The antennæ of the male are small, moderately short, the rays flat, thirty-four rays on each side, one-fourth of the antennæ at the tip being destitute of rays.

The palpi are distinct, but small.



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