

three-fifths to four-fifths the length of the tail. Nostrils nearer the end of the snout than to the eyes; latter lateral, visible from above and from below, equidistant from the spiraculum and the end of the snout or a little nearer the former; distance between the eyes twice and a half to three times that between the nostrils, and twice and one-fourth to twice and one-third the width of the mouth. Spiraculum on the left side, directed upwards and backwards, equidistant from the end of the snout and the anus. Anus opening on the right side, close to the body and above the lower edge of the tail, as in *Hyla*. Tail twice and one-third to thrice as long as deep, acutely pointed; the depth of the muscular portion about three-fifths the total depth.

Mouth as in a typical *Rana*. Beak black; sides and lower edge of the lip fringed with papillæ; upper lip with a long series of fine horny teeth, followed on each side by three series; three uninterrupted series of teeth on the lower lip.

Total length of largest specimen 80 millim.; body 29; width of body 21; length of tail 51; depth of tail 17.

#### EXPLANATION OF THE PLATES.

##### PLATE XLII.

Fig. 1. *Draco maximus*, p. 522.

Fig. 2. *Draco microlepis*, p. 523.

a. Side view of head of male.

##### PLATE XLIII.

Fig. 1. *Rana cavitympanum*, p. 525.

a. Vomerine teeth.

Fig. 2. Larva of *Rana cavitympanum*, p. 526.

a. Mouth.  $\times 3$ .

Fig. 3. Mouth of larva of *Rana latopalmata*, p. 526.  $\times 4$ .

Fig. 4. Larva of *Rana whiteheadi*, p. 526.

a. Mouth.  $\times 5$ .

##### PLATE XLIV.

*Rhacophorus otitophus*, p. 527.

a. Side view of head; b. Vomerine teeth; c. Larva; d. Mouth.  $\times 6$ .

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June 20, 1893.

Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited two eggs of the Cape Coly (*Colius capensis*) laid in the Society's Gardens, and made the following remarks:—

For some time past we have had three examples of this Coly in one of the large cages in the Parrot House. As they showed a disposition to build, a basket-nest was placed in the cage, to which the birds made additions from materials supplied to them. The



result was that an open shallow nest was constructed, in which altogether nine eggs have been deposited. We believe that the birds are all females and have all laid eggs in the same nest. They have occasionally sat upon them, but not in a regular manner.

The eggs are of a dull white colour, with rather a rough texture, and without spots of any kind. Referring to Layard and Sharpe's 'Birds of South Africa,' p. 552, I find it stated that the eggs of this Coly are sometimes streaked, but those laid in the Gardens are perfectly uniform, as will be seen on inspection.

---

The Hon. Walter Rothschild exhibited a series of the Parrots of the genus *Cyanorhamphus*, and made the following remarks:—

In vol. xx. of the 'Catalogue of Birds in the British Museum' Count Salvadori enumerates fourteen species of this genus and mentions a fifteenth species, *C. hochstetteri* (Reisch.).

Having a very fair series of most of these birds, and finding them terribly confused in many of the larger collections, I have thought it might be interesting to exhibit examples of a rare species alive and a good series of those others of which I possess skins. I also have to describe a new form which has hitherto been confounded with *C. auriceps* (Kuhl). This form differs, it is true, in most respects very slightly from the typical *C. auriceps* of New Zealand; but in this genus the birds from the different islands are always constant forms, and therefore I feel justified in separating the Chatham Island bird, and I have much pleasure in naming it after my friend Mr. H. O. Forbes.

CYANORHAMPHUS FORBESI, sp. nov.

Similar to *C. auriceps* (Kuhl), but larger and with the crimson band in front of the yellow crown much narrower. The band of crimson in *C. auriceps* also reaches the eye, and in some specimens there is also a crimson patch behind the eye, while in my new species there is always a clear space between the crimson band and the eye.

*Hab.* Chatham Islands.

Types in Mus. W. Rothschild.

From the large number of specimens I have from the Auckland Islands, the Chatham Islands, and both the North and South Islands of New Zealand, I have come to the conclusion that *Cyanorhamphus aucklandicus*, Bp., and *C. rowleyi* (Buller), are only synonyms of *C. novæ zeelandiæ* (Sparrm.); for the specimens from all parts vary in size so much that no two can be found entirely identical in measurements, and no constant differences in colour can be detected.

Of doubtful species there still remain *C. hochstetteri* and *C. erythrotis*, which I think Mr. Forbes was quite right in provisionally uniting under the name of *C. erythrotis*, for, except the two in the British Museum, we have as yet no authentic specimens from the Macquaries. The material from Antipodes Island, I think, is not sufficient to settle the point finally; and therefore



I consider that for the present the following species only can stand as distinct :—

1. *Cyanorhamphus ulietanus* (Gm.). Society Islands.
2. *C. erythronotus* (Kuhl). Society Islands.
3. *C. unicolor* (Vig.). Antipodes Island.
4. *C. novæ zealandiæ* (Sparrm.). New Zealand, Chathams, Auckland I.
5. *C. cooki* (G. R. Gray). Norfolk Island.
6. *C. subflavescens*, Salvad. Lord Howe Island.
7. *C. erythrotis* (Wagl.). Macquarie Is. and Antipodes I.
8. *C. saisseti* (Verr. & Des Murs). New Caledonia.
9. *C. cyanurus*, Salvad. Kermadec Islands.
10. *C. auriceps* (Kuhl). New Zealand.
11. *C. malherbei*, Souancé. South Island, New Zealand.
12. *C. forbesi*, Rothsch. Chatham Islands.

---

Mr. W. Bateson exhibited an abnormal foot of a calf, which had been forwarded to him for examination by the kindness of Mr. W. L. Sclater.

The specimen was a right fore foot, bearing three digits disposed almost symmetrically with regard to the axis of the limb. Of the carpus only the distal row remained, consisting of the usual two elements, a trapezoido-magnum and an unciform. External to the unciform the small rudiment, considered as representing the fifth digit, was of the usual size and proportions. The upper end of the metacarpal bone presented no peculiarity. Peripherally, however, instead of the usual two articular surfaces the metacarpal in this limb had *three* articular surfaces, all standing in the same plane as those of a normal limb. Each articular surface is well formed and has a large trochlear ridge. The central articular surface differs a little from the other two, being slightly crowded against the external one. In it also the trochlear ridge does not exactly divide the articular surface, but is rather nearer to the external side. With each of the three surfaces articulates a digit containing three phalanges of full length. Over each articulation is a pair of normal sesamoids, three pairs in all, instead of two pairs.

Each digit bears a hoof. The hoof of the middle digit is *convex* on both sides, but each of the lateral hoofs is convex on its outer side and concave on the side turned towards the hoof of the middle digit. The small accessory hoofs, the *ergots* of French writers, are normal and stand in their usual positions with regard to the limb, one being above and slightly external to the metacarpo-phalangeal articulation of each of the outer digits. The limb is almost exactly symmetrical about a line taken through the centre of the middle toe. Each of the toes had well-formed flexor and extensor tendons.

In the normal metacarpus of the Ox there is in the peripheral third a median groove of some depth, indicating the line of demarcation between the metacarpals III. and IV. It is in this



groove that the foramen for the nutrient artery is placed on the posterior surface of the limb. In the abnormal specimen there is no median groove, but on either side of the middle digit there is such a groove, indicating the lines of demarcation between the parts of the metacarpus belonging to each of the three digits. The groove between the middle and external digit is very slightly the deeper of the two, and in it is placed the foramen for the nutrient artery on the posterior surface.

The specimen was an old one and no particulars as to parentage or to the condition of the other limbs were to be had. It was mentioned that this case differed from that of the three-toed Cow described by Neville Goodman, 'Journ. Anat. and Phys.' 1868, in that there was in the present example an almost perfect symmetry about the middle axis of the foot.

---

The following extracts from a letter addressed to the Secretary by Mr. F. E. Blaauw, C.M.Z.S., of 'sGraveland, Hilversum, Holland, were read:—

"Last autumn I obtained a pair of *Aramides ypecaha*. I kept the birds indoors during the winter and turned them out in spring into an out-of-door aviary, in which is a small rockery that served formerly for *Hyrax capensis*. In the first days of May I observed that the male bird collected straw, hay, and bundles of grass that he uprooted with his strong bill, and brought it all to the very top of the rockery, where in a depression between the stones he made a flat nest of the said materials. As the female did not appear to take much notice of the exertions of the male, I was a little doubtful as to the result, but as the birds were extremely noisy at that time I retained some hopes. On the 16th I observed the female sitting on the nest, and on the 17th the keeper informed me that there was an egg in the nest. As the birds were very much excited and the male bird attacked furiously everybody he could reach, the number of eggs laid was not then ascertained for fear of disturbing the birds, but it was afterwards found that the number was *four*. As soon as the eggs were laid the birds began to incubate, the female mostly during the night and the male during the day, and the birds sat so loosely that the slightest thing would disturb them. If a person approached the nest or the aviary when the *male* was sitting, it would come down directly to attack the intruder. If the female happened to be on the nest she would keep motionless and wait till you turned your eyes from her, when she would vanish like a shadow. If you happened to turn your eyes on her before she had had time to get quite clear away, she would stop in the position she was in, sometimes with a leg half stretched out, and keep quite motionless till you again turned your eyes from her, when she would take care to be *quite* away before you looked round again.

"As incubation advanced the birds began to sit closer and were not so easily tempted to abandon their task, and on the 21st day of incubation the head of a young bird was seen peeping from under



the breast of its parent. Early in the morning of the 22nd day the keeper found the whole family, consisting of the two parents and four young ones, on the ground basking in the sun.

"The young birds had beautiful glossy chocolate-brown down, which became almost black on the back and lighter on the head. The legs and beak were short and jet-black.

"The little birds were wonderfully active and strong, and in the evening they all managed to get up to the nest on the stones, where they passed the night under one of the parent birds. The mother bird was very anxious about the safety of her young, and if anybody approached the aviary a sharp noise she made would quickly send them away to hide between the stones. If one kept motionless at some distance, the same note but a little softer would call them to the light again. Both parents fed the young in exactly the same way as Cranes do, bringing them ants' eggs, flies, worms, or anything they thought fit, in their bills, which the young would take from them. The little birds, now twelve days old, grow very rapidly; the legs and neck especially have lengthened considerably, so that they begin to resemble their parents in form very much.

"They also have already acquired the habit of jerking their little tails, which of course are nothing but down. The old birds, which were very noisy at all times, even while incubating, and could sing the most wonderful duets, have become perfectly silent since the young were hatched.

"The eggs were of a greyish yellow, with dark red and brown spots and lines."

Mr. Blaauw also stated that one of his female Darwin's Rheas (*Rhea darwini*) had laid ten eggs, and that the male, after sitting thirty-nine days on seven of them, had hatched three young ones.

---

Dr. C. J. Forsyth Major exhibited a specimen of a subfossil Lemuroid skull from Madagascar, and spoke as follows:—

Very recently I have described<sup>1</sup> a strange gigantic Lemuroid skull (*Megaladapis madagascariensis*, Maj.), discovered by Mr. Last in a subfossil condition, together with remains of *Apyornis*, *Testudo grandidieri*, Vaill., *Hippopotamus*, &c., in a marsh on the south-west coast of Madagascar.

The skull exhibited on the present occasion, found by the same collector in a similar condition in the neighbourhood of Nossi-Vey (S.W. Madagascar), is in several respects not less strange, though in a very different way. Owing to its incomplete state—the whole facial portion being wanting, as well as the right occipital region and basis cranii, and the greater part of the zygomatic arches—it is not possible to enter into many details.

The Lemuroid nature of the specimen is at once demonstrated by the great elongation and downward bending of the postorbital frontal processes, the left one of which has preserved the suture for the orbital process of the malar, thus showing that the osseous

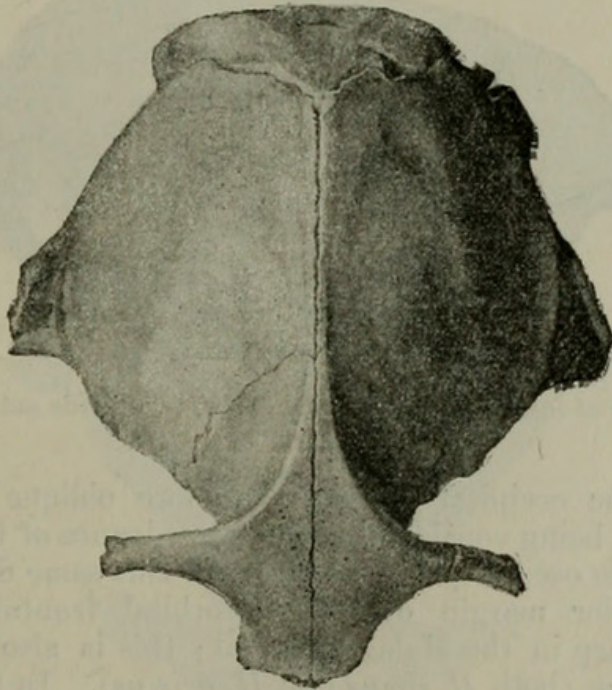
<sup>1</sup> Proc. Roy. Soc. liii. no. 326.



ring of the orbit was complete. By the fact of the orbital and temporal fossæ communicating freely under the postorbital bar, it is shown that we have not here to do with a member of the Anthropeidea.

Unusual for a Lemuroid is the very strong postorbital constriction of the frontals, and the globose form of the very broad and elevated cranial portion. As to the first character, however, we meet with it in the Tertiary *Adapis* (*A. parisiensis*, Cuv., and *A. magnus*, Filh.), and to a much less degree in the existing African *Otogale* and Malagasy *Hapalemur*<sup>1</sup>.

Fig. 1.



Skull of fossil Lemuroid. Upper view, two-thirds nat. size.

It is with this last genus of the subfamily *Lemurinae* that there appear to be the most affinities. And first of all in the voluminous cranial portion, the fossil being proportionally broader still than *Hapalemur simus*. This last has a very short facial portion; from the aspect of the side view it appears that in the Malagasy fossil the anterior portion of the frontals slopes down abruptly, still more so than in *Hapalemur*. This is indicative of a small facial cranium in the former too; though it may partly be a juvenile character, as the distinctness of all the sutures and the aspect of the bones show the fossil to be a somewhat young specimen, in which part of the milk-dentition may have been present.

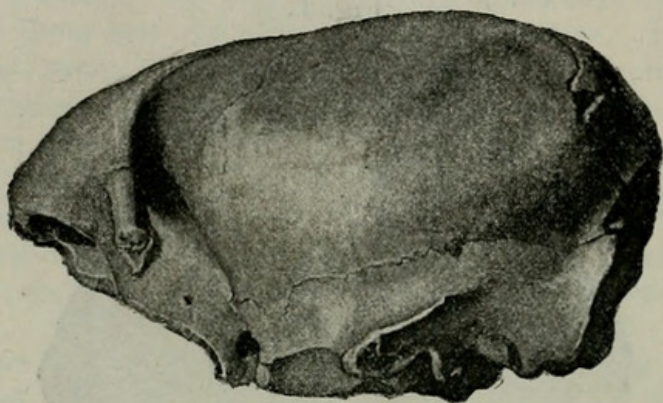
The upper profile of *Hapal. simus*, as seen in the side view, is more rounded off posteriorly, the sloping down towards the occiput beginning anteriorly to a line which would unite the anterior

<sup>1</sup> F. A. Jentink, "On some rare and interesting Mammals" ('Notes from the Leyden Museum,' note vii. 1885, pl. i. fig. 1, *Hapalemur simus*, Gray).



margins of the right and left external auditory meatus across the upper surface of the skull. In the fossil this part of the superior outline of the skull is nearly horizontal, so that the anterior portion of the interparietal appears almost on the same level with the highest region of the parietals. The flattened posterior moiety of the interparietal slopes suddenly down to the occipital crest; the occiput proper is almost vertically truncated, much as in the skull of *Mycetes*. On the other hand, in *Hapalemur*, as in existing Lemuroids

Fig. 2.



Skull of fossil Lemuroid. Side view, two-thirds nat. size.

generally, the occipital crest has a more oblique direction, its inferior edge being considerably more in advance of the upper one; and the whole occiput partakes partly of this same direction.

The inferior margin of the postorbital frontal processes is cuttingly sharp in the Malagasy fossil; this is also characteristic of *Hapalemur* (both *H. simus* and *H. griseus*). In the former the frontals extend laterally somewhat farther backwards than in the latter; and the postero-superior margins of the postorbital processes continue backwards in the shape of two sharp crests, which unite at the coronal suture. No sagittal crest is visible on the median line of the parietals, which are as yet separated; but it appears obvious that this would be the case in a more aged specimen. In *Hapalemur*, even in adult specimens, no such elevated frontal crests are developed, and instead of a sagittal crest there are two temporal ridges remaining low and separated anteriorly, although near the interparietal they converge to form a feeble median crest.

The interorbital region is absolutely broader in *Hapal. simus*, and is, besides, vaulted from before backwards and from right to left, owing to underlying frontal sinuses. These last are not entirely absent in the fossil, as seen in the inferior broken portion; they extend even partly into the postorbital processes.

The olfactory fossa appears very large in the fossil, as is the case in Lemuroids generally. The anterior end of the cribriform plate is but slightly more elevated than the posterior; this is the

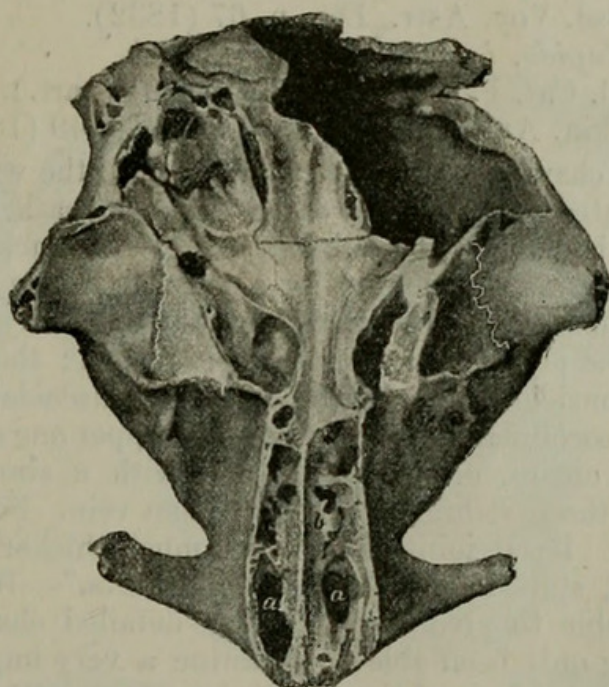


case in *Hapal. simus* too, and is obviously in relation to the downward bending of the facial portion.

Owing to the incomplete condition of the fossil, only a few measurements can be given:—

	millim.
Length of the fossil skull, from the occipital crest to anterior portion of frontals as far as preserved .....	92·7
Same distance in <i>Hapalemur simus</i> , Gray (Br. Mus. 1884/10. 20.4) .....	64·0
Greatest breadth of the brain-capsule between the two parieto-squamosal sutures, in the fossil .....	64·8
Ditto in <i>Hapalemur simus</i> .....	36·2

Fig. 3.



Skull of fossil Lemuroid. Lower view, two-thirds nat. size.

*a*, frontal sinuses; *b*, cribriform plate.

It thus appears that, whilst the fossil skull, in its part preserved, was about one-third longer than *Hapal. simus*, the breadth of its cranial capsule was almost double that of the last<sup>1</sup>.

The foregoing short description gives all the important characters of this interesting fossil, which in my opinion clearly assign its systematic position to be within the subfamily of *Lemurinae*, and would besides justify the establishment of a new genus, having closer relation to *Hapalemur* than to any other members of the subfamily. I refrain, however, for the present, from giving a name to it, as there is some probability that more complete and more adult specimens may before long come to hand.

<sup>1</sup> The skull of *Hapal. simus* figured by Jentink (*l. c.*) is somewhat broader than the one at my disposal.



The following papers were read:—

1. A Monograph of the Butterflies of the Genus *Thysonotis*.  
By HAMILTON H. DRUCE, F.Z.S., and G. T. BETHUNE-BAKER, F.L.S.<sup>1</sup>

[Received June 20, 1893.]

(Plates XLV.—XLVII.)

#### THYSONOTIS.

*Thysonotis*, Hübn. Verz. bek. Schmett. p. 20 (1816); Feld. Wien. ent. Mon. iv. p. 244 (1860).

*Danis*, Fabr. Ill. Mag. vi. p. 286 (1807) (nom. præoc.); Westw. Gen. Diurn. Lep. p. 497 (1852).

*Damis*, Boisd. Voy. Astr., Léop. p. 67 (1832).

*Plebeius*, *Cupido*, *Lycæna*, Authors (part.).

*Danis*, Butl. Cat. Fab. Lep. p. 161 (1869) (part.).

*Danis*, Miskin, Ann. Queens. Mus. no. 1, p. 49 (1891).

“General characters of *Lycæna*; but with the wings generally broadly fasciated with white, not ocellated beneath, but the hind ones marked beneath with a submarginal row of black spots. Eyes hirsute. Antennæ terminated by a long, gradually formed club. Labial palpi long, first two joints clothed with scaly hairs. Fore wings with the post-costal vein three-branched; the third branch arising at a considerable distance beyond the discoidal cell; middle and lower discocellular veins very slender; upper one short, distinct. Hind wings entire, or scoloped, and with a short tail at the extremity of the first branch of the median vein. Fore legs of the female short. Basal joint of the tarsi much thicker than the rest and elongate, spined at the tips of the joints.”—*Westw. loc. cit.*

“I am unable to give a satisfactory detailed character of this genus, having only been able to examine a very imperfect female in the collection of the Linnean Society, from which the accompanying figure was taken. It appears very (perhaps too) close to *Lycæna*, *D. hylas* resembling the tailed Indian species of that genus. The blue colour of the upperside is particularly brilliant, and the species inhabit the Moluccas, New Guinea and the adjacent islands.”—*Westw. ibid.*

On reference to the accompanying plate it will be seen that the genus *Thysonotis* can at once be distinguished from *Lycæna* by the anastomosing of the costal nervure with the first subcostal nervule. It is also remarkable for the length of the terminal joint of the palpi of the female.

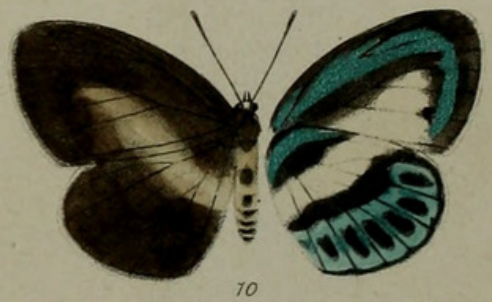
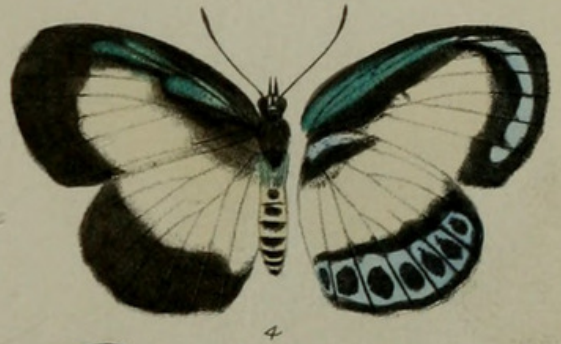
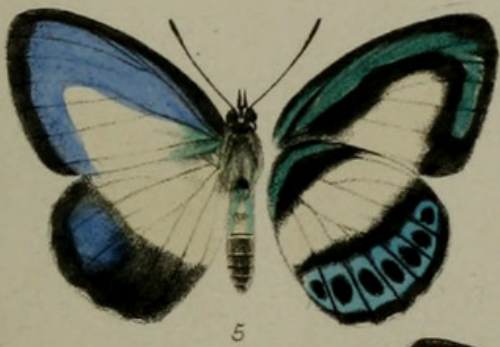
In 1779<sup>2</sup> Cramer described a butterfly and figured it under the name *Papilio danis*.

In 1804 Herbst referred to and refigured the same insect under

<sup>1</sup> Mr. G. T. Bethune-Baker is responsible for the descriptions and drawings of the genitalia of the various species, whilst I am responsible for the synonymy and notes concerning the species.—H. H. D.

<sup>2</sup> 1775 according to Mr. Kirby, Ent. Mo. Mag. xiv. p. 278.













W. Purkiss lith.

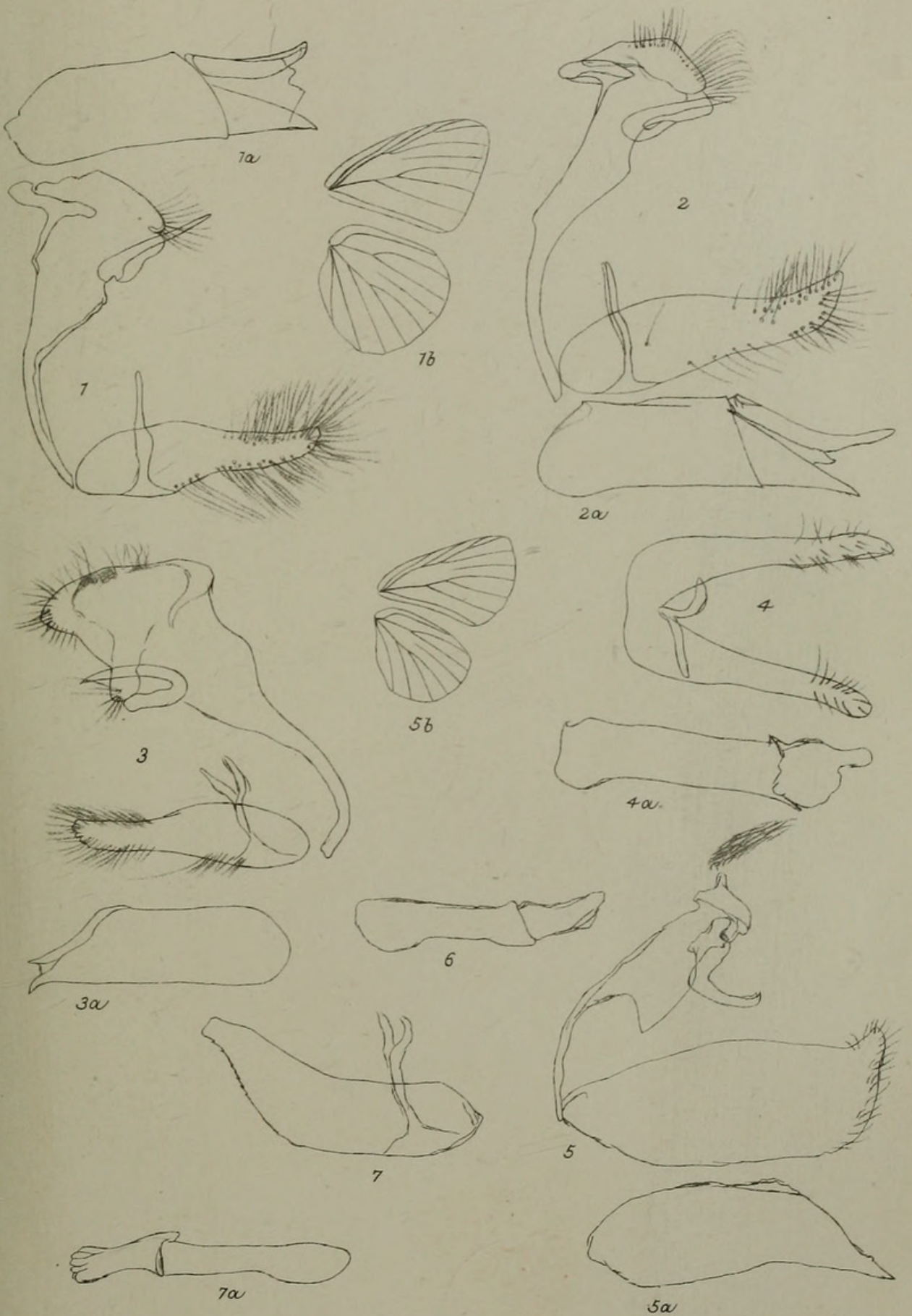
Hanhart imp.

BUTTERFLIES OF THE GENUS *THYSONOTIS*.









W. Purkiss lith.

Hanhart imp.

BUTTERFLIES OF THE GENUS THYSONOTIS.







the name *Papilio damis*. Fabricius in 1807 (Illiger's Mag. vi. p. 286) described the genus *Danis*, but did not mention his type. Westwood, in 1852, was apparently the first author to associate the Fabrician genus with Cramer's insect, but upon what grounds is not clear. But by the rules of nomenclature a generic name must not be one which has been used as a specific name, consequently *Danis* cannot stand. Now, to make matters still more complicated, Boisduval in 1832 (Voy. Ast., Lep.) uses *Damis* as a generic name, but by the same law this is inadmissible.

Westwood in 1852 characterized the genus, at the same time expressing his doubts whether it showed sufficient distinctness to allow of its separation from *Lycæna*. But why he allowed the Fabrician name to stand for the genus, when Cramer's insect had received it as a specific name some 28 years before seems inexplicable.

So far as Boisduval is concerned, I think there can be no doubt that he meant *Danis* when he wrote *Damis* on p. 67 (Voy. Astr., Lép.), as on p. 69 he writes *E. damis*, Godt., and *P. damis*, Cr., both of which should be spelt *danis*.

The question now is what generic name should be used, as it is not right that Cramer's name should be only a synonym when his insect was described for so long a time before Boisduval's.

The next name to deal with is *Thysonotis*, proposed by Hübner in 1816, which has been used by Semper and others for these insects; and bad as we think is the practice of doing away with well-known generic names for others which may be older but which their authors have employed without characterizing, in this case we can see no help for it, as it affects the specific name of the type of the genus.

Dr. Felder at one time (1859) used *Danis* when describing an insect of the group, afterwards (in 1860) *Thysonotis*, and then seems to have considered *Lycæna* sufficient.

In a note by Mr. W. Doherty published by Mr. de Nicéville (Butt. India, iii. p. 261), he speaks of an *Arhopala* mimicking the *danis* group of *Cyaniris*, but as the type of that genus has the costal nervure of the fore wing free, and as after examining a large number of the group we have not found one which at all approaches it in that respect, we do not think, in spite of Mr. de Nicéville's remarks about *C. transpectus*, Moore (Butt. India, iii. p. 92), that they can be placed together under the same generic name. It is evident such a course would alter the synonymy considerably, and we venture to think uselessly, as we have here a group of Butterflies which, although they cannot be perhaps structurally defined, present in their markings an easily recognized division in the family.

We have divided the genus into 5 divisions as follows, a short account of which is given under their respective headings:—

- |                                 |  |                               |
|---------------------------------|--|-------------------------------|
| A. The <i>danis</i> group.      |  | D. The <i>taygetus</i> group. |
| B. The <i>wallacei</i> group.   |  | E. The <i>cyanea</i> group.   |
| C. The <i>schaeffera</i> group. |  |                               |







A. *The* DANIS group.

In this group the males are more or less metallic blue, and both sexes have a white band common to both wings. The species are best distinguished by the presence or otherwise of the metallic blue on the upperside of the females. In *T. serapis* this character seems at its best, as the hind wing is suffused all over, and the base of the fore wing very strongly, with metallic green scales. *T. danis* and var. *karpaia* have the metallic scales along the costal margin only, whilst *T. philostratus*, *T. apollonius*, and *T. regina* are absolutely without any metallic scales on the upperside.

*T. syrius* and *T. ribbei* we have not seen, but from Mr. Miskin's note concerning his species the female has apparently some blue on the upperside.

The females of all the species of this group have the outer marginal band of the hind wings beneath broader, and the blue more extensive, than the males.

## THYSONOTIS SERAPIS. (Plate XLV. figs. 1, 2.)

*Danis serapis*, Miskin, Ann. Queensl. Mus. no 1, p. 49 (1891).

*Hab.* Cardwell, Cairns, Queensland (*Miskin*); Herbert River, W. Queensland (*Mus. Staud.*); N. Queensland (*Mus. D.*).

This is perhaps the easiest species of the group to distinguish, as it is the only one in which the hind wings of the female are suffused with metallic scales. We have in our collection a number of specimens collected by Mr. Gervas Mathew, R.N., in Queensland, but the precise locality is not noted. They vary considerably in size and also somewhat in the width of the metallic fascia on the underside of the hind wings. The extent of blue and also of white on the upperside of the male seems to be quite constant.

## THYSONOTIS DANIS. (Plate XLVII. figs. 1, 1 a, 1 b.)

*Papilio danis*, Cr. Pap. Exot. i. pl. 70. ff. E, F (1779).

*Papilio damis*, Herbst, Naturs. Schmett. xi. t. 321. ff. 10, 11 (1804).

*Erycina danis*, Godart, Enc. Méth. ix. p. 577 (1819).

*Cupido damis*, Pagens. Lep. Fauna Amb. (1884); Schmett. Amb. p. 10 (1888).

*Plebeius damis*, Ribbe, Iris, ii. p. 249 (1889).

*Damis sebæ*, Boisd. Voy. Astr., Lép. p. 68 (1832); Guér. Voy. Coquill. p. 275, Atlas, ii. t. 18. f. 12; Blanchard in Hombron et Jacquinet, Voy. Pôle Sud, Lépid. pl. 3. ff. 1, 2 (1853).

*Danis sebæ*, Westw. Gen. D. Lep. p. 497, pl. 77. f. 4 (1852).

*Danis danis*, Semper, J. Mus. Godeff. xiv. p. 154 (1878).

*Danis sebæ*, Miskin, Ann. Queensl. Mus. no. 1, p. 49 (1891).

*Hab.* Amboina; Ceram; Cardwell to C. York.

Although Cramer gives "Indes Occidentales" as the locality of this well-known species, there can be no doubt from an examination of his figure that he delineates an Amboinese example. My authority for giving Ceram is a pair (♂ ♀) in Messrs.



Godman and Salvin's collection labelled "Ceram, Wallace," which are undoubtedly true *danis*.

We are obliged to place the Australian specimens under this name as the males are identical, but although there are a considerable number of specimens in Messrs. Godman and Salvin's possession from Somerset, C. York, and also in the British Museum and in our own collection, unfortunately there is not a single female amongst them; and, so far as we have been able to ascertain, those writers who have remarked on this species have not stated whether the female possesses any metallic blue above or not.

From a note of Mr. Miskin's (*loc. cit.*) under *D. (= T.) serapis*, "specimens from Cape York and New Guinea of *D. sebæ* I have found to be tolerably stable in their appearance," one is inclined to think there is not, as no New Guinea female specimens have blue above, but, on the other hand, New Guinea males have considerably larger white disks to the fore wing. This is a point which requires looking further into when more material is available.

Dr. Haase has described and figured some of the scales of this insect in his paper on the "Scent-apparatus of Indo-Australian Butterflies" (*Iris*, i. pp. 106, 317, pl. iii. f. 12, 1886, 1888).

Herr Semper writes (*loc. cit.*):—"The females from the Aru Is. and Australia have no blue on the upperside such as the illustrations of Cramer's and the examples from Ceram show." If this is the case, the Australian insect will probably come under the species named *T. apollonius* by Dr. Felder.

Guérin-Ménéville (*Voy. Coq.*), in describing the male, writes:—"Le mâle est plus petit (45 mill. d'enverg.), entièrement noir en dessus, avec les ailes antérieures arrondies au bout;" which is of course incorrect.

*Genitalia.* Clasps longish, moderately slender, fork arising from near base, rather short. Tegumen fairly developed, of *Lycæna* shape, but with saddle-backed hood reduced into a mere ridge and thrown back (*i. e.* towards head of insect); hooks very long and slender.

Penis most unusually stout, but not long; apical joint having a sort of hinged cover at top apparently capable of closing over the lower portion; the apex or tip probably has the power of being withdrawn into the main tube of organ. (Plate XLVII. figs. 1, 1*a*.)

The above description is taken from a male obtained from C. York.

Var. *KARPAIA*, nov. (Plate XLV. figs. 3, 4.)

♂. Upperside allied to *T. danis*, but rather lighter blue; fore wing with the white disk larger and more distinct; hind wing with the white considerably broader and with the blue extending farther towards the anal angle. Underside as in *T. danis*, but with the outer marginal border of hind wing which contains the blue lunules much narrower, while the lunules are the same size, consequently the white area is much enlarged.



♀. Upperside as in *T. danis*, but the black borders narrower and more evenly defined. Underside as in ♂.

Head, thorax, abdomen, and legs as in *T. danis*.

Expanse, ♂  $1\frac{7}{10}$ —2 inches, ♀ 2 inches.

*Hab.* Ceram.

This form occurs only in Ceram and does not appear to vary. The types are in Messrs. Godman and Salvin's collection, and specimens are also contained in the British Museum.

The cilia of both sexes are alternately black and white, but not so markedly as in *T. danis* (typical).

#### THYSONOTIS SYRIUS.

*Danis syrius*, Misk. P. L. Soc. N. S. W. ser. 2, v. p. 34 (1890)<sup>1</sup>; Ann. Queensl. Mus. no. 1, p. 49 (1891)<sup>2</sup>.

*Hab.* N. Queensland<sup>1</sup>; C. York<sup>2</sup>.

We have not seen this species, the male of which is described as light greyish blue above, with the fringes of both wings alternately black and white below.

Mr. Miskin notes: "This is near to *sebæ* and the markings are similar to that species, but the decidedly different tint of blue, the absence of metallic sheen, and the somewhat larger size seem to distinguish it." He says of the female, "As in male, except that the blue is much less pronounced, the upperside being almost black."

It is notable as being the only species which has non-metallic blue.

THYSONOTIS APOLLONIUS. (Plates XLV. figs. 5, 6, XLVII. figs. 2, 2 a.)

*Lycæna apollonius*, Feld. Reise Nov., Lep. ii. p. 265, t. 33. f. 3 (1865).

*Plebeius danis*, Ribbe, Iris, i. p. 84, 1885 (nec Cramer).

*Cupido danis*, Oberthür, Mus. Gen. xv. p. 522 (1880) (nec Cramer); Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 126 (1877) (nec Cramer).

♂. Allied to *T. danis*, ♂. Generally larger. Upperside somewhat lighter blue with less sheen; the white disk of fore wing larger and more clearly defined and the outer-marginal black border gradually widening towards the anal angle. Hind wing—outer half black, covered with greyish-blue scales, thickest towards the apex. Underside as in *T. danis*, but the black borders considerably wider, more especially in the hind wing, in which the white band becomes straighter, much narrower, and is placed before the middle. Cilia alternately black and white on both surfaces.

Head, thorax, abdomen, and legs as in *T. danis*.

Expanse, ♂  $1\frac{1}{2}$ — $2\frac{1}{5}$  inches, ♀  $1\frac{2}{5}$ — $2\frac{1}{5}$  inches.

*Hab.* Central New Guinea (*D'Albertis*); Islands in N. Geelvink Bay (*Kirsch*); Port Moresby (*Goldie*) (*Mus. G. & S.*); New Guinea (*Mus. Staud.*); Waigiou, Soron (*Oberthür*); Jobi (*Kirsch*); Mysol (*Wallace*); Waigiou (*Platen*); Aru (*Wallace*).



Female specimens from Mysol and one in Dr. Staudinger's collection from Waigiou agree best with Dr. Felder's figure, but a female in Messrs. Godman and Salvin's possession has a rather less extensive blue band on hind wing beneath. These gentlemen also possess a female from Aru Islands, which does not differ from the New Guinea female except in its smaller size ( $1\frac{2}{5}$  inch).

This is a somewhat puzzling species on account of the exceptional difference in the widths of the blue bands on underside of hind wings of the two sexes and also the varying width of this band in the female, no two specimens, even from the same locality, being identical.

Judging from the arrangement in the British Museum, Mr. Butler appears to think that Boisduval's name (*sebæ*) should be used for the Aru Islands form, but I am unable to distinguish it from *T. apollonius* and think it is quite evident from the context of Boisduval's description that he was simply redescribing Cramer's insect.

Probably the specimen Godart described from Rawak (Encycl. Méth. p. 578) was a representative of *T. apollonius*.

*Genitalia* very closely allied to those of *T. danis*, but hooks shorter. Penis with hinged cover longer than lower portion. (Plate XLVII. figs. 2, 2a.)

The drawing is from a New Guinea example.

Var. *SUPOUS*, nov. (Plate XLV. fig. 7.)

"*Lycaena danis*, Cr., var. *supous*, Ribbe," Staud. MS.

*Hab.* Wammo Dobbo, Aru Is. (*C. Ribbe*) (*Mus. Staud.*).

Dr. Staudinger has sent us a female with the above MS. name, which, in the absence of more material and without seeing the male, we prefer to treat as a variety. On the upperside it is quite typical, but beneath it differs from Dr. Felder's figure in the hind wing having a somewhat wider white band and considerably less blue.

#### THYSONOTIS REGINA.

*Thysonotis regina*, Kirby, Ann. Mag. Nat. Hist. (6) xvi. p. 163 (1889).

*Hab.* Normanby I., Louisiade Archipelago.

This species may be distinguished from the preceding principally by having the disks of the fore wing in the male almost completely covered with blue. The only specimens we have seen are the types in the British Museum, which do not vary. They were collected by Mr. Basil Thomson in 1888, and are the most easterly examples of this group at present known.

Mr. Kirby (*loc. cit.* p. 164) writes of this insect: "Size of *T. sebæ*, West., but the male more resembles *T. danis*, Cr.:" but Westwood in his description clearly only dealt with Cramer's species, so that the meaning of this remark is not quite apparent.



## THYSONOTIS RIBBEI.

*Plebeius ribbei*, Rober, Iris, i. p. 52, pl. iv. f. 2, ♂ (1886)<sup>1</sup>.

*Hab.* N.W. New Guinea, Sekar.

This species seems to differ from all others by having a narrow metallic line between the usual broad fascia and the margin on the hind wing below. It is known to us only from the figure.

The female is undescribed.

THYSONOTIS PHILOSTRATUS. (Plates XLV. fig. 8, XLVII. figs. 3, 3 a.)

*Lycæna philostratus*, Feld. Reise Nov., Lep. ii. p. 264, t. 33. ff. 1, 2 (1865).

*Cupido philostratus*, Kirby, Syst. Cat. p. 346 (1871); Oberthür, Ann. Mus. Genova, xv. p. 522 (1880).

♂. Upperside much like *T. apollonius* ♂, but of a more violaceous shade of blue.

Underside as ♀, but white central band, as is usual, rather wider.

*Hab.* Gilolo (Felder) (*Platen in Mus. Staud.*) (*Wallace in Mus. G. & S.*); Batchian (*Platen*); Waigiou (*Mus. G. & S.*); Batchian (*Doherty*) (*Mus. D.*); Ternate (*Oberthür*).

This is an easily distinguished species and does not appear to vary except in size—a small female from Batchian in Messrs. Godman and Salvin's collection measuring only  $1\frac{2}{5}$  inches, a large one from Waigiou 2 inches.

*Genitalia.* Clasps somewhat bottle-shaped, but rounded at the base, and the neck (continuing the simile) thick, the apices being bluntly toothed. Tegumen with sides fully developed; hooks of moderate length and rather slender.

Penis decidedly short, very stout, similar in shape to *T. apollonius*. (Plate XLVII. figs. 3, 3 a.)

B. *The WALLACEI group.*

This is a small group which contains insects of somewhat less robust appearance than the preceding and which have the cilia of both sexes pure white, not alternately black and white as in *danis* and allies.

Unfortunately very little is known of them, as very few are contained in collections. They are certainly some of the most beautiful of the genus.

## THYSONOTIS WALLACEI.

*Lycæna wallacei*, Feld. Reise Nov., Lep. ii. p. 265, ff. 8-10 (1865)<sup>1</sup>.

*Cupido wallacei*, Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 126 (1877)<sup>2</sup>.

*Hab.* Waigiou<sup>1</sup>; Mysol (*Wallace*) (*Mus. G. & S.*); N. Guinea, Anus, Kordo, Rubi<sup>2</sup>.

The specimens from Mysol are rather smaller than Dr. Felder's figures, and the male has rather less white on the disks.



Dr. Staudinger possesses a male from Mysol, formerly in the Atkinson collection, in which the white on the disks has entirely disappeared.

THYSONOTIS MELIMNOS, sp. n. (Plate XLVI. fig. 2.)

♀. Allied to *T. wallacei*, Feld. Rather larger. Upperside—fore wing with the apex of the discal white band not produced towards the outer margin as in *T. wallacei*. Hind wing with the basal white area wider and more evenly defined. Cilia of both wings pure white.

Underside—fore wing with the black outer marginal border and the metallic blue marginal line extending right down to the inner margin. Hind wing with the white band broader and the blue marginal band gradually narrowing towards each extremity.

Head, thorax, abdomen, and legs as in *T. wallacei*.

Expanse  $1\frac{9}{10}$  inch.

Hab. Dutch New Guinea, Jobi I. (A. B. Meyer) (*Mus. Staudinger*).

An interesting species, which will, we think, prove quite distinct from *T. wallacei*. The male is unknown and the type is contained in Dr. Staudinger's collection.

THYSONOTIS PERPHERES, sp. n. (Plate XLV. figs. 9, 10.)

♂. Allied to *T. wallacei*, Feld. Upperside considerably darker blue, no white band across the hind wing, which has rather more black at the anal angle. Cilia of fore wing white, of hind wing white spotted with black. Underside much more metallic than in *T. wallacei*, that on fore wing set farther inwards at the apex; black outer-marginal border containing metallic lunules for more than half the wing, consequently the white band is very narrow.

♀. Upperside with white band as in *T. wallacei* ♀, but much narrower and very indistinct; cilia of both wings pure white.

Underside as ♂.

Antennæ black, apparently tipped with white.

Head, thorax, and abdomen as in *T. wallacei*.

Expanse, ♂ ♀,  $1\frac{9}{10}$  inch.

Hab. Dorey, N. Guinea (*Hew. Coll. B. M.*).

The only specimens we have seen of this lovely insect are the pair from which the figures are taken, and which were placed by Hewitson under the name *apollonius*.

C. *The SCHAEFFERA group.*

This group contains females which have a whitish discal streak on the fore wing only, the hind wing being black.

There are three easily recognized species: *T. schaeffera* has a ♂ with the disk only of the fore wing bluish; *T. caledonica* both wings rich dark purple-blue, with black borders and dark gold beneath; *T. cepheis* lighter blue, with narrower borders and metallic green below.



THYSONOTIS SCHAEFFERA. (Plate XLVII. figs. 4, 4 a.)

*Lycæna schaeffera*, Esch. Kotzeb. Reise, iii. p. 216, t. 5. f. 25, a, b (1821).

*Cupido schaeffera*, Druce, P. Z. S. 1873, p. 348<sup>2</sup>.

*Cupido schaeffera*, Oberthür, Ann. Mus. Genova, xv. p. 524 (1880)<sup>4</sup>.

*Thysonotis schaeffera*, G. Semper, Reise Phil., Rhop. p. 167, t. xxxii. ff. 1-3 (1889)<sup>1</sup>.

*Lycæna schaeffera*, Staud. Iris, ii. p. 94 (1889)<sup>3</sup>.

*Danis absyrtus*, Feld. Wien. ent. Mon. iii. p. 270 (1859).

*Hab.* Philippine Is.—Luzon, Bohol, Camotes and S.W. Mindanao<sup>1</sup>; Borneo<sup>2</sup>; Palawan<sup>3</sup>; Ternate<sup>4</sup>; Batchian (*Doherty*) (*Mus. D.*); Taganac Is. (*Mus. D.*).

A well-known species which appears to be very common in the Philippine Is., and, so far as we are aware, does not show any appreciable variation.

*Genitalia.* Somewhat allied to *T. danis* and *T. apollonius*, but front apex of tegumen more produced and hooks stouter. Penis about a third as stout and longer, with the hinged cover, which is produced very much beyond the lower apex and is upturned at the extremity. Taken from a specimen from the Philippine Islands. (Plate XLVII. figs. 4, 4 a.)

THYSONOTIS CALEDONICA. (Plate XLVI. fig. 1.)

*Lycæna caledonica*, Feld. Reise Nov., Lep. ii. p. 267, t. 33. f. 7, ♀ (1865).

*Thysonotis caledonica*, H. H. Druce, P. Z. S. 1892, p. 441.

♂. Upperside dark purple-blue, with the costal margin of fore wing very narrowly and the outer margin narrowly black. Hind wing with the anal and outer margins black, widest at the anal angle and gradually decreasing towards the apex; costal margin black near the base, whitish before the apex.

Underside as ♀.

*Hab.* New Caledonia (*Mus. D. & B. M.*).

As I have before pointed out (P. Z. S. 1891, p. 365), Dr. Felder's figure does not give an adequate idea of the brilliancy of this insect. He described the female only and remarked that it was a local form of *L. schaeffera*.

M. Kirsch (Beitr. Lep.-Faun. von Neu-Guinea, p. 126) records this species from Jobi I., but we think he has probably confounded it with some other.

THYSONOTIS CEPHEIS.

*Thysonotis cepheis*, H. H. Druce, P. Z. S. 1891, pl. xxxii. ff. 1, 2.

*Hab.* Guadalcanar I., Solomon Is.

#### D. *The TAYGETUS group.*

The insects included in this group are somewhat more slender, and have females with a white band common to both wings, with,



so far as is at present known, one exception, *T. kruera*, which has a blue female. A slight difference occurs in the venation of the fore wing, the fourth subcostal nervule terminating just before the apex, not at the apex as in the *danis* group.

THYSONOTIS TAYGETUS. (Plate XLVII. figs. 5, 5 a, 5 b.)

*Lycæna taygetus*, Felder, Reise Nov., Lep. ii. p. 266, t. 33. ff. 19–21 (1865).

*Cupido taygetus*, Kirby, Cat. Diur. Lep. p. 347 (1871); Semper, Mus. Godef., Lep. xiv. p. 155 (1878).

*Danis taygetus*, Miskin, Ann. Queensl. Mus. no. 1, p. 50 (1891).

*Danis salamandri*, Macleay, P. Ent. Soc. N. S. W. p. 54 (1866).

*Hab.* Somerset, C. York; Rockhampton; C. Bowen; Cooktown; Port Denison; Moreton Bay; Brisbane; Sydney. Fiji Is. (*Felder*).

This is a common insect in Queensland and is well known to vary considerably—some males having the hind wings almost entirely blue and some females being entirely without the metallic blue scales near the anal angle of the hind wings.

*D. salamandri*, Macleay, as has already been pointed out by Mr. Miskin and others, undoubtedly equals this species. Macleay writes:—"This beautiful little species is scarcely half the size of *D. sebæ*, and may be readily distinguished from it by its scarcely having any black on the upper surface, while on the lower there is a distinct gap between the black anterior and exterior margins of the upper wings. Cape York. Presented to the Museum by Mr. Moore of H.M.S. 'Salamander.'"

Dr. Felder has recorded this species from the Fiji Is., but amongst the large numbers of *Lycanidæ*. we have examined from those islands we have not seen a single specimen and are inclined to think it is incorrect.

*Genitalia.* Clasps unusually broad, reminding somewhat of a flitch of bacon with the top extremity produced upwards into a hooked tip, the apex of which is pointed and has three distinct teeth; fork short, stout, with the division very short indeed.

*Tegumen:* arms broadly developed, the saddle-hood reduced into insignificance, with hooks short and stout and terminating in a sharp curved point. Penis very large and stout, though not long, somewhat barrel-shaped and flatter on the lower margin, end joint or tip with the lower portion produced into a long sharp spout (as of a jug) and without the hinged cover. (Plate XLVII. figs. 5, 5 a.)

THYSONOTIS MACLEAYI.

*Danis macleayi*, Semper, Mus. Godef., Lep. xiv. p. 155 (1878)<sup>1</sup>; Miskin, Ann. Queensl. Mus. no. 1, p. 51 (1891).

*Hab.* C. York<sup>1</sup>; Somerset, C. York (*D'Albertis*) (*Mus. G. & S.*).

Herr Semper describes this as differing slightly (from *taygetus*) in the spotted fringes, also in the female by a projecting tooth in the white disk in the fore wing and the very indistinct blue dust



on the bases of the wings; and the male as being of a much less intense blue.

The only specimen we have seen is a male in Messrs. Godman and Salvin's collection, which agrees with this description. The blue is certainly paler and of a more lavender shade; and the cilia of both wings pure white, spotted with brown at the extremity of each nervule.

It is difficult to say whether this species is distinct from *T. taygetus*, and this is a point which can only be satisfactorily decided by some entomologist in its native habitat. Mr. Miskin seems to be unacquainted with it.

#### THYSONOTIS HYMETUS.

*Thysonotis hymetus*, Feld. Sitzb. Ak. Wiss. Wien, math.-nat. Cl. xl. p. 459 (1860).

*Lycæna hymetus*, Feld. Reise Nov., Lep. ii. p. 266, t. 33. ff. 22-24 (1865).

*Cupido hymetus*, Kirby, Cat. Diur. Lep. p. 347 (1871).

*Plebeius hymetus*, Ribbe, Iris, i. p. 205 (1887); ii. p. 250 (1889)<sup>1</sup>.

*Cupido hymetus*, Pagens. Lep.-Fauna Amboina, p. 44 (1884).

*Cupido hymetus*, Oberthür, Ann. Mus. Genova, xv. p. 523 (1880)<sup>2</sup>.

Hab. Amboina; Ceram<sup>1</sup>; Batchian; Gilolo (*Wallace*) (*Mus. G. & S.*, ♂). Soran, New Guinea<sup>2</sup>.

The single male in Messrs. Godman and Salvin's collection is considerably smaller than Felder's figure, but the female agrees exactly.

Dr. Staudinger possesses a male labelled "Celebes" with a MS. name, "*Danis ceramica*, Bd.," attached, which is undoubtedly *T. hymetus* and is probably incorrectly localized.

#### THYSONOTIS KORION, sp. n. (Plate XLVI. fig. 3.)

♂. Allied to *T. hymetus*. Upperside violaceous blue, narrowly black-bordered; cilia of both wings distinctly alternately black and white spotted. Underside with the blue costal streak of fore wing extending evenly almost to the apex. Hind wing with the outer marginal black border more regularly defined inwardly and the blue marginal spots more quadrate. Cilia as on upperside.

Head, thorax, abdomen, and legs as in *T. hymetus*.

Expanse  $1\frac{1}{5}$  inch.

Hab. Kei Is. (*Semper*) (*Mus. Staudinger*).

Distinguished by the broad blue costal streak on underside of fore wing and by the spotted cilia.

#### THYSONOTIS BROWNII, sp. n. (Plate XLVI. fig. 8.)

♂. Upperside dull violaceous blue, costal and outer margins of fore wing very narrowly blackish brown; of hind wing, apex blackish brown, increasing gradually towards the anal angle, where it is broadest. Underside most like that of *T. hymetus*, but with much less blue at the bases and with the black border to outer



margin of hind wings inwardly more evenly defined and the marginal blue lunules much less distinct; a broken metallic blue line running along the black outer marginal border of fore wing from apex to outer angle.

Head, thorax, and abdomen blackish brown. Antennæ black above, white-spotted beneath.

Expanse  $1\frac{1}{5}$  inch.

*Hab.* New Ireland (*Brown*) (*Mus. G. & S.*).

The type specimen in Messrs. Godman and Salvin's collection is the only one we have seen. It is distinguished from all others by the blue line on underside of fore wing.

#### THYSONOTIS CÆLIUS.

*Thysonotis cælius*, Feld. Wien. ent. Mon. iv. p. 245 (1860)<sup>1</sup>.

*Lycæna cælius*, Feld. Reise Nov., Lep. ii. p. 265, t. 33. ff. 11, 12 (1865).

*Cupido cælius*, Kirby, Cat. Diur. Lep. p. 347 (1871); Oberthür. Ann. Mus. Genova, xv. p. 523 (1880)<sup>2</sup>; Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 127 (1877).

*Hab.* Aru Is.<sup>1</sup>; Dorey; Port Moresby, New Guinea; Sula Is. (*Wallace*) (*Mus. G. & S.*); Gilolo<sup>2</sup>; Mysol (*B. M.*); Kaiser Wilhelm's Land, New Guinea (*Eichorn*) (*Mus. Staud.*).

We have not seen the female of this species, but specimens have been received by M. Oberthür from Gilolo.

#### THYSONOTIS EUDOCIA, sp. n. (Plate XLVI. fig. 4.)

♂. Allied to *T. cælius*. Upperside duller blue; fore wing with the outer margin rather more broadly bordered with brown; hind wing with the costal margin greyish brown, not white as in *T. cælius*. The border to the outer margin and anal angle twice as broad. Underside with all the borders, especially that on the costa of fore wing, considerably broader and the blue metallic streaks and lunules very much decreased. A distinct light yellow streak stretching along the costal nervure at the base of the fore wing.

Head, thorax, abdomen, and legs as in *T. cælius*. Antennæ black above, spotted with white below. Cilia of both surfaces brown.

Expanse  $1\frac{3}{10}$ – $1\frac{2}{5}$  inch.

*Hab.* Batchian (*Wallace*, *Mus. G. & S.*); (*Platen*, *Mus. Staudinger*); (*Doherty*, *Mus. Druce*, type).

Although there is before us a good series of this species there is not a single female amongst them. We have compared it to *T. cælius*, but it is perhaps nearer to the next species, *T. piepersii*, Sn., as possessing the yellow basal streak on underside of fore wing. Its position is intermediate between the two.

#### THYSONOTIS PIEPERSII. (Plate XLVI. fig. 9.)

*Cupido piepersii*, Snellen, Tijds. Entom. xxi. p. 16, pl. 1. f. 3 (1878).

♀. Upperside dull blackish brown, with an indistinctly defined



white band common to both wings. Underside as in male, but with the yellowish basal streak on the costal margin more prominent. Cilia of both surfaces brown.

*Hab.* Celebes : Minahassa (*Platen, Mus. Staud.*) ; Tongubu (*Mus. G. & S.*) ; S. Celebes (*W. Doherty, Mus. D.*).

The male of this species is well figured by Herr Snellen, and the figure here given of the female is from a specimen in Dr. Staudinger's collection.

Mr. W. Doherty obtained a number of this insect in S. Celebes in August and September.

The white disks below are often more or less covered with light sulphur-yellow.

#### THYSONOTIS KRUERA.

*Thysonotis kruera*, H. H. Druce, P. Z. S. 1891, p. 364, pl. xxxi. ff. 16, 17.

*Hab.* Solomon Is.

So far as we know this is the only species of the group which has a blue female.

The type specimens are the only ones we have seen.

#### E. *The CYANEA group.*

The insects I have placed in this group may be recognized by the short linear tail to the lower median nervule of hind wings.

There are several easily distinguished forms.

#### THYSONOTIS CYANEA. (Plate XLVII. fig. 6.)

*Papilio cyanea*, Cram. Pap. Ex. i. t. 76, C, D (1779).

*Papilio cyanus*, Fabr. Spec. Ins. ii. p. 116 (1781) ; Herbst, Pap. tab. 297.

*Polyomm. cyanus*, Godt. Enc. Méth. ix. p. 642 (1823).

*Danis cyanea*, Butl. B. M. Cat. Fabr. Lep. p. 162 (1869).

*Cupido cyanea*, Semper, Mus. Godeff., Lep. xiv. p. 155 (1878).

*Plebeius cyanea*, Ribbe, Iris, ii. p. 250 (1889)<sup>1</sup>.

*Cupido cyanea*, Pagens. Schmett. Amb. p. 10 (1888) ; Oberthür, Ann. Mus. Genova, xv. p. 524 (1880).

*Hab.* Amboina (*Doherty, Mus. D.*) ; Ceram<sup>1</sup>.

We possess a number of specimens from Amboina which do not vary and which agree well with Cramer's figures and whence his type was probably obtained. The locality he gives is "Indes Occidentales." His figure shows two tails to the hind wings, which is of course incorrect, but it is in other respects a good one.

As has been already pointed out by Herr Semper (*Mus. Godef. xiv. p. 155*), this form shows considerable differences from its Australian representative which has been described under the name *Cupido arinia* by M. C. Oberthür : in the male by the black band on the hind wing below being very much narrower and consequently allowing a much greater extent of white, and in the female by the



black borders being much narrower on both surfaces and also by having less metallic blue at the bases of the wings above. (Plate XLVII. fig. 6, penis.)

THYSONOTIS EPICORITUS. (Plate XLVI. fig. 10.)

*Damis epicoritus*, Boisd. Voy. Astr., Lep. p. 67 (1832).

*Hab.* New Guinea; Port Moresby (*Goldie*), Waigiou (*Wallace, Mus. G. & S.*), (*Mus. Staud.*).

This insect has apparently never been recognized since it was described by Boisduval. Messrs. Kirby and Miskin in their Catalogues place it as a synonym of *T. cyanea*, Cr., but a reference to the figure here given, which is taken from a specimen in Messrs. Godman and Salvin's collection from Port Moresby, obtained by Goldie, will at once show that it presents considerable differences from that species. The female is unknown.

THYSONOTIS ARINIA. (Plates XLVI. figs. 6, 7; XLVII. figs. 7, 7a.)

*Cupida arinia*, Oberth. Ann. Mus. Gen. xii. p. 465 (1878), xv. p. 523 (1880).

? *Damis albastola*, Lucas, T. P., P. R. Soc. Queensl. p. 156, ff. 3, 4 (1889).

*Hab.* Queensland, N. Australia.

Through the kindness of M. C. Oberthür I have been able to examine the type of this species, which is from Queensland.

The figure of the male here given is from a specimen in our own collection from N. Australia, which agrees exactly with the type, and that of the female is one of several received with it. I place Mr. Lucas's species somewhat doubtfully as a synonym, as I have not been able to examine his description and figures.

Mr. Miskin, to whom *T. arinia* was unknown, has placed *D.* (= *T.*) *albastola* under Cramer's name *T. cyanea* (Ann. Queensl. Mus. no. 1, p. 50, 1891).

*Genitalia.* Clasp broad, united at each lower extremity from the apical lower end to the tip; the margin is crescent-shaped and is strongly serrated, the apex itself being produced upwards and terminating in a square tip. Fork long, slender, and deeply divided. Tegumen arms narrow. Penis with inner base bladder-shaped for  $\frac{1}{3}$  length, when it suddenly narrows for another  $\frac{1}{3}$  and at the apical third expands again into a swollen joint, whence it tapers to tip. (Plate XLVII. figs. 7, 7a.)

The description is taken from a specimen received from N. Australia.

THYSONOTIS SMARAGDUS, sp. n. (Plate XLVI. fig. 5.)

♂. Allied to *T. arinia*. Upperside much the same but with a small white dot at the end of the cell of the fore wing in place of the whitish patch in *T. arinia*, and an indistinct white blotch in the cell of hind wing. Underside: borders blacker and more distinctly defined; outer marginal border of fore wing narrower than in



*T. arinia* towards the anal angle; the white submarginal line also narrower. Hind wing: the black streak rather longer, the black submarginal band containing the metallic green lunules, which are considerably smaller than in *T. arinia*, differently situated, the inner edge commencing at the apex and running in a straighter though somewhat broken line to the anal margin, which it reaches decidedly lower down. The shape of the wings is also different from *T. arinia*, the apices of both being more produced and the outer margins considerably straighter.

A short, black, linear, white-tipped tail to the lower median nervule.

Head, thorax, and abdomen concolorous with wings; legs black and white; antennæ black above, spotted with white below.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Wetter I. (*W. Doherty*, *Mus. D.*); (*Holy*, *Mus. Staud.*).

This species, which is the local representative of *T. arinia*, is distinguished by the form of the wings and by the difference in the position of the band on the underside of the hind wings.

Taken by Mr. Doherty in May.

#### THYSONOTIS SPERCHIUS.

*Thysonotis sperchius*, Feld. Wien. ent. Mon. iv. p. 245, t. 3. f. 4 (1860)<sup>1</sup>.

*Cupido sperchius*, Oberthür, Ann. Mus. Gen. xv. p. 523 (1880)<sup>2</sup>; Kirsch, Beitr. Lep.-Faun. von Neu-Guinea, p. 127 (1877)<sup>3</sup>.

*Hab.* New Guinea<sup>1</sup>; Soron, Salwatti<sup>2</sup>; Mysore Is.<sup>3</sup>.

We have not seen this species, but the position of the white band on the underside of the hind wing and the broken border on the outer margin of fore wing below seem to distinguish it from the following species, *T. pindus*, to which it is closely allied, although M. Oberthür in his *Lép. Océan.* (Ann. Mus. Gen. xv.) places two other species between them.

#### THYSONOTIS PINDUS. (Plate XLVI. fig. 11.)

*Lycæna pindus*, Feld. Reise Nov., Lep. ii. p. 267, t. 33. ff. 17-18, ♀ (1865)<sup>1</sup>.

*Cupido pindus*, Oberth. Ann. Mus. Gen. xv. p. 523 (1880)<sup>2</sup>.

*Hab.* Ternate (*Wallace*)<sup>1</sup>; New Guinea, Salwatti, Andai<sup>2</sup>; Batchian (*Platen*) (*Mus. Staud.*), (*Wallace*) (*Mus. G. & S.*).

The specimens before us from Batchian agree well with Dr. Felder's figure. The male on the upperside is scarcely distinguishable from that sex of *T. arinia*.

#### THYSONOTIS CHROMIA.

*Thysonotis chromia*, H. H. Druce, P. Z. S. 1891, p. 365, pl. xxxii. f. 3.

*Hab.* Solomon Is.

Allied to the two preceding species, but has much narrower black borders on the upperside, besides differences below.



## THYSONOTIS ILLUSTRIS.

*Plebeius illustris*, Rober, Iris, i. p. 53, t. iv. f. 6 (1885).

*Hab.* Key Is.

We have not seen a specimen of this species. The male only is described, and seems to differ from that sex of *T. pindus* in the hind wing possessing a submarginal row of lunules which are entirely absent in that species. Although Herr Rober's figure does not show any tail, we feel sure that it should do so and consequently place it in this group. His figures are photographs, and this one appears to show signs of having been repaired near the anal angle.

## THYSONOTIS (?) MIRACULUM, sp. n. (Plate XLVI. fig. 12.)

♀. Upperside uniform dull brown; a few whitish scales on fore wing just above the submedian nervure; hind wing with a small irregular whitish patch rather before the middle of the costal margin extending slightly into the cell; basal half of anal margin whitish. Cilia of fore wing brown, whitish at anal angle, of hind wing alternately brown and whitish. Underside—both wings brown as above but rather darker, fore wing with a costal border of metallic bluish green consisting of streaks of scales between the nervules from their bases almost to the costal margin, thickest and most prominent at the base of the wing and terminating gradually rather before the apex; outer margin with a border consisting of a row of distinct metallic bluish-green crescent-shaped lunules placed between the nervules and extending from the apex to the anal angle. Inner margin creamy white from base almost to anal angle, slightly extending into the wing towards the middle. Hind wing margined with a row of irregular metallic spots from the apex, where is the largest, to the anal angle, the two spots following the large one at the apex very small but distinct.

Head, thorax, and abdomen brown above, brownish white below; front of head black, with a distinct metallic blue streak on the inner side of each eye. Palpi white, tipped with black. Antennæ brown above, spotted with white towards the base below. Legs wanting.

Expanse  $1\frac{9}{10}$  inch.

*Hab.* Waigiou (*Platen*).

The type specimen of this curious species, which is in Dr. Staudinger's collection, is the only example we have seen. Another genus will have to be erected for it, as the first subcostal nervule of the fore wing is entirely separate from the costal nervure and the fourth subcostal is emitted much higher up the third than in typical *Thysonotis*, but without seeing the male we do not care to propose a new generic name and have placed it provisionally in *Thysonotis*.

*Lycæna aleuas*, Felder, and its allies, which have been placed in *Danis* by various authors, are not included here, as in our opinion they are not congeneric and are better placed in *Lampides*.



## EXPLANATION OF THE PLATES.

## PLATE XLV.

- Fig. 1. *Thysonotis serapis*, ♂, p. 539.  
 2. ———, ♀, p. 539.  
 3. ——— *danis*, var. *karpaia*, ♂, p. 540.  
 4. ———, ———, ♀, p. 540.  
 5. ——— *apollonius*, ♂, p. 541.  
 6. ———, ♀, p. 541.  
 7. ———, var. *supous*, nov., ♀, p. 542.  
 8. ——— *philostratus*, ♂, p. 543.  
 9. ——— *perpheres*, ♂, p. 544.  
 10. ———, ♀, p. 544.

## PLATE XLVI.

- Fig. 1. *Thysonotis caledonica*, ♂, p. 545.  
 2. ——— *melimnos*, ♀, p. 544.  
 3. ——— *korion*, ♂, p. 547.  
 4. ——— *eudocia*, ♂, p. 548.  
 5. ——— *smaragdus*, ♂, p. 550.  
 6. ——— *arinia*, ♂, p. 550.  
 7. ———, ♀, p. 550.  
 8. ——— *brownii*, ♂, p. 547.  
 9. ——— *piepersii*, ♀, p. 548.  
 10. ——— *epicoritus*, ♂, p. 550.  
 11. ——— *pindus*, ♂, p. 551.  
 12. ——— (?) *miraculum*, ♀, p. 552.

## PLATE XLVII.

- Figs. 1, 1a, 1b. *Thysonotis danis*, p. 539.  
 2, 2a. ——— *apollonius*, p. 542.  
 3, 3a. ——— *philostratus*, p. 543.  
 4, 4a. ——— *schaffera*, p. 545.  
 5, 5a, 5b. ——— *taygetus*, p. 546.  
 6. ——— *cyanea*, p. 549.  
 7, 7a. ——— *arinia*, p. 550.

2. Descriptions of new Species of Butterflies from the  
 Island of St. Thomas, West Africa. By EMILY  
 MARY SHARPE.

[Received June 2, 1893.]

The Butterflies which I have the pleasure of describing in the present paper have been submitted to me by Prof. Barboza du Bocage, the Director of the Lisbon Museum. They were obtained in the island of St. Thomas by Senhor Francesco Newton.

Fam. NYMPHALIDÆ.

Subfam. DANAINÆ.

DANAIS CHRYSIPPUS.

*Danais chrysippus* (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 6.



## Subfam. SATYRINÆ.

## MELANITIS LEDA.

*Melanitis leda* (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 43.

## Subfam. ACRÆINÆ.

## ACRÆA ZETES.

*Acraea zetes* (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 131.

## ACRÆA NIOBE, sp. n.

General colour brownish black, with large spots on both wings, being very distinctly pronounced and of a velvety black appearance.

*Fore wing.* Costa and inner margin brown, apex and hind margin darker, as also the base of wing; discoidal cell from base to apical portion transparent grey, including the discal area and extending below the first median nervule. Between the latter and the submedian nervure are two black spots, one near the base and the second one near the hind margin; above the first median nervule is a third spot, close to the discoidal cell, followed by a fourth one between the second and third median nervules. Immediately above this third median nervule follow three black spots very close together, but all situated between the above-mentioned nervule and the second and first discoidal or radial nervules. There is a large black spot at the end of the cell, with a second one about halfway from the base of the wing.

*Hind wing.* Brownish black with darker border on hind margin, rather inclined to become transparent across the disk. Base of wing very thickly spotted with black, the spots becoming more separated and more distinct towards the disk. As in the fore wing, there is a large black spot at the end of the cell. From the costal nervure to below the submedian nervure is a submarginal row of black spots, but each spot distinctly between each nervule.

*Underside.* Both wings much lighter brown than on the upper-side, with the borders and all the spots very distinctly indicated.

Thorax and body black; abdomen deep red, with a little red also between the head and thorax.

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

My friend Dr. Staudinger has had an example of this species in his collection for some time under the MS. name of *A. niobe*. He has kindly sent me over his type for comparison, and I have had much pleasure in describing the species under the name which he had given to it.

## ACRÆA NEWTONI, sp. n.

Similar to *A. peneleos*, Ward, but at once distinguished by the absence of any bright colour on the fore wing.

*Fore wing.* Entirely black with three transparent grey spaces, just prevented from representing one large patch by the black lines of the second and third discoidal nervules. This grey patch



occupies the apical portion of the wing; one large transparent spot is distinctly marked between the first and second median nervules.

*Hind wing* black, with a well-defined band of orange-red crossing the discal portion from the costal margin to the inner margin; this is followed by a black border along the hind margin. Base of wing with a few indistinctly marked black spots.

*Underside*.—*Fore wing*. Similar in colour and markings to the upperside, but lighter.

*Hind wing*. Similar to the upper surface but much paler, the black spots at the base of the wing being much more forcibly indicated. The red band much more subdued in tint.

*Hab.* St. Nicolau.

Expanse 2 inches.

ACRÆA INSULARIS, sp. n.

Allied to *A. bonasia*, Fabr., but easily distinguished by the colour of the fore wing.

*Fore wing*. General colour brownish black, relieved by spots of orange-red. This species has two small red spots near the apex in place of the large oval patch of *A. bonasia*. Near the end of the discoidal cell is a spot, followed by a larger one between the first and second median nervules; directly under the latter nervule, while somewhat nearer to the hind margin, is a small triangular-shaped spot of red. The middle of the cell has a small ovate spot of orange somewhat paler in tint.

*Hind wing*. With a broad brownish-black border on the hind margin extending along the costa and occupying the base of the wing. The whole of the central portion of the wing orange-red, becoming pale yellow below the first median nervule. This portion of the wing has several small black spots, with a larger one marking the middle of the discoidal cell; there is one spot between the submedian nervule and the first median nervule, followed by two minute spots placed one above the other below the first-named nervule. At the end of the cell are three spots varying in size between the third median, radial, and second subcostal nervules, and just above the middle spot there is another situated in the fork of the radial and the first discocellular nervule.

*Underside*. Very similar to that of *A. newtoni*, the markings of the upper surface being plainly indicated on the underside.

*Hab.* St. Nicolau.

Expanse 2 inches.

Subfam. NYMPHALINÆ.

JUNONIA SINUATA.

*Precis sinuata*, Flötz, Stett. ent. Zeit. p. 477 (1880).



## HYPOLIMNAS MISIPPUS.

*Hypolimnas misippus* (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 225.

## HYPOLIMNAS DUBIUS.

*Hypolimnas dubius* (Beauv.); Kirby, Syn. Cat. Diurn. Lepid. p. 226.

## CRENIS NATALENSIS.

*Crenis natalensis*, Boisd., Trimen, S. Afr. Butt. i. p. 250 (1887).

## Subfam. LIBYTHÆINÆ.

## LIBYTHEA LABDACA.

*Libythea labdaca*, Westw., Kirby, Syn. Cat. Diurn. Lepid. p. 282.

## CHARAXES MONTEIRI.

*Charaxes monteiri*, Staudinger, Ex. Schm. p. 170, Taf. 59. fig. 1.

## Fam. LYCÆNIDÆ.

## HYPOLYCÆNA RAVA.

*Hypolycæna rava*, Holland, Ann. Nat. Hist. (6) vol. x. p. 286 (1892).

## TARUCUS PULCHRA.

*Tarucus pulchra*, Murr. Trans. Ent. Soc. 1874, p. 524, pl. 10. figs. 7, 8.

## HYREUS LINGEUS.

*Cupido lingeus* (Cram.); Kirby, Syn. Cat. Diurn. Lepid. p. 350.

## ZIZERA KNYSNA.

*Zizera knysna*, Trim. Rhop. Afr. Austr. p. 255 (1862-66).

## CATOCHRYSOPS SANCTI-THOMÆ, sp. n.

Allied to *C. ella*, Butl., but rather larger. The male is more brownish violet on the upperside.

The underside differs considerably, being of a uniform brown with darker markings edged on both sides with pale drab or white. The hind wing has three ocelli, black encircled by orange and the lower half of the ocelli edged with metallic green.

The female has a very brilliant patch of metallic blue on the fore wing, with a very broad border of dark brown on the costa and hind margin.

Hind wing also with a blue patch at the base, but not so bright in colour. The border on the costa and hind margin brown, with an indistinct spot of black just above the tail.



Underside similar to the male, though somewhat more plainly marked.

*Hab.* St. Nicolau.

*Exp.* of male 1·3 inch ; female 1·2 inch.

Subfam. PIERINÆ.

MYLOTHRIS BERNICE.

*Tachyris bernice* (Hew.) ; Kirby, Syn. Cat. Diurn. Lepid. p. 464.

NYCHITONA NUPTA.

*Nychitona nupta*, Butl. Cistula Entomologica, i. p. 175 (1873).

TERIAS SENEGALENSIS.

*Terias senegalensis*, Boisd. Hist. Nat. Spec. Gén. Lépid. p. 672 (1836).

Fam. PAPILIONIDÆ.

Subfam. PAPILIONINÆ.

PAPILIO DEMOLEUS.

*Papilio demoleus* (Linn.) ; Kirby, Syn. Cat. Diurn. Lepid. p. 543.

PAPILIO BROMIUS.

*Papilio bromius* (Doubl.) ; Kirby, Syn. Cat. Diurn. Lepid. p. 562.

Fam. HESPERIDÆ.

RHOPALOCAMPTA FORESTAN.

*Ismene forestan* (Cram.) ; Kirby, Syn. Cat. Diurn. Lepid. p. 581.

RHOPALOCAMPTA BOCAGII, sp. n.

The under surface is similar to that of *R. keithloa*, Wallgr. (*R. stella*, Trimen), but is at once distinguished by the blue upper-side.

*Fore wing* metallic violet-blue with black indentations along the hind margin, which has a broad black border extending also along the costa, but not quite to the base of the wing.

*Hind wing* similar to the fore wing, but the black border is much broader at the apex and extends also along the inner margin, though somewhat lighter in tint.

*Underside.* Fore wing entirely brown, with a slight lustre of metallic blue, becoming rather greener near the base.

*Hind wing* brown, but relieved by a somewhat triangular-shaped spot of bright orange-red, with three large black spots in the centre of the orange patch between each of the following nervules. The first spot between the submedian nervure and the first median nervule, a second between the last-named nervule and the second nervule, and a third spot between the third median and second subcostal nervules. There is a small patch of bright orange colour just below this larger patch, with a narrow band



connecting the two. A broad streak of orange colour extends along the inner margin.

The underside of the body is similar to *R. keithloa*, but on the upper surface the head and thorax are a bright blue-green, with the body dark brown.

*Hab.* Angolares.

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

PTERYGOSPIDEA FLESUS.

*Tagiades fesus* (Fabr.); Kirby, Syn. Cat. Diurn. Lepid. p. 635.

PARNARA NISO.

*Parnara niso* (Linn.); Kirby, Syn. Cat. Diurn. Lepid. p. 597.

### 3. On the Dentition of a Gigantic Extinct Species of *Myliobatis* from the Lower Tertiary Formation of Egypt. By A. SMITH WOODWARD, F.Z.S.

[Received June 20, 1893.]

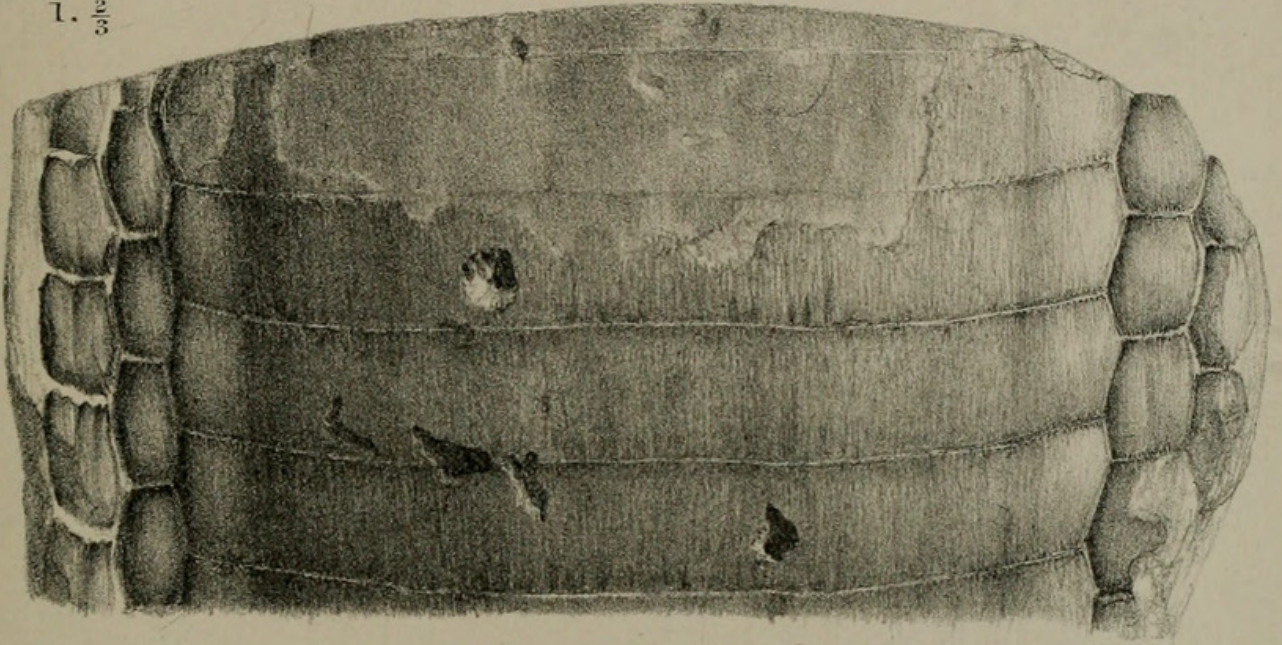
(Plate XLVIII.)

The Skates of the family of Myliobatidæ are well known to attain a great size, but few examples even of the dentition of the largest specimens are preserved in museums. It is therefore of much interest to record that the British Museum has lately received from Surgeon-Captain R. H. Penton a good example of the jaws of one of the most gigantic extinct species of *Myliobatis*, discovered in the Lower Tertiary Limestone of the Mokattam Hills, near Cairo, Egypt. So far as the present writer is aware, this is the largest specimen of the dentition of *Myliobatis* that has hitherto reached any museum.

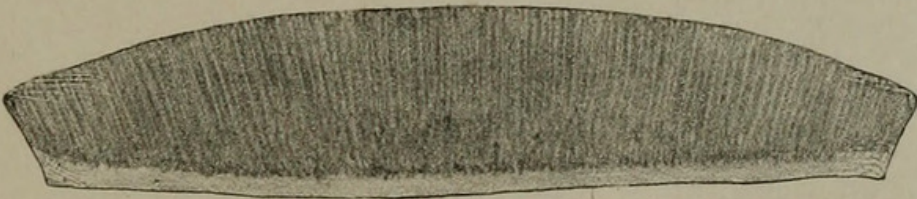
Each jaw is in a separate piece of limestone, but the two portions are known to have been found in association; and, as usual in the Myliobatidæ, one dentition (lower) is flat, while the other (upper) is much bent from front to back. Of the lower jaw, partly shown in the figure (Plate XLVIII. fig. 2), about 17 series of plates are preserved, 10 being worn; while of the upper jaw (fig. 1) only 6 series remain. The unworn teeth are almost smooth, being marked only by short feeble longitudinal striæ or rugæ. In both jaws the oral surface is arched from side to side, very gently in the lower, more strongly in the upper jaw, as well shown in the sections figs. 1 *a*, 2 *a*. The principal teeth are very slightly arcuated and not strongly reflexed at the extremities; and the narrow lateral teeth have their long axes directly antero-posterior, not oblique. As an abnormality, it is also interesting to note in the upper dentition that the two outer lateral series are fused together on one side, while the two inner lateral series are similarly fused on the other side.



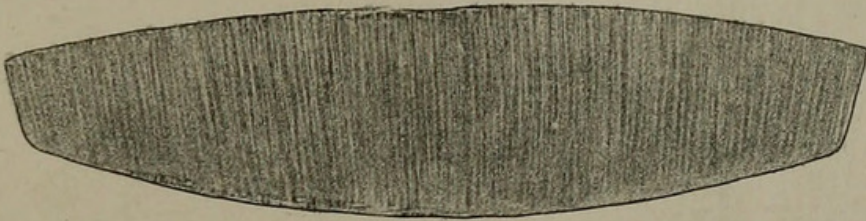
1.  $\frac{2}{3}$



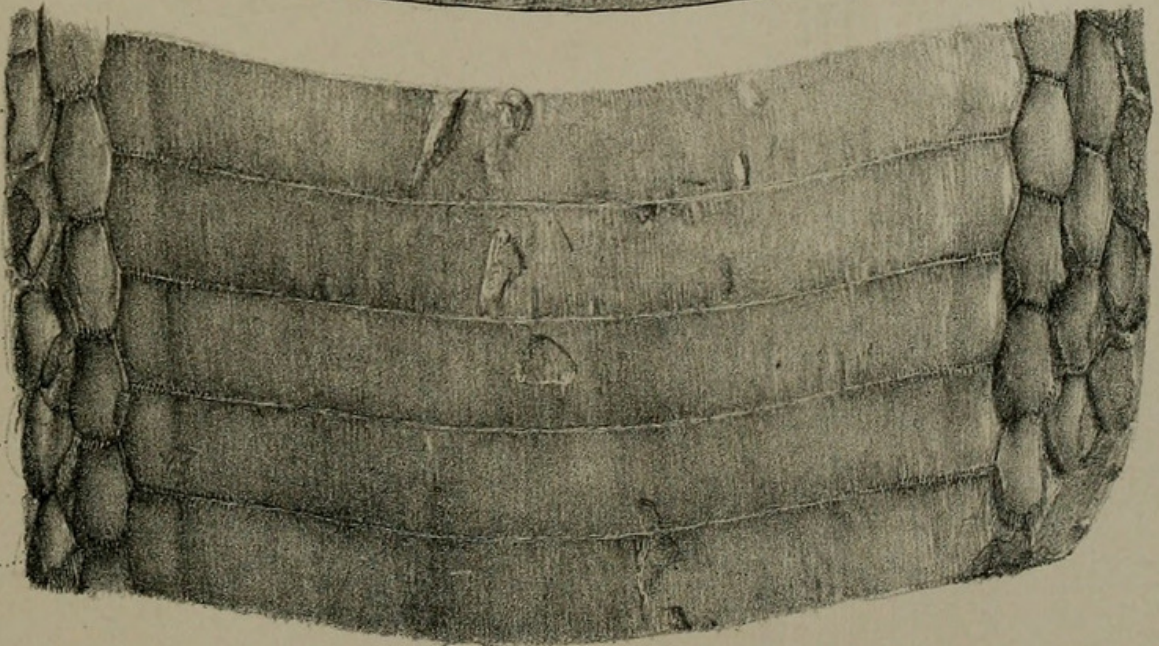
1a.



2a.



2.  $\frac{2}{3}$



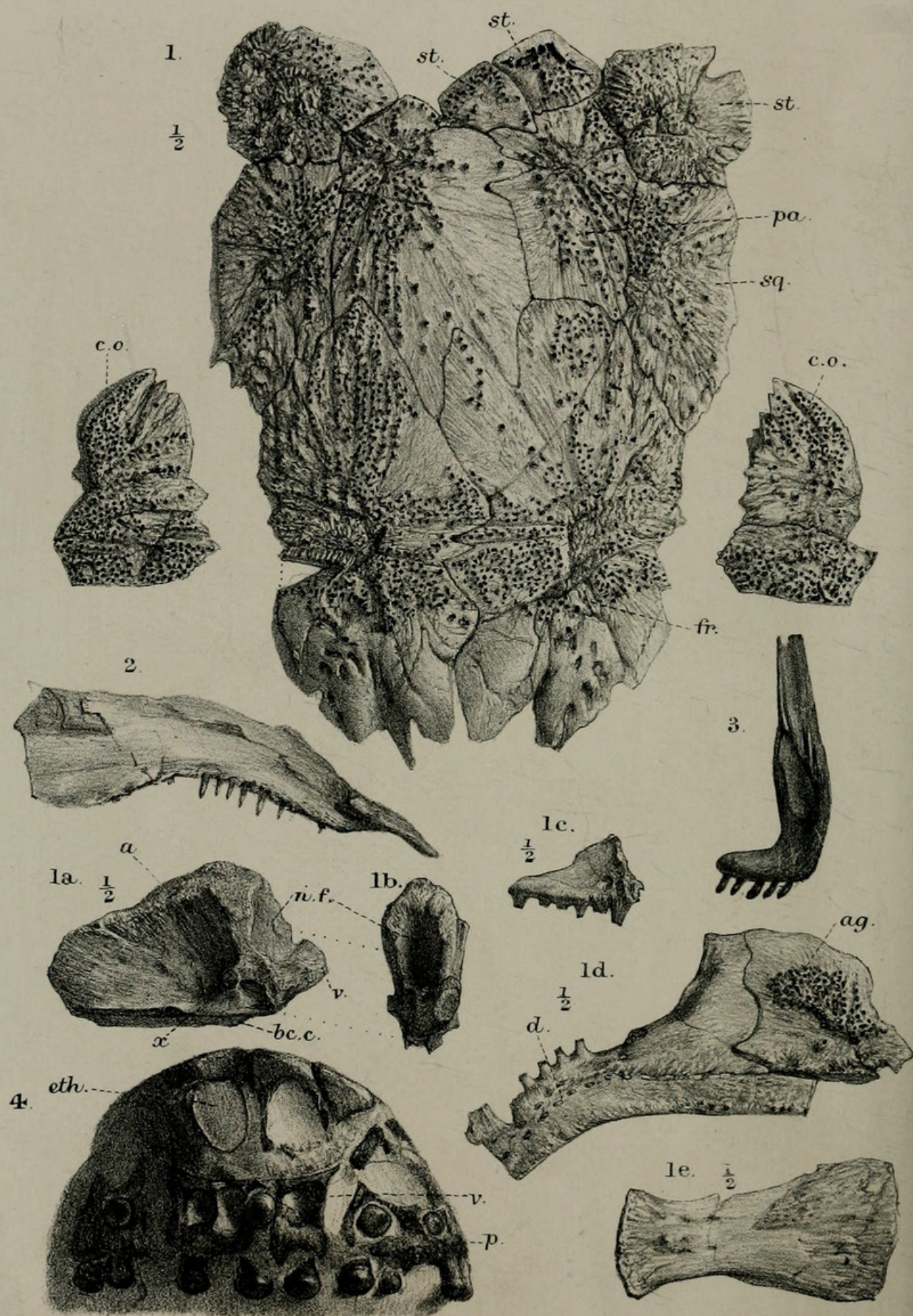








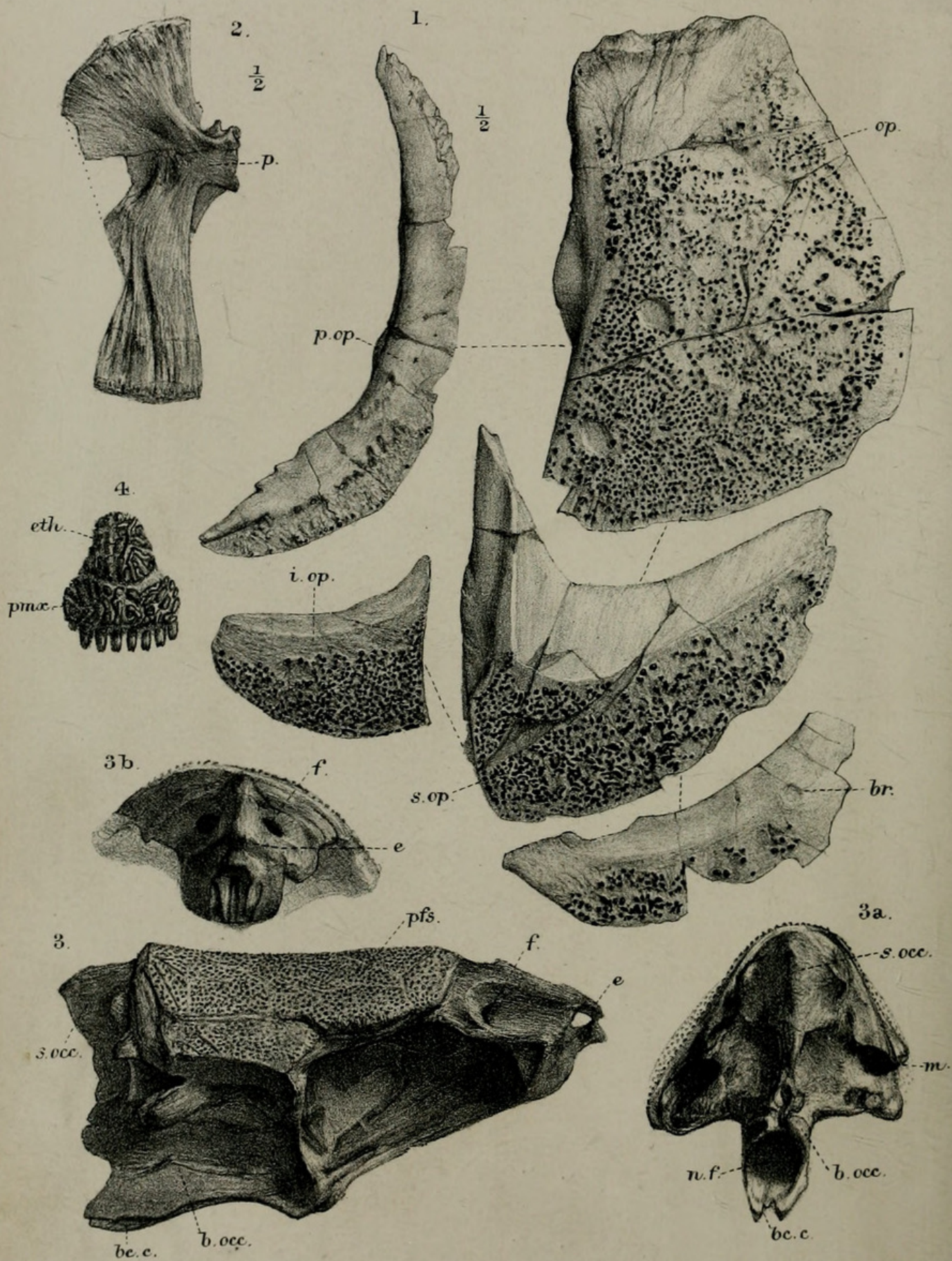












F. H. Michael del. et lith.

Mintern Bros. imp.

MESOZOIC GANOID FISHES.  
1, 2, LEPIDOTUS. 3, 4, DAPEDIUS.



The following is a table of measurements :—

	UPPER DENTITION.		LOWER DENTITION.	
	m.	m.	m.	m.
Width of median dental plates . .	0·13	to 0·135	0·12	to 0·13
Length                    „                    „ . .	0·18		0·014	to 0·016
Maximum width of three lateral series of plates . . . . .	0·02		0·02	

From these measurements it is evident that the principal teeth in the lower jaw are about eight times, those of the upper jaw about seven and a half times as broad as long ; while the maximum thickness of the same teeth in both jaws equals nearly one-quarter of their breadth. These characters, taken in conjunction with the form and proportions of the lateral teeth, suffice to distinguish the Mokattam specimen from the dentition of all known species of *Myliobatis* ; and it may therefore be named *M. pentoni* in honour of its discoverer. In determining such specimens it is, of course, necessary to take into account the mode of growth of the teeth and their change in proportions with age ; but it does not appear possible, in accordance with the ordinary laws of growth, for any known type of dentition to develop by increase of size into the one now described. The form of the lateral teeth and the transverse section of the median teeth seem to be nearly constant at all stages of growth in any one species.

Materials for comparison are unfortunately insufficient to form any certain estimate of the size of *Myliobatis pentoni* ; but if the few small examples of the recent *Myliobatis aquila* in the British Museum are at all similar in proportions, the maximum width of the disk of the extinct species cannot have been much less than five metres.

#### EXPLANATION OF PLATE XLVIII.

Fig. 1. *Myliobatis pentoni*, sp. nov. ; portion of upper dentition, two-thirds nat. size. Lower Tertiary, Mokattam Hills, Cairo. 1 a. Transverse section of crown of median tooth.

2. Ditto ; portion of lower dentition of same fish, two-thirds nat. size. 2 a. Transverse section of crown of median tooth.

The original specimen was presented to the British Museum by Surgeon-Captain R. H. Penton, June 1893.

#### 4. On the Cranial Osteology of the Mesozoic Ganoid Fishes, *Lepidotus* and *Dapedius*. By A. SMITH WOODWARD, F.Z.S.

[Received June 20, 1893.]

(Plates XLIX. & L.)

One of the earliest attempts to describe the skeleton of a Lower Mesozoic fish was based upon *Lepidotus*<sup>1</sup>, and the same genus still affords the most satisfactory material for determining the

<sup>1</sup> F. A. Quenstedt, 'Ueber *Lepidotus* im Lias Württembergs.' 4to, Tübingen, 1847.



essential features in the osteology of the group to which it belongs. The exoskeleton is so robust that it is usually well preserved, and the internal bones also exhibit a high degree of ossification. As found in the Oxford Clay of Northamptonshire and in the Wealden of Sussex, the remains are in an especially good condition; and the discoveries of Messrs. Alfred N. Leeds and Samuel H. Beckles respectively render it possible to obtain information concerning nearly all the more important characters of the skeleton. In the case of one Oxfordian specimen from the Leeds collection in the British Museum (no. P. 6841<sup>1</sup>), all the bones are isolated as if carefully macerated; in others the display of the various elements depends upon accidents in fracture. It is the object of the present communication to describe these specimens so far as they add to our knowledge of the cranial osteology of *Lepidotus*; and finally to compare with the skull of this genus that of the closely related Liassic fish, *Dapedius*.

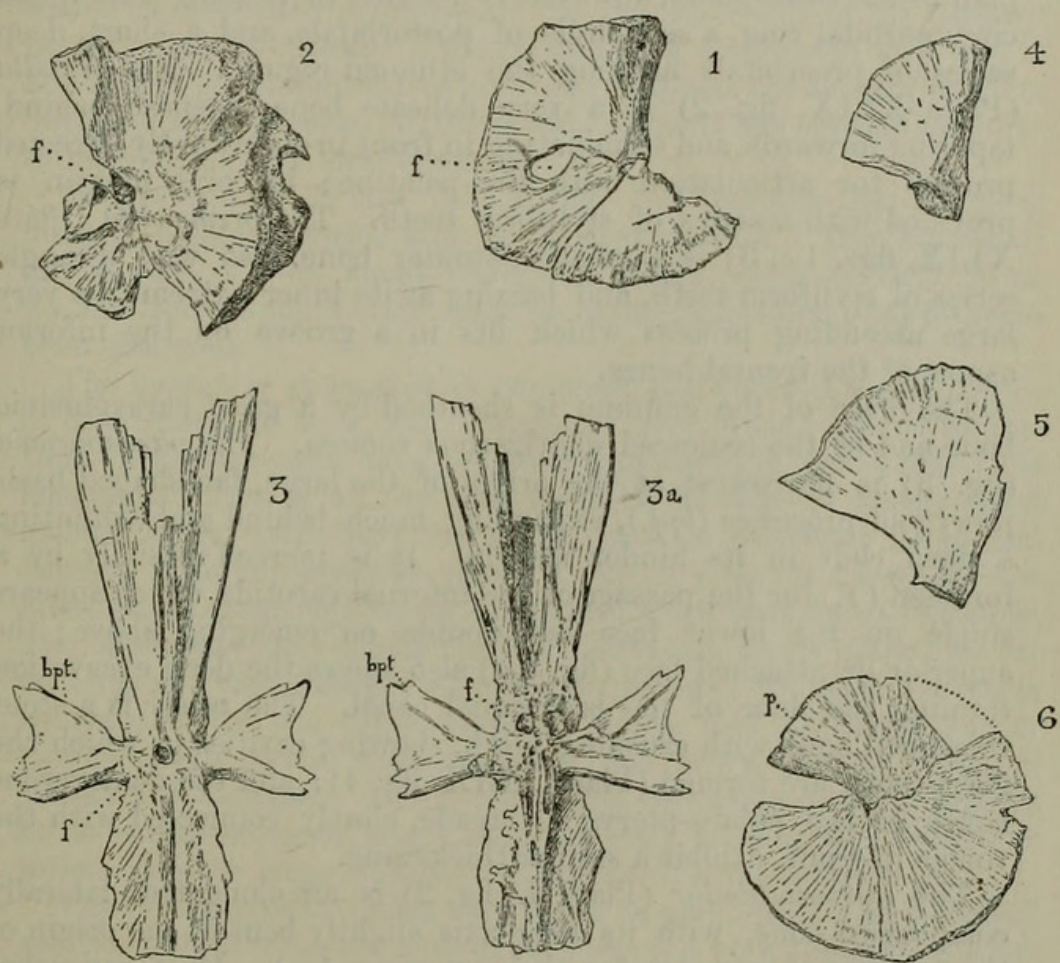
#### I. ON THE CRANIAL, FACIAL, AND OPERCULAR BONES OF *Lepidotus*.

The basicranial axis in *Lepidotus* is straight, and the cranium itself is well ossified. The *basioccipital* element, known only from a laterally compressed specimen (Plate XLIX. figs. 1 *a*, 1 *b*), is highest behind and exhibits on its posterior face a very deep conical fossa for the notochord (*n.f.*). Towards the postero-inferior angle of each side there is a small acuminate tubercle or process (*x*); and the inferior aspect of the bone exhibits a broad longitudinal groove, with a flattened rim on each margin, evidently indicating the backward extension of the basicranial canal (for the recti muscles of the eye) as far as the occiput. There is some appearance also of one vertebral ring (*v.*) being fused with the basioccipital on its hinder face. The *exoccipital* (fig. 1) forms a considerable part of the lateral wall of the brain-case, and is perforated as usual by a large, transversely oval foramen (*f.*) for the exit of the vagus nerve. The *pro-otic* (fig. 2) has a still larger extent than the exoccipital, and exhibits a deep, oblique notch (*f.*) at its anterior margin for the passage of the fifth nerve. In the *interorbital septum* there is as yet no evidence of ossification, and particulars are similarly wanting as to the nature of the *pterotie* and *opisthotic* bones. Of the rostral region it can only be said that the *ethmoids* are arranged in such a manner that the olfactory nerves must have passed through a pair of long, closed canals, well shown in a Wealden fossil in the British Museum (Plate XLIX. fig. 4, *eth.*).

<sup>1</sup> This is the type specimen of a new species, *Lepidotus latifrons*, diagnosed in the forthcoming Catal. Foss. Fishes, Brit. Mus. pt. iii. Its principal distinctive characters are:—External head- and opercular bones ornamented with conspicuous tuberculations; all the teeth with much elevated crowns. Premaxilla with six teeth. Each frontal bone twice as long as its maximum breadth; operculum three times as deep as broad.



The membrane-bones of the cranial roof do not extend backwards quite so far as the occipital border, the narrow space thus left being covered by the supratemporal plates. There are two principal pairs of bones, the short *parietals* (Plate XLIX. fig. 1, *pa.*) behind, and the longer *frontals* (*fr.*) forwards, not bilaterally symmetrical, and uniting in all directions by very irregular angulated sutures. More anteriorly there would be the *nasals*, but



Head-bones of *Lepidotus latifrons*; Oxford Clay, Peterborough.  
One half nat. size.

1. Exoccipital. 2. Pro-otic. 3. Parasphenoid, inferior aspect. 3 a. Parasphenoid, superior aspect. 4. Right quadrate, inner aspect. 5. Left quadrate, outer aspect. 6. Metapterygoid.

*bpt.*, basipterygoid process; *f.*, foramen; *p.*, process.

these are not satisfactorily known. The long and narrow *squamosal* element (*sq.*) on each side reaches as far forwards as the anterior extremity of the parietals, but not so far backwards as the hinder margin of these bones. It is considerably overlapped behind by the supratemporal series of plates, and on the inner



aspect there is an undetermined amount of connection with some of the ossified otic elements. The surface for articulation with the upper extremity of the hyomandibular is clear, and a triangular walled area at the hinder end of its inner face denotes the boundaries of the small temporal fossa. Postfrontal and prefrontal membrane-bones are not differentiated from the circumorbital ring, and the cheek-plates are irregularly subdivided, being often different even on the two sides of the same head. The general plan of the *cheek-plates*, however, is distinct, there being a complete circumorbital ring, a semicircle of postorbitals, and a short, deep series of preorbitals flanking the ethmoid region<sup>1</sup>. The *maxilla* (Plate XLIX. fig. 2) is a very delicate bone, deepest behind, tapering forwards, and terminating in front in an inwardly-directed process for articulation with the palatine; its oral margin is provided with a series of styliform teeth. The *premaxilla* (Plate XLIX. figs. 1 c, 3) is a smaller, stouter bone, also with a single series of styliform teeth, and bearing at its inner extremity a very large ascending process which fits in a groove on the inferior aspect of the frontal bones.

The base of the cranium is sheathed by a great parasphenoid bone and by the coalesced dentigerous vomers. The *parasphenoid* (fig. 3) is narrowest at the origin of the large, fan-shaped basipterygoid processes (*bpt.*), expanding much behind and exhibiting a deep cleft in its hinder margin. It is pierced mesially by a foramen (*f.*) for the passage of the internal carotids, which appears single on the lower face but double on emerging above; the superior or attached face (fig. 3 a) also shows the deep excavation forming the floor of the basicranial canal. The *vomer* is a stout thickened bone with crushing teeth, showing cavities in which the germ-teeth are formed (Plate XLIX. fig. 4); and the dentigerous bones of the palato-ptyergoid arcade, closely connected with the vomer in front, exhibit a similar thickening.

The *hyomandibular* (Plate L. fig. 2) is an elongated, laterally compressed bone, with its long axis slightly bent at the origin of the process of support for the operculum (*p.*). It is somewhat strengthened by longitudinal ridges on the outer face, and the surface for attachment with the cranium is much extended. The bone is not pierced by any foramen. The *symplectic* element remains unknown, but the hinder border of the quadrate exhibits an inner surface evidently for union with it. The *quadrate* (figs. 4 and 5) is slender for a fish with so powerful a dentition, and in the fine example of *Lepidotus latifrons* from the Oxford Clay this element is of much interest as exhibiting a very different degree of ossification on the two sides. The *metapterygoid* bone (fig. 6) is also comparatively delicate, but it shows a broad facette on its upward and anteriorly directed process, which may have articulated with some lateral element of the cranium.

The hinder portion of Meckel's cartilage is ossified as a robust

<sup>1</sup> See figures by Quenstedt, *op. cit.*



*articular* bone, and to its outer face there is apposed a large plate, probably to be interpreted as *angular* (Plate XLIX. fig. 1 *d*, *ag.*). The coronoid region of the mandible is very deep, and the summit of the elevation is completed by a very small *surangular* bone, shown in a Wealden specimen of *L. mantelli* (Brit. Mus. no. P. 6342). The *dentary* bone (*d.*), very deep in the coronoid region, becomes much narrower in its tooth-bearing portion; and its anterior half curves rapidly inwards to meet its fellow of the opposite side in a somewhat deepened symphysis. To the inner side of the dentary bone the robust *splenial* is articulated by a roughened face, and it also enters the mandibular symphysis; whereas the dentary exhibits only one regular series of teeth, this element has several irregular series of a more tritoral character.

The *ceratohyal* (Plate XLIX. fig. 1 *e*) exhibits its ordinary hourglass-shaped form, and is deepest behind. The *hypohyals* are a pair of very small triangular bones (seen in Brit. Mus. no. P. 6341); and no evidence of an ossified glossohyal has hitherto been observed.

The opercular apparatus is complete, and there is a good series of branchiostegal rays, the uppermost very broad; but no indications of a gular plate have yet been discovered in *Lepidotus*. The last-named fact is all the more remarkable, since in closely allied genera (e.g., *Dapedius*) the gular plate is relatively large and robust. The *preoperculum* (Plate L. fig. 1, *p.op.*) is a long narrow bone, exposed throughout its length and much bent forwards below. The *operculum* (*op.*) exhibits a sharp elevation on its inner face for articulation with the hyomandibular process; its upper border is overlapped by the supratemporal plates, and its lower border deeply overlaps the *suboperculum*. The latter element (*s.op.*) is almost sickle-shaped, with a very large upwardly-directed process at its antero-superior angle, and abruptly truncated in front for union with the large elongate-triangular *interoperculum* (*i.op.*)

The *supratemporal* plates vary much in arrangement in different species of *Lepidotus*, but they always overlap both the cranial roof-bones and the most anterior dorsal scales. In *L. latifrons* (Plate XLIX. fig. 1, *st.*) there is one not quite symmetrical pair of outer plates, occupying the space between the operculum, squamosal, and parietal on each side; and there are three symmetrically arranged plates no larger than ordinary scales apposed to the hinder margin of the parietals. In *L. mantelli* the supratemporals are in three pairs, the two outer ones corresponding to the single outer pair in *L. latifrons*. In *L. elvensis*, as already described by Quenstedt, the supratemporal series consists of a single pair of large plates, as in *Amia*.

## II. ON THE CRANIUM OF *Dapedius*.

The Liassic genus *Dapedius* is so closely related to *Lepidotus*, that it is interesting to compare the characters of the skull in these two fishes. So far as the external bones are concerned, the restora-



tion of *Dapedius* already published by Dr. Traquair<sup>1</sup> suffices for the purpose; but the cranium itself is shown only in one specimen from Lyme Regis (Brit. Mus. no. P. 3541), which seems worthy of description as an appendix to the foregoing account of *Lepidotus*.

As seen in side view (Plate L. fig. 3), the basicranial axis of *Dapedius* is sharply bent upwards in front of the otic region—an arrangement perhaps correlated with the deepened form of the fish. As in *Lepidotus*, the cranial cartilage is well ossified, and there seems to have been a complete, or nearly complete, interorbital septum. The *basioccipital* element (*b.occ.*) is deep, much excavated behind for the notochord (*n.f.*), and longitudinally grooved below for the basicranial canal (*bc.c.*). The divisions between the elements of the cranium and the situation of the foramina for the nerves are unfortunately not distinguishable; but it is clear that there was an ossified *supraoccipital* (*s.occ.*), with a vertical median ridge behind, and there are robust ossifications in the *prefrontal* and *postfrontal* regions. The *ethmoidal* region (*e.*) terminates in front in a small blunt process, pierced transversely by a large foramen; and it expands on each side, in advance of and below the prefrontal, into a great mass that would be sheathed by the vomer. The olfactory nerve evidently passed through a foramen (*f.*) between the prefrontal and ethmoid, there being no elongation of this foramen into a canal. Of the membrane-bones of the cranial roof, the *parietals*, *frontals*, and *squamosals* are fused into a continuous plate (*pfs.*); while, as in *Lepidotus*, a narrow rim of the cranium projects behind the covering thus formed. Viewed from behind (Plate L. fig. 3 *a, m.*), there is seen to be a small cavity on each side between the cranium and the squamosal portion of the roof, this being evidently the reduced temporal fossa.

### III. CONCLUSION.

From the observations now recorded it would be premature to make any very general deductions, the characters of the skull having yet to be discovered in the majority of the Mesozoic fishes. The new facts, however, are interesting as tending to confirm a conclusion that must have impressed everyone who has deeply studied these extinct fishes, namely, that it is impossible in Jurassic and early Cretaceous formations to recognize any absolute subdivision of the so-called Ganoids into "Lepidosteoidei" and "Amioidei." The skulls of *Lepidosteus* and *Dapedius* differ from those of existing "ganoids" in exhibiting the backward extension of the basicranial canal; and the cartilaginous cranium of *Dapedius* is remarkably similar in every respect to that of the modern salmon (*Salmo*), except somewhat more ossified. Both *Lepidotus* and *Dapedius* agree with *Lepidosteus* and *Amia* in the fact that the membrane-bones of the roof do not extend quite to the occipital

<sup>1</sup> R. H. Traquair, "On the Structure and Affinities of the Platyosomidae," Trans. Roy. Soc. Edinb. vol. xxix. (1879) pl. vi. fig. 13.



border of the cranium ; but *Dapedius* at least is distinguished from *Amia* and approximated to *Lepidosteus* by the course of the olfactory nerves across the orbital cavity, while *Lepidotus* is paralleled only by the last-named genus in the absence of a gular plate. On the other hand, the superficial bones of the two extinct genera differ greatly from those of *Lepidosteus* and closely resemble those of *Amia* ; the peculiar attachment of the premaxilla in *Lepidotus*, for example, being reproduced almost in detail in the last-named genus.

## EXPLANATION OF THE PLATES.

## PLATE XLIX.

- Fig. 1. *Lepidotus latifrons*, sp. nov. ; cranial roof, upper aspect, one half natural size. Oxford Clay ; Peterborough. [B.M., no. P. 6841.]  
*c.o.*, circumorbital ; *fr.*, frontal ; *pa.*, parietal ; *sq.*, squamosal ; *st.*, supratemporal.  
 1 *a, b.* Basioccipital, lateral and posterior aspects.  
*a*, surface of attachment for lateral bones of cranium ; *bc.c.*, basi-cranial canal ; *n.f.*, notochordal fossa ; *v.*, supposed vertebra ; *x*, lateral process.  
 1 *c.* Right premaxilla, showing base of ascending process.  
 1 *d.* Portion of left mandibular ramus, outer aspect.  
*ag.*, angular ; *d.*, dentary.  
 1 *e.* Ceratohyal.  
 2. Ditto ; right maxilla. Ibid. [B.M., no. P. 6838.]  
 3. *Lepidotus minor*, Ag. ; right premaxilla. Purbeck Formation ; Swanage. [B.M., no. 48371.]  
 4. *Lepidotus mantelli*, Ag. ; transverse section of snout. [B.M., no. P. 6342.]  
*eth.*, canal through ethmoid bones ; *p.*, palato-pterygoid arcade ; *v.*, vomer.

## PLATE L.

- Fig. 1. *Lepidotus latifrons*, sp. nov. ; opercular apparatus of left side, one half natural size. Oxford Clay ; Peterborough. [B.M., no. P. 6841.]  
*br.*, branchiostegal ray ; *i.op.*, interoperculum ; *op.*, operculum ; *p.op.*, preoperculum ; *s.op.*, suboperculum.  
 2. Ditto ; hyomandibular, one half natural size. Ibid. [B.M., no. P. 6840.]  
*p.*, process for operculum.  
 3. *Dapedius*, sp. ; cranium from the lateral, posterior (3 *a*), and anterior (3 *b*) aspects. Lower Lias ; Lyme Regis. [B.M., no. P. 3541.]  
*b.occ.*, basioccipital ; *bc.c.*, basiscranial canal ; *e.*, ethmoidal region ; *f.*, foramen for olfactory nerve ; *m.*, temporal fossa ; *n.f.*, notochordal fossa ; *pfs.*, parieto-fronto-squamosal shield ; *s.occ.*, supra-occipital.  
 4. *Dapedius granulatus*, Ag. ; premaxillæ (*pmx.*) and ethmoidal dermal plate (*eth.*), anterior aspect. Lower Lias ; Lyme Regis. [B.M., no. P. 3538.]

B.M.=British Museum. Unless otherwise stated the figures are of the natural size.



5. A List of the Coleoptera, of the Family *Cleridæ*, collected by Mr. Doherty in Burmah and Northern India, with Descriptions of new Species; and of some Species from Borneo, Perak, &c., from the Collection of Alexander Fry, Esq. By Rev. H. S. GORHAM, F.E.S., F.Z.S., &c.

[Received June 17, 1893.]

The present paper is to some extent a sequel to one published by me in the 'Annals' of the Genoa Museum in 1892, on the *Cleridæ* collected by Signor L. Fea.

The great number of new species met with by Mr. Doherty in the same genera shows how rich the north-east frontier district must be in the beautiful and interesting family here treated of.

For general remarks on the genera I must refer to the account of Mr. Fea's collection, the subject matter being so very similar.

Twenty-eight species are now described as new.

CALLIMERUS DULCIS.

*Clerus dulcis*, Westw. P. Z. S. 1852, p. 40, t. 24. f. 6.

*Callimerus dulcis*, Gorh. Cist. Ent. 1876, p. 64; Ann. Mus. Gen. ser. 2, xii. p. 722.

Burmah, Momeit.

CALLIMERUS AMABILIS.

*Callimerus amabilis*, Gorh. Cist. Ent. 1876, p. 66; Ann. Mus. Gen. 2, xii. p. 723.

Assam, Naga Hills.

CALLIMERUS MIRANDUS.

*Callimerus mirandus*, Gorh. Cist. Ent. 1876, p. 65.

Perak.

A very beautiful species. Five specimens.

CALLIMERUS SUAVIS.

*Callimerus suavis*, Gorh. Ann. Mus. Gen. 2, xii. p. 722.

N. India, Manipur.

CALLIMERUS ELEGANS.

*Callimerus elegans*, Gorh. Ann. Mus. Gen. 2, xii. p. 720.

Assam, Naga Hills. One specimen, in bad condition.

CALLIMERUS GRACILIS.

*Callimerus gracilis*, Gorh. Mus. Gen. 2, xii. p. 724.

Burmah, Momeit. Two examples.



## CALLIMERUS LATESIGNATUS.

*Callimerus latesignatus*, Gorch. Ann. Mus. Gen. 2, xii. p. 728.  
Assam, Naga Hills. Two examples.

## CALLIMERUS RUSTICUS.

*Callimerus rusticus*, Gorch. Notes from Leyden Mus. v. p. 252  
(1883).

Borneo, Labuan; Perak. Five examples.

## CALLIMERUS LATIFRONS.

*Callimerus latifrons*, Gorch. Cist. Ent. 1876, p. 67.

Borneo, Pengaron; Perak. One example from each locality.

## CALLIMERUS INSOLATUS.

*Lemidia insolata*, Pascoe, Journ. of Ent. i. p. 48.

*Callimerus insolatus*, Gorch. Cist. Ent. 1876, p. 67.

Assam, Patkai Mountains, Perak.

## TILLUS BIRMANICUS.

*Tillus birmanicus*, Gorch. Ann. Mus. Gen. 2, xii. p. 729.

Assam, Sudiya.

## TILLUS NOTATUS.

*Tillus notatus*, Klug, Mon. Abhand. Berl. Acad. 1842, p. 276.

Burmah, Ruby Mines; Assam, Sudiya.

Var. *Prothorace elytrisque nigris, his fasciis duabus apiceque albidis.*

Burmah, Karen Mountains.

## CLADISCUS SANGUINICOLLIS.

*Tillus sanguinicollis*, Spinola, Mon. Clérites, i. p. 125, tab. xv. f. 7; nec *Cladiscus sanguinicollis*, Lac. Gen. des. Col. tab. 45. f. 4.

Assam, Patkai Mountains (*Doherty*); Andaman Islands (*Roepstorff*); Burmah, Karen Mountains (*Fea*).

This is the insect referred to by me as *C. strangulatus*, Chevr. (Ann. Mus. Civ. Gen. 2, xii. p. 730); considerable confusion has occurred from M. Chevrolat having quoted *T. sanguinicollis* as a synonym of his *C. strangulatus*, Lacordaire having figured what is presumably that species under the name of *Cladiscus sanguinicollis*. They are obviously quite distinct from the species figured by Spinola. Although it is but a mutilated specimen that Spinola had seen, enough is shown to prove that his insect had simply serrate antennæ.

## TILLICERA JAVANICA.

*Tillicera javanica*, Spin. Mon. i. p. 160, t. 12. f. 2; Gorch. Ann. Mus. Gen. 2, xii. p. 731.

Burmah, Ruby Mines; Assam, Sudiya; India, Manipur.



## HEMITRACHYS BIZONATUS.

*Hemitrachys bizonatus*, Gorh. Cist. Ent. 1876, p. 92.

Perak (*Doherty*). One example.

I have not seen any other specimens of this insect, since I described it from a pair obtained by Wallace.

STIGMATIUM. (The species of *Stigmatium* are exceedingly obscure and will need further revision.)

## STIGMATIUM CICINDELOIDES.

*Stigmatium cicindeloides*, Gray in Griffith's Anim. Kingd. i. p. 376, t. 43. f. 2; Spin. Mon. i. p. 176, t. 13. f. 4.

The identification of these insufficiently described species must necessarily be problematical. There is little doubt, however, that the insect figured by Spinola is the species of which I have seen many specimens from Malacca, Java, and the neighbouring islands. The blue or green tint on the thorax shown by Spinola is not constant, but is characteristic of the species when it occurs.

Perak.

## STIGMATIUM RUFIVENTRE.

*Stigmatium rufiventre*, White, Cat. of Cleridæ in Brit. Mus. p. 54 (1849); Westw. Proc. Zool. Soc. 1852, p. 45, t. 26. f. 5 (" *Clerus rufiventris*").

Very close to *S. cicindeloides*, larger and with the metasternum and abdomen and base of the legs red: the original description is White's. Possibly only a large form of a widely distributed species.

Assam (*Doherty*).

## STIGMATIUM MUTILLÆCOLOR.

*Tillicera mutillæcolor*, White, Cat. of Cleridæ, p. 51.

*Stigmatium dimidiatum*, Chev. Rev. et Mag. de Zool. 1874, p. 63.

*Stigmatium mutillæcolor*, Gorh. Cist. Ent. 1876, p. 72; Ann. Mus. Gen. 2, xii. p. 740.

Burmah, Momeit.

## STIGMATIUM BASIPENNE.

*Stigmatium basipenne*, Chevr. Rev. et Mag. de Zool. 1874, p. 64.

*Stigmatium humerale* (ined.), coll. W. W. Saunders.

Perak (*Doherty*); many specimens.

Singapore (*Wallace*).

The general colour of this insect is deep black; the middle of the body beneath is vaguely brownish red; the front of the head, basal half of the antennæ, the reflexed margin of the base of the thorax, the base of the elytra (the shoulders more widely), the scutellum, the front tarsi, the tips of the middle and posterior tarsi, and the trochanters are rusty red. The elytra are striated nearly to the apex, becoming granulose there; and the interstices



are granulose, or rather are broken by the coarse punctures of the striae in the basal half.

I have possessed this species for many years, under the name *humerales*. M. Chevrolat's description is not very accurate, as in a very long series of examples I do not find any with two linear grey fasciæ. The legs are black, with the exceptions which I have pointed out; the femora are not more stout than is usual in the smaller species of this genus. The application of the name *humerales* came about by a reprehensible system of so labelling species which it was intended to describe; my specimens were probably so named by White for the late Mr. W. W. Saunders, and it is well that that name should now drop for that of M. Chevrolat. It is common apparently at Singapore and Perak.

#### STIGMATIUM TAPETUM.

*Stigmatium tapetum*, Gorh. Cist. Ent. 1876, p. 95.

*Omadus nebulosus*, Klug?, Spin. Mon. ii. p. 133, t. 15. f. 6.

I have already (*l. c.* p. 101) suggested that these may be, and probably are, synonyms, but in such an obscure genus I cannot affirm that they are so.

Perak.

#### CLADISCUS DISTORTUS, n. sp.

*Niger, prothorace obscure rufo; capite crebre, thorace parcius, elytris crebre cribrato-punctatis, apice lævi; antennis articulis 3<sup>o</sup>-10<sup>m</sup> ramulis longis a basi exorientibus, apicali subulato; tibiis anticis compressis, medio subincrassatis. Long. 9½ millim.*

*Hab.* Camboja.

Black with a slight brown tint, and clothed with long upright hairs; only the thorax is rufous, and the mandibles and two basal joints of the antennæ pitchy red. The thorax is not so conically contracted as in *C. sanguinicollis*, Spin. (to which I refer the species from the Andaman Isles), but the sides are subparallel till they are rounded in to the strangulation. Its disk is very smooth and sparsely impressed with a few distinct points; it is a little depressed in the middle, but with no constricted line in front. The antennæ are remarkable for the mode in which the rami spring from the base of each joint; each ramus is as long as three joints, and the apical joint widens from its base to near the middle, and from thence is awl-shaped. The basal node of the thorax is black and has the usual double tumidity; the front tibiae are compressed, widened in the middle, and somewhat distorted.

One specimen in Mr. Fry's collection.

#### CLADISCUS ATTENUATUS, n. sp.

*Fere filiformis, niger, antennis quam caput cum prothorace sesquilogioribus, articulis 3<sup>o</sup>-10<sup>m</sup> leviter serratis, elytris cribrato-striatis apice levioribus, callo humerali rufo. Long. 6-6½ millim.*

Var. ♀? *antennis brevioribus, prothorace obscure rufo.*

*Hab.* Burmah, Ruby Mines: Manipur (*Doherty*).



Very narrow, the elytra scarcely wider than the front of the thorax, the latter and the head both thickly and obsoletely punctured, brownish black inclining to rusty red at the constricted part. The antennæ with the joints 3 to 10 nearly three times as long as wide, the apical joint rather longer than those preceding it; palpi black. Elytra black, excepting the extreme humeral angle which is dull red, and a little shining. Legs and body black.

Allied to the species recently described by Mr. G. Lewis from Japan as *C. obeliscus*, but apparently differing by the longer antennæ, black scutellum and breast, and by the red shoulder-spot. The specimens which seem to have shorter antennæ, and which may be females, have also often the thorax red excepting the basal nodule.

*CLADISCUS RUFICORNIS*, n. sp.

*Elongatus, sanguineo-rufus, elytris et corpore nigris; nitidus, capite prothoraceque parcissime minute punctatis, antennis his brevioribus leviter serratis. Long. 8-9 millim.*

*Hab. Manipur (Doherty).*

Very shining and smooth, the head rather large, and with the base of the thorax of about the width of the elytra, sparingly punctured; the thorax much narrowed to the stragulate part, and with a distinct curved impressed line in front.

The antennæ are rather wide, entirely clear red; the joints (after the third) scarcely longer than wide, serrate, their length is not greater than that of the thorax alone. Elytra with series of elongate square punctures terminating at quite a third from the apex; the apex round, a little dehiscent.

Two specimens.

*CALLIMERUS DECORATUS*, n. sp.

*C. dulci proxime affinis: nigro-cæruleus, nitidus; prothoracis maculis quatuor et lateribus, scutello, elytrorum maculis quatuor in singulis, a sutura æque distantibus, tertia reniforme; corporisque lateribus albo-squamosis; ore, antennis, palpis pedibusque pallidis. Long. 11 millim.*

*Hab. Assam, Naga Hills (Doherty).*

This insect is very nearly allied to *C. dulcis*, Westw., in size, form, punctuation, and also in marking, so that it will be sufficient to point out the following points of difference:—In *C. dulcis* there are two large, round, white spots (one on each elytron) rather near their base, in *C. decoratus* the corresponding spots are rather further removed; in *C. dulcis* two small spots nearer the margin follow, in *C. decoratus* these are absent; in *C. dulcis* the pair of spots before the apical spots are clearly double, sometimes not confluent, in *C. decoratus* the same pair are at most reniform. The hind femora are not dark at their apex in the three specimens of *C. decoratus* now before me.



## CALLIMERUS MYSTICUS, n. sp.

*C. amabili*, Gorh., *proxime affinis: nigro-cæruleus, griseo-squamosus; prothorace, linea mediana et lobis lateralibus denu-  
datis, lævibus; elytris nigris, griseo-squamosis, macula elongata  
suturali communi, lateribus maculis quasi quatuor præbentibus  
nigris, prima ad punctum parvulum juxta scutellum producta,  
tertia in fasciam integram ad suturam angustam provectam,  
quarta retrorsum obliqua. Pedibus flavis, femoribus posticis  
apicibus extus nigris. Long. 11 millim.*

*Hab.* Borneo, Pengaron (*Doherty*).

It will be sufficient to compare this insect with *C. amabilis*, Gorh. The prothorax is smooth, not punctured. The scales of the upperside are more greenish grey; the pattern is very different, very difficult to describe. The base of the elytra, a plagia running obliquely outward from the scutellum, and a fascia-like spot form by their union an intricate device in the basal half; while an oblique fascia, triangular in shape, and a sutural line, widening at the apex, form a sort of 7 on the left elytron, reversed of course, on the right, somewhat similar to the mark in *C. amabilis* and *C. fææ*, but with the head more oblique. The single specimen appears to be a male, and has the apical dorsal segment formed of two wide laciniae of fulvous colour.

## CALLIMERUS BELLUS, n. sp.

*Nigro-cæruleus; antennis, palpis pedibusque testaceis; capitis  
fronte, prothoracis margine antico et postico, elytrorum basi,  
lunula humerum cingente, fascia pone medium cum lunula per  
lineam rectam conjuncta, sutura postice in fasciam obliquam  
desinente, albo-squamosis. Capite crebre obsolete, prothorace  
fortiter parcius, elytris fortiter seriatim punctatis. Long. 8  
millim.*

*Hab.* Borneo, Pengaron (*Doherty*).

The pattern of this *Callimerus* is difficult to describe, but very neatly defined. The thorax is widely margined with white scales before and behind, leaving the middle and the sides denuded and shining, but the bands of scales nearly meet round the sides; the colour of the parts not covered with scales is dark steel-blue; on the elytra are eight areæ thus denuded, viz. two humeral, then three oblong areæ in a row transversely, two of them being lateral and one common on the suture, then two lateral, then a small round apical spot. These are all neatly defined by the white lines of scales. The elytra in some examples appear nearly black; the punctures are large, the rows not very distinct, and quite confused at the sides and near the apex. The underside is clothed in the manner usual in this section of the genus, densely at the sides, with white scales.

This is a very beautiful species; it is allied to the following (*C. niveus*), and both remind me of *C. ornatus*, from Sumatra (Notes from Leyden Mus. iv. 110).



## CALLIMERUS NIVEUS, n. sp.

*Nigro-cæruleus; antennis, palpis pedibusque pallide testaceis; capitis fronte, prothorace antice et postice, scutello, elytrisque albo-squamosis, his areolis quinque fascia subapicali, apiceque denudatis. Long. 8 millim.*

*Hab.* Perak (*Doherty*).

This species is punctured as *C. bellus*, but is more densely clothed with white scales, only the base of the head and the disk and a narrow transverse band of the thorax are denuded, and the elytra have a very elegant pattern, the bare parts being a subhumeral spot on each, a common sutural one, then two lateral spots, a rather wide and not very regular fascia, it being widest on the margins, and an apical spot. The elytra have silvery-white hairs over the whole surface; they are distinctly obliquely truncate, and their punctuation is distinctly in rows, almost striate. I cannot discover any trace of the small tooth on the hind tibiæ of this or the preceding species.

Four specimens.

## CALLIMERUS DOHERTYANUS, n. sp.

*Niger; capite prothoraceque subcæruleis, hoc antice et postice, illo fronte parce albo-squamosis; elytris singulis lituris duabus, una humerum cingente, irregulari, postice interrupta, altera ante apicem, albis, sutura basi metallico-fulvo; antennis, palpis pedibusque pallide testaceis. Long. 8 millim.*

*Hab.* Perak (*Doherty*).

## CALLIMERUS PICTUS, n. sp.

*Niger; antennis, palpis pedibusque testaceis; capitis fronte, prothoracis margine antico et postico, elytrorum basi, punctis duobus lateralibus, gutta suturali, cum macula basali plerumque connexa, fascia subapicali apiceque albo-squamosis. Prothoracis disco obsolete, haud profunde, lateribus rugose, elytris fortiter irregulariter punctatis. Long. 8 millim.*

*Hab.* Assam, Patkai Mountains (*Doherty*).

The head in both this and the following species (*C. albosparus*) is wider than the thorax, the eyes being large and prominent; it is very finely punctured at the base, and finely wrinkled longitudinally near the eyes in both. The thorax is rather suddenly widened below the anterior constriction, and then compressed before the base, the margin of which is distinctly reflexed. The elytra are thickly and deeply punctate, but there is no sign of series or striation; they are very obsoletely costate, and obliquely truncate. The usual lateral parts beneath are covered with white scales.

Two specimens.

## CALLIMERUS ALBOSPARSUS, n. sp.

*C. picto affinis, statura et elytrorum pictura similis; nitidior, niger, antennis, palpis pedibusque testaceis, prothoracis elytrorum*



*umque pictura ut in C. picto, attamen paulo latius disposita, et fascia subapicali e maculis duabus oblique positis, interiore majore et basi propiore formata. Long. 8 millim.*

*Hab.* India, Manipur (Doherty).

The points which chiefly distinguish this species from *C. pictus* are its rather smaller size, the head and thorax, the latter especially, more sparsely and more distinctly punctured, and hence more shining. The punctures of the elytra exhibit a little serial arrangement in the middle. The apices are very distinctly truncate, a small mucro being present at the exterior angle. The pattern of the elytra, though very similar, presents a specific difference, and gives the appearance of consisting of three sutural rather large spots,—one basal, the second not united with it, but sometimes united by a few scales to the third (which is the interior spot of the oblique subapical fascia),—three lateral spots (the first two corresponding to those in *C. pictus*, and the third usually but not always united with the third sutural one), and an apical spot.

Four examples from Manipur agree so closely in possessing these differences, that I think this is more than a local form of *C. pictus*.

In both these species the small tooth near the apex of the hinder tibiæ is present.

#### CALLIMERUS BENEDICTUS, n. sp.

*Niger, nitidus; antennis, palpis pedibusque testaceis; capitis fronte densissime, prothoracis basi parce, elytrorum basi tenuiter, puncto, suturali fasciisque duabus subarcuatis, nec suturam nec marginem attingentibus, apiceque albo-squamosis; capitis basi parcissime, prothorace fortiter fere grosse, elytris fortiter profunde seriatim punctatis. Long. 8.5 millim.*

*Hab.* Assam (Doherty).


The thorax in this species is longer than in *C. pictus* and its allies, and hence does not appear so much widened in front; it is much more coarsely punctured, and in the three specimens before me has only a few white scales in the fossa on the sides formed by their compression behind the middle. The scales are of course liable to be worn off; the head in one of the specimens is so densely clothed in front that the whole of that part is white and shining as if painted, while in the other two they are sparser. The elytra are black and shining, with about five rows of large punctures on each, the punctures, however, becoming confused towards the apex and at the sides, they would form in all eight series; in one specimen they are inclined to be pitchy brown at the base. The white markings are very much reduced; besides the usual basal scales there are three spots on each elytron, two of which are placed along the suture, the third a little higher than the second sutural one, so forming (if united) an arcuate fascia, then a curved oblique fascia, and an apical spot (sometimes wanting). Hind thighs toothed. Apex subtruncate.



## CALLIMERUS ARCUATUS, n. sp.

*Niger*; palpis (apicibus exceptis) pedibusque basi obscure testaceis; capite, prothorace elytrisque apicibus cinereo-tomentosis; scutello, elytrorum basi, linea obliqua cum hoc conjuncta, fascia intus abbreviata, arcua communi, et fascia subapicali recta albo-squamosis; elytris basi fortiter, lateribus et versus apicem crebrius minus fortiter punctatis. Long. 9 millim.

*Hab.* Burmah, Karen Mountains (*Doherty*).

The head and thorax in this species are almost entirely covered with ashy-grey close hairs, resembling scales, and perhaps in part really these are scales; the thorax is very even, scarcely constricted in front, and with the posterior part very gently rounded to the base, the margin is there raised and polished in the middle, and there is a small denuded mark in the centre of the base, before the margin slightly impressed. It is half as long again as wide. The pattern of the elytra is very elegant, but hard to express in words. The basal scales and first oblique mark form an *x*, with the top straight, then almost united to this is a mark like , the *u* being common to the two elytra; then a straight and entire fascia at about one third from the apex, slightly thickened on the suture, and the apex itself ashy, and the ashy scales joining the fascia. Legs black, except the trochanters and extreme base of the thighs.

Four specimens.

## CALLIMERUS HYDNOCEROIDES, n. sp.

*Nigro-cæruleus, nitidus*; ore, antennis, palpis pedibusque testaceis; elytris nigris, dimidio basali intus aureo-testaceo, sutura postice punctisque nonnullis albo-squamosis; capite prothoraceque parce et profunde, elytris obsolitus crebre punctatis. Long. 8.5-9 millim.

*Hab.* Burmah, Ruby Mines (*Doherty*).

Head blue-black, with white scales in front, very sparingly punctured and shining; thorax strongly constricted, and widely lobed at the sides, an impression on each lobe, and one in the middle of the base which is smooth and polished; there are a few white scales on each side in the anterior constriction, the colour is blue-black, the punctuation strong and distinct. The elytra are depressed at their base, black or brownish, this colour extending up the margin to the base, but of a sordid yellow within (the suture narrowly dark) and almost to their apices. The white scales border the suture sometimes in the apical half. In the basal half there are normally six white spots, four in pairs near the suture and between them, one nearer the margin on each elytron on the black part, and there is one lateral subapical spot, sometimes joined with the sutural scales, forming the 7 mark so common in this genus. But these spots are feebly scaled and liable to be worn off, and the central pair may be absorbed in the sutural line. Scutellum white. The hind thighs have the small tooth near their apices. The underside is blue-black, with the



usual lateral white scales. The wide head, lobed sides of the thorax, and form of the elytra, depressed at the base and narrowing to their apex, give this species much the appearance of a large *Hydnocera*.

XENORTHRIUS, Gorham (Ann. del Mus. Civ. Gen. xii.  
p. 733, 1892).

*Xenorthrius* is proposed by me, in my descriptions of the Cleridæ collected by L. Fea in Burmah, for a genus of that family of which I have long had a few exponents obtained by Wallace in the East. They are allied to *Opilo* and to my genus *Orthrius*; from the former the conical apical joint of the maxillary palpi, from the latter the eyes distinctly cut out afford sufficient distinction. *X. mouhoti*, from Laos and Burmah, the type of the genus, *X. subfasciatus*, from Pegu, and *X. balteatus*, Burmah, described in the publication quoted, have the elytra entire; I have now to add two species of this section, and one in which the elytra are truncate with a distinct mucro, the genus thus resembling *Priocera*.

XENORTHRIUS EPHIPPIATUS, n. sp.

*Pallide piceo-brunneus, breviter dense brunneo-pilosus; palpis, pedibus, elytrorum fascia communi undata ad suturam latiore apiceque pallide flavis; prothorace antice et lateraliter vix punctato, disco postice obsolete, crebre subrugose, elytris basi et lateribus granulose punctatis, fascia et apice sublævibus. Long. 8-9 millim.*

*Hab.* Assam, Patkai Mountains (*Doherty*).

The general colour of this insect is pitchy brown, the elytral fascia and the apex being very pale, almost white, and the brown of the parts margining these is more suffused indeterminately; the puncturing is similar to that of *X. mouhoti*, viz. the head is nearly smooth, as well as the front part and rather tumid sides of the thorax; these parts are separated from the disk by the anterior constriction and an impressed line on each side, and the disk is thickly, not deeply or strongly, punctured: as this structure seems usual in the genus, it will not be referred to again except where modified in other species. The elytra have also a normal sculpture, viz. striæ with rasp-like puncturing, the interstices being flattened in the middle and from thence on each side of the suture to the apex, and the punctures obliterated. The punctures are only distinct in the basal third; they become obsolete and only leave small rasp-like edges behind, and in that part the alternate interstices are raised lines, hardly amounting to costæ.

Three specimens.

XENORTHRIUS GENICULATUS, n. sp.

*Brunneus; pedibus pallidioribus, geniculis nigris, tarsis brunneis, capite prothoraceque nitidis, hoc disco crebre obsoletius punctato;*



*elytris obsolete punctato-striatis, striis dorso oblitteratis. Long. 13-16 millim.*

*Hab.* Manipur (*Doherty*).

The larger size and plain brown colour will distinguish this species from any other yet described. The antennæ are long and thin, the three last joints hardly wider than those preceding them; the head and thorax smooth and shining, with the punctuation very fine; the anterior constriction very plain on the sides, and a fovea on each side below it. The elytra are very plain; though the usual sculpture is present it is all reduced, the flat sutural smooth space being but little emphasized. The legs are paler, with the knees just tipped with black. Although plain this is a fine species, reminding one of certain *Cymatoderæ*.

Five specimens.

*XENORTHRIUS WALLACEI*, n. sp.

*Nigro-piceus; antennis, palpis, pedibusque basi testaceis, elytris pallide variegatis, prothorace inæquali, nitidiore vage punctulato, basi in medio tuberculo parvo, elytris basi et lateraliter subrugose punctato-striatis. Long. 8.5 millim.*

*Hab.* Borneo, Sarawak (*Wallace*).

Nearly allied to *X. ephippiatus* and differing from it as follows: the colour is darker, the thorax is more shining and more uneven and its disk less thickly and more vaguely punctured, on each side of a basal median tubercle are two sulci, thus making three raised tumid spaces; the elytra are more coarsely punctured and the yellow markings not so clearly defined, the apical one being an undulate fascia, and the apex being dark, like the rest of the ground-colour.

One specimen.

I have had this insect for many years and have never been able satisfactorily to classify it. It was unknown to the late M. Chevrolat, to whom I sent it.

*XENORTHRIUS TRUNCATUS*, n. sp.

*Rufopiceus, nitidus; pedibus et fascia elytrorum haud bene discreta pallidioribus, elytris truncatis et mucronatis. Long. 12 millim.*

*Hab.* Assam, Patkai Mountains (*Doherty*).

This species is longer though not much wider than the largest specimen of *X. ephippiatus*; the antennæ are much longer, all the joints, and especially the three terminal ones, being longer; the thorax is more shining, the posterior part more sparingly and obsoletely punctured. The elytra have the flattened space not so wide, the third row of punctures persisting further towards the apex; their fascia is not so well marked nor so white, being very little paler than the ground-colour. The apex is cleanly cut out in an arcuate way, with a distinct mucro at the outer angle of this excision. The legs are long, pale, with the knees and tarsi a little darker.

One example.



## ORTHRIUS, Gorham (Cist. Ent. 1876, p. 74).

*Orthrius* was proposed by me for an Australian species (*O. cylindricus*), a smooth cylindrical insect with only the labial palpi hatchet-shaped at the tip, and the eyes coarse, scarcely cut out. I have since then recognized that many Eastern species placed in various genera should be united with it, though not often so cylindrical. *Clerus subfasciatus*, Westwood, *Thanasimus sellatus*, Westwood, *Opilo sinensis*, Gorh., and probably some others cannot be retained in those genera, but will form a homogeneous group under this name.

## ORTHRIUS BRACHIALIS, n. sp.

*O. tarsali*, Gorh., *affinis et summa similitudine, ferrugineus, nitidus, tibiis geniculisque nigris, elytris substriatis perobsolete punctatis*. Long. 10 millim.

*Hab.* Assam, Sudiya, Naga Hills, Patkai Mountains (*Doherty*).

Very closely allied to *O. tarsalis*, described by me in the 'Annals' of the Genoa Museum of Natural History for 1892, a species from Burmah, and only differing from it in having merely the tips of the femora and the tibiæ black, whereas in *O. tarsalis* the femora and breast are also black.

The striation and punctuation of the elytra are a little more distinct. The specimen from the Nagas has the antennæ a little more infusate, and in both it and the other specimens the tarsi have their uppersides dark. A single example from Patkai is not well developed and has the tibiæ red, being, in fact, ferruginous all over, but does not, I think, represent another species.

The femora in this species and its allies are subincrassate, especially the front pair.

## THANASIMUS CARBONARIUS, n. sp.

*Ater; antennarum articulo ultimo, femorumque basi albo-testaceis, prothorace tuberculoso-inæquali, elytris basi granulatis tuberculisque nonnullis seriatim instructis, dimidio apicali sublævi, versus apicem fascia argenteo-pubescente ad suturam interrupta*. Long. 8 millim.

*Hab.* Manipur (*Doherty*).

Coal-black, a little shining; eyes finely granulated, deeply and angularly excised; antennæ longer than the head and thorax, dull and pubescent, compressed, the three basal joints pitchy, the apical joint acuminate, nearly white, and the one preceding pale, the second joint very short, the third as long as the two basal joints, those following gradually increasing in width, not serrate. The thorax longer than wide, very rugose and uneven, having several tubercles, one of which before the middle of the base is round and shining. Elytra not much wider than the thorax, their basal third very rough, with two rows of elongate sharp tubercles on each, very irregular and often coalescing, the apex smooth, with an oblique fascia-like band of silvery hairs at about a quarter from the apex; a few scattered hairs are found all over the elytra,



the apex is subpubescent, but smooth and shining. The meso-sternum is strongly punctured; metasternum and episterna clothed with short pubescence, but very thinly. Abdomen shining. The palpi are pitchy, the maxillary ones paler at their tips, which are sharply acuminate.

I have some doubts as to what genus this insect is best placed in. *Thanasimus*, as it now stands, is a complete magazine. Comparing this insect with *T. formicarius*, the antennæ are rather long, and are in the middle wider and flatter, the apical joint rather larger and less cultriform; the head, trophi, eyes, thorax, form of the elytra, &c. agree fairly well; the femora and tarsi appear to me also to agree sufficiently well.

Two specimens were obtained.

NEOHYDNUS, Gorham (Ann. Mus. Civ. Gen. ser. 2, xii. 1892, p. 742).

NEOHYDNUS BASALIS, n. sp.

*Niger; elytris basi, pedibus basi, tibiæ apicibus tarsisque, ore, antennis, palpisque testaceis, prothorace postice fortiter contracto, antice transversim constricto, elytris creberrime et confluentè punctatis. Long. 3 millim.*

*Hab.* Assam, Patkai Mountains (*Doherty*).

The head in this little species is wider than the thorax and thickly clothed with silvery shining hairs; the eyes are large and oval and finely faceted, with numerous setose hairs; the antennæ are very short, reaching scarcely to the middle of the eyes, almost white. The thorax is wide in front, with a deeply impressed transverse line just behind the front margin, the sides strongly lobed immediately behind this line; the lobes with a small fossa on each, then much contracted to the constricted base. The elytra are about the same width as the head, parallel, almost variolose, the small callus, and a variable spot nearer the scutellum, often the whole base, is indeterminately white; the rest dull black, thickly clothed with short shining hairs. The legs are rather variable; the tibiæ except at the apex, the femora except at the bases, are dark pitchy; but the hind femora are sometimes quite testaceous, the tarsi are short. This species differs from *N. despectus* in the form of the thorax and with the following species will probably ultimately be separated generically; at present the points of resemblance—the structure of the antennæ and head—justify its association with it.

Several specimens.

NEOHYDNUS RELUCENS, n. sp.

*Niger, nitidus; pedibus basi tibiisque apicibus testaceis; prothorace postice valde contracto, brevi; elytris profunde ac distinctè punctatis, pube brevi pruinosa relucente. Long. 4 millim.*

*Hab.* Siam, Renong (*Doherty*).

Allied to *N. basalis*, but larger and broader, the thorax not so



suddenly contracted, with a *double* fossa in each lobe; the elytra more distinctly punctured, but the punctures often confluent transversely, no trace of a pale mark, and their tips smooth; the legs more widely black and the tarsi brown.

One specimen.

*NEOHYDNUS CINERASCENS*, n. sp.

*Niger, subnitidus; tibiæ apicibus tarsisque testaceis; antennis palpisque brunneis; prothorace postice angustato, antice, haud profunde, constricto, basi transversim impresso, disco perobsolete punctato; elytris crebre, distincte, confluentè punctatis, fascia cinerea e pube formata haud bene discreta. Long. 3-4 millim.*

*Hab.* Tenasserim, Tavoy (*Doherty*).

The thorax in this species is rather longer than in *N. basalis* and with the head is more shining; it shows evident but very obsolete traces of punctuation. The sides are not clearly lobed; they have indistinct oblique impressions, but these and the constricted lines are not well defined. The hairs composing the fascia on the elytra are so small as not easily to be seen separately, but are very bright and reflect silvery light (remining one of the fascia in *Clerus mollisfascia* and some South-American *Hydnoceras*).

A small series of specimens were obtained.

*NEOHYDNUS LUGUBRIS*, n. sp.

*Niger, nitidus; antennarum articulis duobus primis, tibiæ apicibus intermediis et posticis testaceis; prothorace postice contracto, lobis lateralibus impressis, disco nitido; elytris crebre distincte punctatis. Long. 4.5 millim.*

*Hab.* Manipur (*Doherty*).

Very nearly the same size and form as *N. cinerascens*; black, with the exception of the two basal joints of the antennæ and the other parts of the mouth, which are, however, obscure, and the tips of the four hinder tibiæ; the tarsi are obscurely pallid. In one specimen there is on each elytron near the apex a depressed flat oval areolet, which seems to be clothed with brown hairs: I am not able to say whether this may not be an accidental character; I do not think it is sexual.

*NEOHYDNUS SORDIDUS*, n. sp.

*Piceo-brunneus vel piceus; ore, palpis, pedibus elytrorumque plagiæ communi suturali testaceis. Long. 4-5 millim.*

*Hab.* Tenasserim, Tavoy (*Doherty*).

This is evidently a variable species in colour; in all the examples I have seen the elytra are brownish yellow along the suture, this colour widening out at the base, and at the apex shading off into the blacker tint of the margins. The thorax, puncturing, and other characters are generally those of *N. cinerascens*.



## PELONIUM (?) NIGRO-ÆNEUM, n. sp.

*Nigrum, superne æneo-nitens; capite prothoraceque crebre subtiliter punctatis, nitidis; elytris quam prothorax duplo latioribus creberrime inæqualiter punctatis, punctis ubique confluentibus, pube grisea tenui dense vestitis; abdominis apice pallescente, antennarum articulo primo subtus testaceo. Long. 7-12 millim.*

*Hab.* Assam, Patkai Mountains (*Doherty*).

Antennæ with the basal joint stout, slightly curved; second joint short, bead-shaped; third elongate, compressed; fourth to eighth gradually shorter, the seventh and eighth being transverse, the latter especially being very short and smaller than the seventh; the ninth and tenth joints large, triangular, subequal, the apical one more oval; the palpi have their apical joints oblong and truncate, wider than the preceding joints, in both pairs. The eyes are reniform, moderately strongly faceted, deeply excised, with a short ridge, beneath which the antennæ take their origin. The thorax has the sides evenly rounded; it is a little more narrowed in front than behind, the constrictions are obsolete; it, as well as the head, legs, and sides of the elytra, has a rather long but fine grey pubescence. The punctuation of the elytra is thick and irregular; the punctures are broken, *i. e.* the larger ones seem formed of groups of confluent smaller ones; towards the apex the larger pits gradually disappear. The legs are black, but not deeply so, the body beneath and the trochanters tending to be pitchy.

Three specimens were obtained by *Doherty*, one much smaller than the other two, and having the last three joints of the antennæ much longer and thinner than in those examples.

## SISYRNOPHORUS.

*Sisyrnophorus*, C. Waterhouse, Ent. Mo. Mag. xiii. (1876) p. 125.

This singular genus was detected by myself among the Coccinellidæ at the British Museum—the typical species, *S. maculatus*, at first sight roughly resembling some species of that family. Two species were characterized by the author—*S. maculatus* from the Philippine Islands and *S. bowringii* from Penang. I do not at present see that there was sufficient ground for separating it from *Allochotes*, Westwood, Trans. Ent. Soc. 1875, p. 241. But anyhow that name appears too close to *Allocotus* (Fieber), Puton (Hemiptera), Ent. Mo. Mag. xi. p. 146 (1874).

Westwood describes (*loc. cit.*) seven species.

*Choresine*, Pascoe, to which he compares the genus, belongs to the Melyridæ.

## SISYRNOPHORUS BIRMANICUS, n. sp.

*Læte ferrugineus; elytris metallico-viridibus, nitidis, crebre subtiliter punctatis. Long. 8 millim.*

*Hab.* Burmah, Ruby Mines (*Doherty*).

Head and thorax rich rusty—almost blood—red, very finely,



scarcely visibly punctate, with a very fine and short blackish pile. Antennæ paler than the thorax, but the legs and body beneath entirely of the same colour as they are; the scutellum also red. The thorax has the base finely margined, the sides are quite merged in the same curve as the base. The elytra are brilliant, of a dark metallic green, evenly punctured, with very fine and very short blackish pubescence.

This insect appears to be allied to *Allochotes bicolor*, Westw.; it seems to differ from it in being larger, in the antennæ being inserted closer to the eyes (in Westwood's figure, t. ix. f. 1 a, they are shown as inserted well in front of the excision), in the thorax not being "fulvo-setosus," and in the elytra not being "nigro-viridia."

Two specimens.

#### SISYRNOPHORUS CHRYSOMELINUS.

*Allochotes chrysomelina*, Westw. Ent. Mo. Mag. xiii. p. 242.

A single specimen from the Ruby Mines, Burmah, may pertain to this New-Guinea species, but it seems hardly likely that it would; but the brief diagnosis, six words, in addition to the size,  $2\frac{1}{2}$  lines, apply quite well to it, as they might to many other species. We cannot be always going to Oxford to see types.

#### SISYRNOPHORUS FRYI.

*Niger, densius subpruinoso-pubescent; capite, antennis, pedibus (femoribus prætermis), prothoracis basi, elytrorumque fasciis duabus, externe abbreviatis, posteriore lato, fulvis; elytris creberrime et subtilissime punctatis. Long. 6.5 millim.*

*Hab.* Burmah, Ruby Mines (*Doherty*).

Head entirely pale rusty red, shining; eyes not large; the antennæ as long as the head and thorax, the third and fourth joints elongate, the fifth to the tenth quadrate but gradually shortening, the apical joint short.

#### TENERUS DOHERTYANUS, n. sp.

*T. chalybæo proximus et valde affinis; cyaneus, nitidus; palpis ad basin, epistomate punctoque capitis flavis, antennis nigris, elytris unicostatis. Long. 7 millim.*

*Hab.* Perak (*Doherty*).

This species is so very much like *T. chalybæus*, Gorb. (Trans. Ent. Soc. 1877, p. 405), that it will be sufficient to point out the differences. The elytra appear to be rather longer, and have each a fine costa nearer to the suture than to the shoulder, terminating about a third from the apex. The elytra are even more closely punctured. The presence of a yellow spot on the head recalls a specimen of *T. chalybæus* mentioned (*loc. cit.*).

I have not hitherto had any reason to doubt that costation of the elytra is a specific character in this genus. It is, however, so very difficult to ascertain the sex, that this supposition must be taken with some reserve.



## 6. On the Dates of the 'Encyclopédie Méthodique' (Zoology).

By C. DAVIES SHERBORN and B. B. WOODWARD.

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The exact dates of publication of the separate parts of this remarkable Encyclopedia, which first began to appear in 1782, and was not completed until almost the middle of this century, have been a constant source of trouble to zoologists. The most diligent search has failed to bring to light particulars of the original parts and their contents, and only now and then can any such facts be established. For instance, the 50th livraison was published on the 23rd July, 1792, but we are by no means certain of its contents. The following determinations are the results of a search extended over many months, of a careful consideration of the views of others, and of a personal page by page observation by Mr. Sherborn while compiling his 'Index Gen. et Spec.'

In arriving at these conclusions we have been indebted to the writings or communications of the following authors:—Moquin-Tandon, G. Dollfus, H. E. Dresser, A. Newton, R. Bowdler Sharpe, Salvadori, F. H. Waterhouse, Edgar Smith, W. F. Kirby, and others.

We have decided to arrange the 'Encyclopédie' according to the method employed in the General Library of the British Museum (Natural History), as that has been found most convenient.

Considerable confusion has been caused by writers who have treated portions of this book as separate publications and have quoted them as such. We refer to Desmarest's 'Mammalogie,' Bonnaterre's 'Cétologie,' 'Erpétologie,' etc., and Bonnaterre and Vieillot's 'Ornithologie.' In order to avoid such confusion in the future, we would suggest the following as a satisfactory method of quotation:—

A. G. Desmarest, Enc. Méth. (Mamm.) (1), 1820, p. —.

G. P. Deshayes, Enc. Méth. (Vers) ii. (2), 1831, p. —.

The following is the result of our investigations:—

ZOOLOGY.—*Text.*

Tom. I. Hist. Nat. des Animaux. By Daubenton, edited from Buffon: pp. i–xcii, 1–230. 1782.

Ornithologie, by Mauduyt: pp. 231–691. 1782.

Tom. II. Ornithologie, by Mauduyt: pp. 1–544. 1784.

Anim. Quad. ovipares, et les Serpens, by Daubenton: pp. 545–712. 1784.

Tom. III. Poissons, by Daubenton: pp. i–lx, 1–435. 1787.

[*Note.*—To the "Animaux" and "Oiseaux" no specific names are appended; to the "Quad. ovip.," the "Serpens," and the "Poissons" the genera and species of earlier authors are appended, but no new names are given and precedence is given to the French version.]



Tom. IV. Insectes. Five "discourses préliminaires" (pp. i-cclxxxviii and i-ccclxxiii) by Mauduyt are prefixed: (Guéneau de Montbeillard, who had been entrusted with the work, died before he could carry out his mission). Mauduyt also contributed some of the articles, which he signed. Olivier took up the systematic portion of the work from the beginning (pp. 1-322). **1789.**

Tom. V. Insectes, by Olivier: pp. 1-794. **1790.**

Tom. VI. Insectes, by Olivier: pp. 1-704. **1791.**

Tom. VII. Insectes, by Olivier: pp. 1-828. **1792.**

[*Note.*—"M. Olivier, obligé de s'absenter pendant plusieurs années pour remplir dans le Levant une mission de Gouvernement, reprend ici la rédaction de ce Dictionnaire, qui avoit été confiée à d'autres personnes depuis la lettre L." That is to say, from vol. vii. p. 601 to vol. viii. p. 45 (on which page is the note quoted). As B. E. Manuel signed the last page of vol. vii. and the article so signed was not completed, it is probable that he was the chief person to whom the work was entrusted.]

Tom. VIII. Insectes. By Olivier [and Latreille]: pp. 1-722.

Pt. 1, pp. 1-464. **1811.**

Pt. 2, pp. 465-722. [**? 1814<sup>1</sup>.**]

[*Note.*—On p. 468 we find the following:—"Nous avons engagé M. Latreille, . . . à se charger dorénavant de quelques articles qui seront souscrits des trois premières lettres de son nom."]

Tom. IX. Insectes, by Latreille and Godart.

Pt. 1, pp. 1-328. **1819.**

Pt. 2, pp. 329-828. [**? 1823 or 1824.**]

[Mr. W. F. Kirby possesses copies of these 2 parts as issued: the second is undated<sup>2</sup>. In vol. 2 of "Musique"<sup>3</sup> an advertisement states that the 87th livr. by Latreille was about to appear [1818] and would contain "Papillons"; this part was, however, written by Godart (see preface to vol. ix.).]

Tom. X. Insectes, by Latreille, Le Peletier de St.-Fargeau, Serville, and Guérin [-Ménéville]: pp. 1-832. **1825.**

Histoire Naturelle des Vers. By Bruguière.

Tom. i. pt. 1, pp. 1-344. **1789.**

„ pt. 2, pp. 345-758. **1792.**

Ibid. Tom. ii. By Bruguière, Lamarck, and Deshayes.

Pt. 1, pp. 1-256. **1830.**

Pt. 2, pp. 1-594. **1831.**

[*Note.*—Bruguière and Lamarck had nothing whatever to do with this volume; it was entirely by Deshayes, except the article CONUS, which was written by Hwass.]

Ibid. Tom. iii. By Deshayes: pp. 595-1152. **1832.**

<sup>1</sup> Quoted by Lamarck in his *Anim. s. Vert.* vol. iii., which was published in August 1816.

<sup>2</sup> Quoy & Gaimard in *Freycinet, Voyage Uranie*, etc., 1824, quote pt. 2.

<sup>3</sup> British Museum (*Nat. Hist.*), General Library.



Histoire Naturelle des Zoophytes. By Lamouroux, Bory de St. Vincent, and Eudes-Deslongchamps:

pp. 1-448. <sup>376</sup> 1824. (livr 95)  
 pp. 449-819. 1825. <sup>7</sup> (98)  
 377

ZOOLOGY.—*Plates* (with Explanations and Appendices).

Mammalogie. By Desmarest.

Pt. 1, pp. 1-276. 1820.

Pt. 2 (& Suppl.), pp. 277-556. 1822.

Tableau Encyclopédique et Méthodique des Trois Règnes de la Nature.

Cétologie. By Bonnaterre, pp. xli, 28: 12 pls. 1789.

Ophiologie. By Bonnaterre, pp. xliv, 76: 26 pls. 1790.

Erpétologie. By Bonnaterre, pp. xxviii, 70: 43 pls. 1789.

Ornithologie. By Bonnaterre and Vieillot: 247 pls.

pp. 1-152. By Bonnaterre. 1790.

pp. 153-320. " 1791.

pp. 321-528. By Vieillot. 1820.

pp. 529-848. " 1822.

pp. 849-1460. " 1823.

Ichthyologie. By Bonnaterre, pp. lvi, 215: 102 pls. 1788.

Crustacés, Arachnides et Insectes. By Latreille, pp. 1-142, 1-38: pls. 1-268, 269-397.

[The plates 1-268 were engraved under the supervision of Bonnaterre, and may have been issued in 1797; the explanation to them was furnished by Guérin in 1818. The author of the last 38 pages of explanation, which refer to pls. 269-397, was probably Latreille, and this portion is of later date.]

Vers, Coquilles, Mollusques et Polypiers, pp. viii, 180: 488 pls.

Vers Infusoires. By Bruguière, pp. 1-83: 28 pls. 1791.

[Is a translation of F. O. Müller's "Anim. Infus.," with 4 new spp. added.]

Vers Intestins. By Bory de St. Vincent, pp. 84-180: pls. 29-61. 1824.

[Pp. 85-132 we consider to be by Bruguière, since the leaf, pp. 83, 84, signed by Bory, is obviously an insertion.]

Livr. 1, pls. 1-189. 1791.

Livr. 2, pls. 190-286. 1797.

Livr. 3, pls. 287-390. 1798 (An. vi.).

Livr. 4, pls. 391-488. 1816. [The 3rd and 4th livraisons were issued under the supervision of Lamarck; and the fourth part, accompanied by a "Liste des objets représentés dans les planches de cette livraison," was by him.]



7. On the Coracoid of the Terrestrial Vertebrata. By G. B. HOWES, F.Z.S., F.L.S., Assistant Professor of Zoology, Roy. Coll. Sci. Lond.

[Received June 20, 1893.]

I. *As to Terminology.*

It is now generally conceded that some of the Anomodont reptiles, which in many respects so closely approximate towards the Mammalia in their skeletal anatomy, were possessed of an expanded epicoracoid of the Monotreme type. Professor Seeley, to whom we are chiefly indebted for the discoveries which have rendered this conclusion clear, discards the Cuvierian term "epicoracoid" and persistently applies the term precoracoid to the element in question in both reptiles and mammals<sup>1</sup>.

In this he is followed by Mr. Hulke<sup>2</sup>. Mr. Lydekker, however, in a recent communication to this Society<sup>3</sup>, has proposed to abolish the term epicoracoid altogether, in association with a discovery of my own<sup>4</sup> that the element to which in the Monotreme the term 'epicoracoid' was first applied is the serial homologue of the coracoid process of the higher mammals, to which, in the long run, the term 'coracoid' was originally given.

The term precoracoid (procoracoid of Gegenbaur) is well known to be used in two or more totally distinct senses (sometimes by the same observer in the same paper<sup>5</sup>). It is for the most part either applied to a mere process of the coracoid, most variable in its relationships when present and in no sense originally distinct, or restricted to that bar which underlies the clavicle<sup>6</sup> and (some

<sup>1</sup> Cf. Phil. Trans. 1888, B. pp. 490-492, 1889, B. pp. 255 and 275, and P. R. S. vol. li. p. 119.

<sup>2</sup> P. R. S. vol. li. p. 233.

<sup>3</sup> See P. Z. S. 1893, p. 172.

<sup>4</sup> Journ. Anat. & Phys. vol xxi. p. 192.

<sup>5</sup> Cf. Hulke, *loc. cit.* description of figs. 4, 6, 7, and 9.

<sup>6</sup> Goette, as is well known, confirmed Rathke's discovery of this "Anlage" in the young lizard. The contradictory arguments which have been based upon its supposed distinctness or non-distinctness in this or that animal lose their force to-day in the tendency of recent research to demonstrate, more and more clearly, that the three great elements of both the pectoral and pelvic girdles are at first independently differentiated. (Cf. especially the papers of Miss Lindsay in P. Z. S. 1885, p. 692, and of Mehnert in Morph. Jahrb. Bd. xiii. p. 293, & Bd. xv. p. 110).

There can, I think, be little doubt that the Rathke-Parker conclusion that the dermo-clavicular elements are in the Chelonia represented by the ecto- and entoplastra is correct. It appears to me highly probable that in these animals the claviculo-coracoid apparatus has undergone a kind of analysis into its constituent elements, and that the precoracoid (in the non-differentiation of a distinct endosteal centre within its substance, such as Gegenbaur first described for man himself) has become ossified by an extension of the acromial tract. Baur has lately proposed to term this apparent acromion a 'proscapula' (cf. Proc. Acad. Nat. Sci. Philad. 1891, p. 424), a by no means inappropriate term, if a new one be necessary.



Edentates alone excepted) either abuts against or is confluent with the scapular element, and its acromion when differentiated<sup>1</sup>. It is thus seen that the same term has been applied to a localized outgrowth of the coracoid element most variable in its differentiation, and to a distinct element of invariable relationships. The different usages of the term epicoracoid have been productive of a precisely similar confusion, as I have elsewhere pointed out<sup>2</sup>. If, as is most desirable in the progress of anatomical science, distinct substantive names are to be applied to distinct structures, the terms precoracoid and coracoid must in the future be used to distinguish a portion of the ventral half of the shoulder-girdle which is from one which is not related to the clavicle. Upon this principle the term epicoracoid can only apply to the Mammalia, and those Anomodontia<sup>3</sup> in which the coracoid is segmented into two perfectly distinct parts which ossify independently.

In commenting upon my proposal to restrict the term epicoracoid to the element so named by Cuvier in the Monotremes and its serial homologue, and the term precoracoid to the cartilaginous clavicular bar and its representative, Mr. Lydekker remarks that "this emendation, if properly authenticated," he would have been willing to accept. I presume that by "properly authenticated" he means tenable upon the accepted rules of priority in nomenclature? If so, I would ask what would be the outcome of the application of these, with their rigid restrictions, to the terminology of, say, the elements of the carpus and tarsus, or the muscles of the limbs, so variable in both their characters and detailed relationships? Confusion worse confounded, 'progress' but not scientific advancement, would, I venture to think, ensue.

Having proposed to reject the term epicoracoid, and to restrict the term coracoid to the element thus left nameless, Mr. Lydekker suggests the term 'metacoracoid' for the Cuvierian coracoid of Monotremes, and the 'coracoid epiphysis' of the higher mammals which I have claimed as its homologue. I would no less gladly accept his proposals than he would my own, but for the following very grave consideration. The observations of Goette and others leave no doubt that the coracoid and epicoracoid of the Mammal on the one hand, and the single so-called coracoid of the Amphibia, living Reptilia, and Birds, on the other, are derivatives of that

<sup>1</sup> It is interesting to note that *Bradypus tridactylus*, in the adult of which the clavicle is *par excellence* attached to the coracoid, is the very mammal in the young of which Hoffmann has detected the primary continuity between the precoracoid and acromion. (Niederl. Arch. f. Zool. Bd. v. p. 37.)

<sup>2</sup> *Loc. cit.* pp. 196, 197.

<sup>3</sup> With the possible exception of the Ichthyosauria and Nothosauria, in accordance with Seeley's recent observations. My friends in the Natural History Museum have accorded me the privilege of examining Prof. Seeley's specimens, and I entirely agree that an unossified ventro-dorsal continuation of the Ichthyosaurian coracoid was present in the region in which he believes it to have been. It seems to me, however, that the notion that a separate (distinctly segmented) epicoracoid existed must remain in abeyance, until at least its impress shall have been discovered in the matrix.



portion of the coracoidal skeleton not involved in the clavicular apparatus, and to its homologue the term coracoid is applied in all the lower Vertebrata, whether it be ossified or not. What, then, are we to term this, if Mr. Lydekker's system is to endure? The context of his paper suggests coracoido-metacoracoid as a likely term; but before that could be introduced it ought to be shown that the single 'coracoid' of living Lizards, which is coincident in area with the conjoint coracoidal elements of Anomodonts and Mammals, is the product of fusion of these. No one has yet demonstrated the remotest trace of more than a single centre of ossification in the Lacertilian coracoid; while, on the other hand, its double ossification in the Mammalia, in its non-abbreviated form (*Ornithorhynchus*), is preceded by its segmentation while still cartilaginous. Mr. Lydekker's proposals might perhaps be accepted were the Mammalia and Anomodontia alone concerned. Anatomical terminology, however, unlike nomenclature in systematics, must needs be applicable to all classes of this or that sub-kingdom; and it has therefore to cover a very wide range of structural variation. These considerations, together with those which I have already raised, appear to me fatal to the acceptance of Mr. Lydekker's terms, which seem no more tenable than the application of the human anatomists' term 'scapula' to the coraco-scapular 'blade-bone,' into which he lapses in his final footnote on p. 174, and which, on grounds of sheer priority, should be adhered to. We are dealing with a common (*coracoidal*) cartilage, which is in some animals replaced by a couple of osseous elements, and in others by but one. Setting aside the precoracoid and clavicle, the ultimate homologies of which are by no means yet fully worked out, our present requirements may be met by the retention of the universal term *coracoid* for the entire set of structures (*i.e.* the cartilaginous 'coracoid' bar and its derivatives), with the introduction of, say, the terms *unicoracoidal* and *bicoracoidal* for its diversely modified types, and the retention of Cuvier's *epicoracoid* for its anterior and Lydekker's *metacoracoid* for its posterior segment in the latter one. Upon this basis, the sum of our knowledge of the coracoid of Amphibia and Amniota may be formulated as follows:—

*Coracoid.*

- i. *unicoracoidal*. Amphibia, all living Reptilia, Aves.
- ii. *bicoracoidal*. Some Anomodontia, Mammalia, Ichthyosauria and Nothosauria (?).

A simple alternative would be the description of the common coracoid as either uni- or bi-segmented; but this, for obvious reasons, would be insufficient. The arrangement which I here propose admits of the retention of the human anatomists' term 'coracoid process' as all-sufficient for the requirements of the systematic mammalogist, who, except for his concern with the Monotremes, deals with the vexed element only in its most abbreviated and vestigial conditions.



II. *As to the Mammalian Coracoid.*

A leading feature in Mr. Lydekker's paper is the presumed demonstration that in *Bradypus* the "so-called epicoracoid enters to a small extent into the formation of the glenoid cavity." He urges this, in forcible opposition to an assertion of my own that "the exclusion of this element from the glenoid facet is one of its most characteristic features;" and from the context of his paper the reader would be prone to conclude that I had laid this down as a condition characteristic of all Mammals. In my original paper, to which the assertion he transcribes is but a casual allusion, I expressly stated<sup>1</sup> that in the higher Placentalia the so-called epicoracoid "comes to enter into the formation of the glenoid facet in proportion as the coracoid bar is suppressed," adding that "the latter structure retires from the scene as the 'coracoid epiphysis' of human anatomists."

Mr. Lydekker asserts that in both the Dicynodont and the Bradypodine the "so-called epicoracoid enters to a small extent into the formation of the glenoid cavity;" but while his figure of the former depicts it as contributing an altogether insignificant share in the cavity, that of the latter represents it as contributing wellnigh one linear half of it. There is an incongruity here; and in proceeding to deal with it I incorporate some observations upon the Mammalian coracoid which have accrued since my former paper was written.

My friend Mr. Oldfield Thomas has generously allowed me to examine the material which passed through Mr. Lydekker's hands. The latter gentleman infers that the coracoid of Sloths consists of but one element (his so-called coracoid, *Co'*, see figs. 1 *d*, 1 *e*), therein implying that that element which I have claimed as the homologue of the Monotreme's coracoid (his metacoracoid) is in them absent.

There is in our National Collection a blade-bone of *Choloepus didactylus* (fig. 1 *e*) in which both coracoidal elements are well represented; and it will be noted that the epicoracoid (*Co'*) is completely excluded from any share in the glenoid facet, like that of both the Monotreme and the Rabbit, on comparison of which I originally sought to reduce the pectoral girdle of all Mammals to a uniform plan of structure. I find the metacoracoid (*Co''*), which effects this exclusion, represented in a very young *Bradypus cuculliger* by a feebly constituted fragment of bone (*Co''*, fig. 1 *d*) wedged in between the epicoracoid and scapula. The epicoracoid in this specimen is remote from the actual glenoid border, there being present at this period of growth a considerable tract of cartilage (the dotted area of fig. 1 *d*), into which the epi- and metacoracoidal centres are alike free to extend.

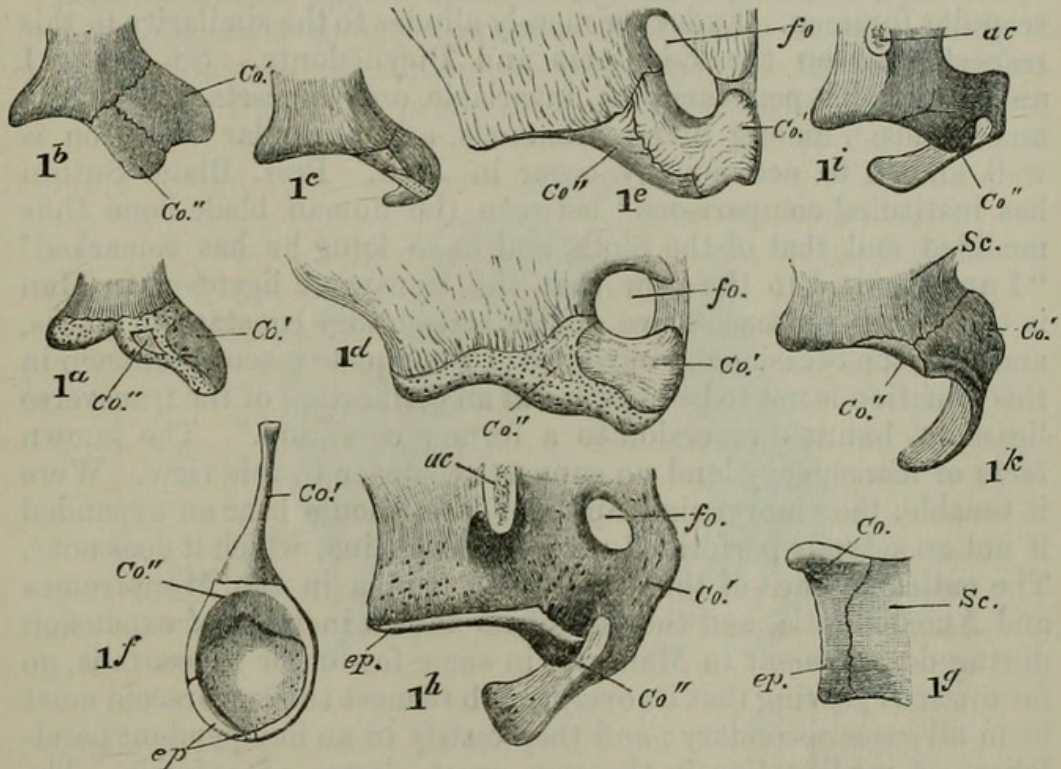
The condition of this specimen is very nearly that of the Rabbit (fig. 1 *a*) when first the metacoracoid (*Co''*) appears. The period of independent duration of this bone is, in the Placentalia,

<sup>1</sup> Journ. Anat. & Phys. vol. xxi. p. 193.



exceedingly brief (from two to three weeks in *Lepus*); it arises late, extends rapidly, and first ankyloses, no less summarily, with either the scapula or epicoracoid. It is therefore a difficult structure to detect, unless we examine a large series of specimens of all ages. In view of these facts, the further study of the Bradypodine girdle can alone show what is the actual share of the coracoid centres in the adult glenoid cavity of that animal; but, be the outcome of this what

Fig. 1.



The Coracoid Apparatus.

1 a. *Lepus*, one month after birth; 1 b. *Lepus*, 7 weeks, both  $\times 1\frac{1}{2}$ . 1 c. *Sciurus vulgaris*, juv.; 1 d. *Bradypus cuculliger*, juv., both  $\times 2$ . 1 e. *Cholæpus didactylus*, half-grown, nat. size. 1 f. *Tamandua tetradactyla*, front view, adult,  $\times 1\frac{1}{3}$ . 1 g. *Tatusia novemcincta*, inner aspect,  $\times 1\frac{1}{3}$ . 1 h. *Ateles marginatus*,  $\times 1\frac{1}{2}$ . 1 i. *Cebus* sp.,  $\times 1\frac{1}{3}$ . 1 k. *Homo*, 14-15 years, modified from Sabatier,  $\frac{1}{3}$  nat. size.

ac. Acromion. Co'. Epicoracoid. Co''. Metacoracoid. Sc. Scapula. ep. Scapular epiphysis. fo. Coraco-scapular foramen.

it may, the condition of the Cholæpine girdle (as here figured) shows that the interpretation of Lydekker cannot hold good for the Sloths as a series. In justice to myself, I am therefore compelled to add that, so far as the point immediately at issue is concerned, the ground traversed by Mr. Lydekker has been already covered in my earlier communication, and I regret that in my later one, which he cites, I did not add, after the words "most characteristic features," at any rate in its non-reduced form.

I have observed the existence of a distinct metacoracoid in the



young of members of six orders of Placental Mammals (see the list given below). I give figures of some of my specimens, and it will be noticed that there is evidence of independent parallelism of reduction of the bone named. The conditions suggest that the differences between the *Cholæpus* and *Bradypus* figured may be akin to those between *Cebus* and *Homo*, *Lepus* and *Sciurus*, and that the Edentata may be on a variational equality with other orders in respect to the reduction in question.

To turn finally to the well-known overgrowth of the Edentate epicoracoid and scapula, for enclosure of the so-called coraco-scapular foramen. Lydekker merely alludes to the similarity in this respect between the Edentates and Dicynodonts. So far as I am aware, this peculiarity is invariable only in certain Edentata and Cebidæ<sup>1</sup>, among living Mammals, and a similar condition is well known to occasionally occur in Man. Prof. Bland Sutton has instituted comparisons<sup>2</sup> between the human blade-bone thus modified and that of the Sloth, and in so doing he has remarked<sup>3</sup> "I am disposed to the view that the transverse ligament in Man is the fibrous representative of this bony bridge constant in Sloths, and that the occasional occurrence of a complete osseous foramen in this situation is not to be regarded as an ossification of the transverse ligament, but as a reversion to a former condition." The known facts of morphology lend no support whatever to this view. Were it tenable, the embryonic scapula of Man should bear an expanded if not an actually perforated prescapular lamina, which it does not<sup>4</sup>. The entire absence of the prescapular lamina in the Monotremes and Anomodontia, and the fact of its known increase of expansion during development in Man and in some few other Placentalia, go far towards proving that its overgrowth to meet the epicoracoid must be in all cases secondary; and they testify to an independent parallelism of modification in the two great classes of animals. The condition occasionally met with in Man may be closely paralleled by the Tapir among placental quadrupeds.

The Bradypodines are remarkable for the secondary association of the clavicle with the coracoid (see above, p. 586). In the *Cholæpines* the *apex* of the acromion becomes inwardly rotated, and, together with the clavicle and coracoid, bound up in a dense fibro-cartilaginous mass<sup>5</sup>. In *Cycloturus* the scapula differs from that of all other Edentata but some Armadillos (ex. *Dasyurus minutus*) in the inward rotation of its antero-ventral border. As viewed from the front (see fig. 2 *b*, p. 591), this is very conspicuous. I find, on examination, that this peculiarity is associated with the presence of a very powerful ligament (*lg.*) which passes between the *body* of the adult acromion and the scapula, enclosing a foramen above. In

<sup>1</sup> In *Ateles marginatus* (fig. 1 *h*) (not in *A. melanochir*), *Brachyteles*, and *Lagothrix*.

<sup>2</sup> 'Ligaments, their Nature and Morphology.' London, 1887.

<sup>3</sup> *Op. cit.* p. 6.

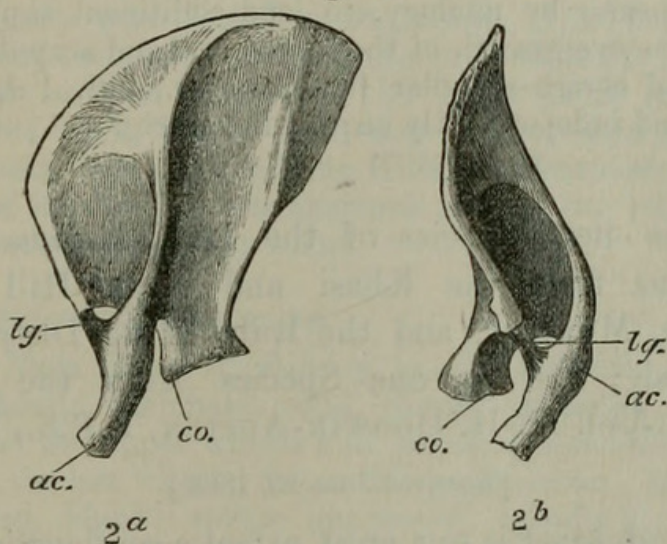
<sup>4</sup> *Cf.* Parker's Ray Soc. Monogr. pl. xxx. figs. 9 and 12.

<sup>5</sup> *Cf.* Parker, *op. cit.* pl. xxi. figs. 10 and 22.



my own specimen this ligament is superficially calcified, and the acromion is vertically enlarged at its point of origin, in a manner suggestive of a tendency on the part of this bar to fulfil the function of the overgrown epicoracoid of *Cholæpus*, *Bradypus*, and other genera. In *Cholæpus* the two conditions coexist. I have long desired to work out the detailed anatomy of the Edentate axilla in its bearings on these facts, but the necessary fresh material has not been obtainable. I cannot help thinking, however, that they point to the conclusion that the condition of the coraco-scapular apparatus in *Bradypus* which Mr. Lydekker has described is due to one of a series of adaptive changes which that of the Edentata has undergone in relation to the modification of their fore limb and pronounced peculiarities of life. Certain it

Fig. 2.



The blade-bone of *Cycloturus didactylus*. 2a, from the side; 2b, from the front.  $\times 1\frac{1}{2}$ .

ac. Acromion. co. Coracoid process. lg. Acromio-scapular ligament.

is, that, except for the joint possession of a bicoracoid, the resemblances between the Edentate and Dicynodont blade-bones are indicative of nothing but a parallelism of adaptive change; and it is interesting to meet with this in two great groups of animals the ancestors of which we to-day seek independently among the lower Anomodontia.

I append a list of those Placentalia in which I have observed the metacoracoid, and have much pleasure in tendering my thanks to Mr. Oldfield Thomas, of the Natural History Museum, and to Prof. C. Stewart and Mr. R. H. Burne, of the Royal College of Surgeons, for permission to examine the collections under their charge.

EDENTATA. *Bradypus cuculliger*, *Myrmecophaga*, *Tamandua tetradactyla*, *Tatusia novemcincta*.—UNGULATA. *Cervulus reevesi*, *Equus*.—RODENTIA. *Cælogenys paca*, *Lepus cuniculus*, *L. timidus*,



*Sciurus vulgaris*.—SIRENIA. *Manatus americanus*, *Halicore australis*(?)—CARNIVORA VERA. *Arctictis binturong*, *Cercoleptes caudivolvulus*, *Felis lynx*, *Lutra vulgaris*, *Viverra malaccensis*.—PRIMATES. *Ateles melanochir*, *A. sp.*, *Brachyteles sp.*, *Cebus sp.*, *Chiromys*, *Cynocephalus babuin*, *C. maimon*, *Homo*, *Lagothrix sp.*, *Lemur macaco*, *Macacus cynomolgus*, *M. silenus*, *Mycetes auratus*, *Semnopithecus maurus*, *S. schistaceus*.

I find that one extreme term in the series of modifications to which the Mammalian coracoid is susceptible is reached in the Edentata (*Tamandua*, fig. 1 *f*, and *Tatusia* fig. 1 *g*, p. 589), viz. the complete exclusion of the scapula from the fully-formed glenoid facet, by the fusion and joint extension of the metacoracoid and scapular epiphyses (*Co''* and *ep.*, figs. 1 *f*, *g*, *h*). I have only observed this peculiarity in *Ateles marginatus* and *Lutra vulgaris* among the higher forms which I have examined. Its independent assumption in them appears, by analogy, to lend additional support to the belief that the overgrowth of the epicoracoid and scapula to enclose the so-called coraco-scapular foramen (*fo.*, figs. 1 *d*, *e*, *h*) is a secondary and independently acquired character.

8. On some new Species of the Land-Molluscan Genus *Alycæus* from the Khasi and Naga Hill Country, Assam, Munipur, and the Ruby Mine District, Upper Burmah; and on one Species from the Nicobars. By Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.

[Received June 20, 1893.]

The present paper is to a great extent a continuation of one I read before the Society last year<sup>1</sup> describing the *Diplommataina* from the Assam Hill Ranges which Mr. Doherty's excellent collecting had accumulated.

The *Alycæi* now described include those which Mr. Doherty obtained in North Burmah, one species which I discovered myself in Munipur, and another of which examples have lately been sent to me by Colonel Beddome, who received them from Mr. Muspratt, an officer now stationed in the Naga Hill Country. I also take this opportunity to describe a new species of the same genus of which an example, found by Mr. Busby at the Nicobars, was in Dr. Hungerford's fine collection.

In 1871 (J. A. S. B. 1871, pl. iv. fig. 3) I figured an *Alycæus* from the Naga Hills as "*A. ingrami*, var." A comparison of it with typical specimens of *A. ingrami* now shows me that it is quite distinct, and I therefore name it *A. distinctus*. I referred to the same species again in 1874 (J. A. S. B. 1874, p. 150) and gave the many localities where I had subsequently obtained it. I have lately received from Col. Beddome, also from the Naga Hills,

<sup>1</sup> See P. Z. S. 1892, p. 509.



examples of the same shell, which have led me to recompare the two forms.

1. *ALYCÆUS BI-RUGOSUS*, n. sp.

*Locality.* Khasi Hills and Manipur (in coll. Godwin-Austen).

*Shell* globosely turbate, rather openly umbilicated; sculpture smooth on upper whorls, regular close ribbing on the swell of the last; colour pale ochraceous or ruddy brown; spire conoid, rounded at apex; suture impressed; whorls 4, the last not swollen, contracted in front of the rather short sutural tube, then enlarging again into two parallel ridges, which adjoin the aperture; aperture ovate, angular above and below, rounded on the inner margin.

*Operculum* pale in colour, smooth in front.

*Size*: maj. diam. 3.0; alt. axis 1.25 mm.

The specimens were found in the Khasi Hills, but the exact locality is not recorded. One specimen I obtained south of the Barak River on the road from the Naga Hills to Manipur. Although this shell, in size and most of its characters, is like *A. multirugosus*, G.-A., of the Naga Hills, it differs materially, more especially in the form of the aperture and in the ridges on the expanded portion of the last whorl.

2. *ALYCÆUS SUBCULMEN*, n. sp.

*Locality.* Naga Hills (*W. Doherty*, in coll. Aldrich).

*Shell* globosely turbate, solid, closely perforate; sculpture, smooth on all the upper whorls and polished, close-set ribbing on the swell of the last whorl; colour dark ochraceous; spire conical, apex rounded, blunt; suture impressed; whorls 4, round, the last swollen, contracted at base of a short sutural tube, then rising into a depressed ridge, thence expanding and spreading to the aperture; aperture circular, subvertical; peristome double, much thickened, simple, continuous.

*Size*: maj. diam. 2.75; alt. axis 1.5 mm.

This is a very distinct species; in the solid rounded peristome it approaches *A. conicus* from Jaintia and *A. vestitis* from the Arakan Hills.

3. *ALYCÆUS (DIORYX) GRANUM*, n. sp.

*Locality.* Margarita, foot of Eastern Naga Hills (*W. Doherty*, in coll. Aldrich).

*Shell* perforate, globose; sculpture fine regular ribbing, closely arranged and extending to the peristome; colour ruddy ochre; spire subconical; suture well impressed; whorls 4, rounded, a slight constriction in front of the short sutural tube; aperture suboblique, circular; peristome double, the outer reflected slightly.

*Size*: maj. diam. 2.25; alt. axis 2.0 mm.

This species is only half the size of its nearest ally, a variety of



*A. otiphorus* from the wooded slopes of the North Jaintia Hills. This variety was figured and described by me in the J. A. S. B. 1871 (p. 93, pl. v. fig. 6). From Mr. Aldrich I have received three specimens of it all fully grown, and as it is so much smaller than the typical *A. otiphorus* from Sikkim (which is as much as 4.25 mm. in maj. diam.), I consider it necessary to give it a distinct title. It is also more depressed and has fewer whorls, and the umbilical area is more open than in the Darjiling form. The form of the Jaintia Hill shell is again so very distinct from that of the type species that I think it will be better to distinguish it as *A. granum*, var. *major*.

4. *ALYCÆUS MAGNUS*, n. sp.

*Locality.* Naga Hills, 150 miles eastward of Kohima (*Muspratt*, in coll. Col. Beddome).

*Shell* globosely turbate, rather closely umbilicated, thick; sculpture fine regular costulation next the sutural tube, becoming finer and more irregular on the apical whorls; colour, specimen bleached; spire conoid, rounded, apex blunt; suture moderately impressed, the sutural tube long and well developed; whorls 5, the last much swollen, the constriction near the base of the sutural tube slightly swelling towards the aperture; aperture oblique, circular, with a slight angulation above; peristome double, continuous, strong, slightly expanded and reflected, the inner with a flange on the umbilical margin.

*Size:* maj. diam. 11.0, min. diam. 8.8; alt. axis. 5.25 mm.

Two specimens of this shell have been submitted to me by Col. Beddome, neither of them in the best state of preservation. It is a giant, yet modified, form of *A. nagaensis*, from Asalu, but it is more closely umbilicated and the costulation, for its greater size, is much finer; it is also more globose and more rounded at the apex.

5. *ALYCÆUS RUBINUS*, n. sp.

*Locality.* Ruby Mines District, Upper Burmah (*W. Doherty*, in coll. Aldrich).

*Shell* globosely turbate, closely umbilicated, of thin texture, the last whorl not much swollen; sculpture very fine close ribbing adjacent to the sutural tube, rest of shell smooth, with distant fine striæ; colour olivaceous ochre; spire conic, sides rounded; suture impressed; whorls 4, sides rounded, slightly constricted in front of the sutural tube, which is fine and moderately long; aperture oblique, circular; peristome thin, reflected, the double lips being scarcely perceptible, a slight nick on the inner upper margin.

*Size:* maj. diam. 6.0; alt. axis 5.0 mm.

6. *ALYCÆUS OCHRACEUS*, n. sp.

*Locality.* Ruby Mines District, Upper Burmah (*W. Doherty*, in coll. Aldrich).

*Shell* sub-depressedly turbate; sculpture rather strong ribbing



on the swollen part of the last whorl, on the apical whorls it is close and fine; colour ochre; spire somewhat flattened, apex blunt; suture deep; whorls 4, the last moderately swollen; sharp constriction in front of sutural tube, followed by a strong ridge which is contiguous to the crenulate peristome; aperture circular, suboblique; peristome strongly crenulated, double; operculum horny, a large central excavated circular space, surrounded by a pale ring, well marked, rising above to the marginal portion.

*Size*: maj. diam. 4.5; alt. axis 1.5 mm.

The nearest known species allied to this is *A. crenatus*, of the Khasi Hills, but the ridge behind the aperture in this last lies further back with a short interval; the peristome is not so strongly crenulate. *A. plectocheilus* of Darjiling is a much smaller form.

7. *ALYCEUS DOHERTYI*, n. sp.

*Locality*. Momeit, Burmah (*W. Doherty*, in coll. Aldrich).

*Shell* globosely turbate, solid, not umbilicated; sculpture regular distant sharp costulation, closer and fine near the sutural tube; colour stone, with pink apex; spire rather high, conoid, rounded, apex blunt; suture impressed, the tube fine, rather long; whorls  $4\frac{1}{2}$ , the last swollen, constricted with a rounded ridge midway between the sutural tube and the peristome; aperture expanded, ovate; peristome double, fine sharp crenulations on the outer margin, rounded on the inner.

*Size*: maj. diam. 3.25; alt. axis 2.8 mm.

This is quite a new form, partaking in the constriction and peristome of the characters of *A. plectocheilus*, *crenatus*, &c. Momeit lies N.N.E. of Mandalay, about midway between it and Bhamo and further east than Mogok in the Ruby Mine District.

8. *ALYCEUS BUSBYI*, n. sp.

*Locality*. Nicobars (*G. Busby*, in coll. Dr. Hungerford).

*Shell* turbate, of tumid form, widely umbilicated; sculpture smooth, fine ribbing near the sutural tube and still finer below; colour pale ochraceous; spire moderately high, apex blunt; suture deep, the sutural tube short and thick; whorls  $4\frac{1}{2}$ , very rounded, the last much swollen and compressed within the umbilical cavity, constriction simple, slight; aperture oblique circular; peristome double, the outer lip flat and expanding at right-angles to the whorl.

*Size*: maj. diam. 7.5; alt. axis 3.0 mm.

This is the largest species as yet known from the Nicobar Islands. I name it after its discoverer, who gave the specimen to Dr. Hungerford; its exact locality has not been recorded.



9. On a little-known European Viper, *Vipera ursinii*, Bonap.  
By G. A. BOULENGER, F.Z.S.

[Received June 16, 1893.]

(Plate LI.)

About a year ago I received from my friend Dr. F. Werner, of Vienna, a remarkable Viper from Laxenburg, which differed very considerably from *Vipera berus* in its smaller eye, the small number of rows of scales and of ventral and caudal shields, the shape of the head, and the coloration. I requested my esteemed correspondent to procure further specimens from the same locality, and he was so kind as to send me five more, which showed clearly that the differences by which I was struck were not individual. Quite recently I received from Hr. Henkel, of Vienna, numerous specimens from Laxenburg, which removed all my doubts as to the specific distinction of this form from *V. berus*. Almost at the same time the number of the 'Zoologischer Anzeiger' for May 29th came into my hands, containing the description of it by Prof. von M  hely as a new variety of *V. berus*, from Rakos, on the left bank of the Danube, near Budapest, which he names var. *rakosiensis*. This name I therefore at once adopted, regarding the snake, however, as a distinct species, not as a variety<sup>1</sup>. In fact Prof. von M  hely seems to me to singularly underrate the taxonomic value of its characters in placing it as a variety between the typical form and the var. *prester*, which is merely a melanism of the former. It is true, however, that he appears to have overlooked two of the most important characters of the new form, viz. the small eye and the low number of ventral shields, although he draws attention to the number and shape of the dorsal scales.

I will now proceed to the description of this remarkable Viper, which should be called

VIPERA URSINII.

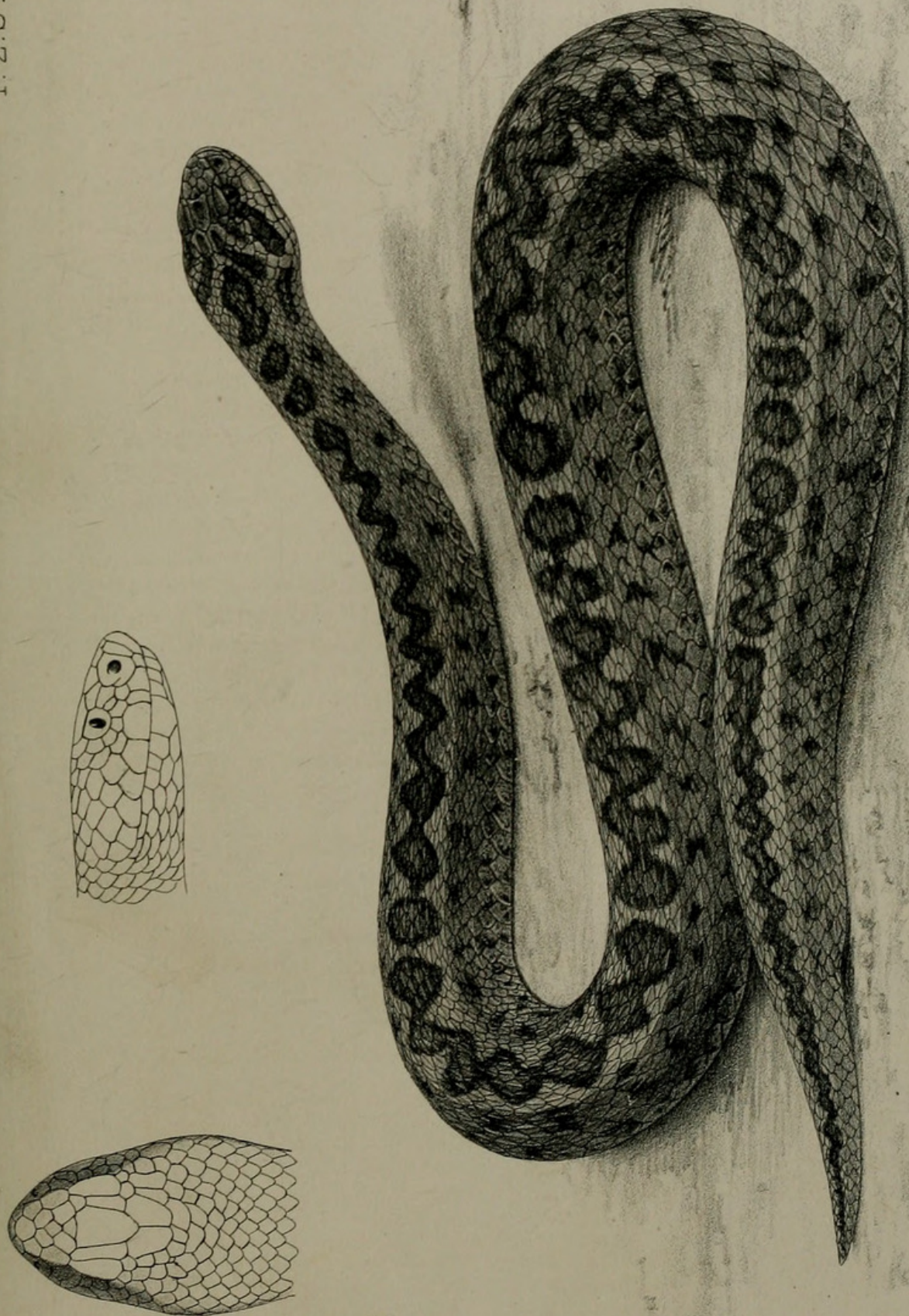
*Pelias chersea* vel *ursinii*, Bonap. Icon. Faun. Ital. (1835).

*Pelias berus*, part., Bonap. Amph. Eur., Mem. Acc. Tor. (2) ii. 1839, p. 440.

*Pelias berus*, var. *ursinii*, Cope, Proc. Ac. Philad. 1859, p. 342.

<sup>1</sup> On searching through the literature I soon after became convinced of the identity of this *V. rakosiensis* with the "Marasso alpino" of Bonaparte, a species described from young specimens obtained by Signor Orsini in the Abruzzi, near the province Ascoli. I am confirmed in this conclusion by my friend Count Peracca, who has very kindly examined at my request the two specimens from the Gran Sasso preserved in the Museum of the University of Turin, and mentioned by Camerano under *V. berus*. These, he informs me, have the eye very small, 19 rows of scales, 124 and 128 ventrals, 30 and 28 subcaudals. Bonaparte's specimens, one of which is preserved in the Museum of the Academy of Philadelphia, are stated to have 18 scales, 124-126 ventrals, and 28-30 subcaudals.—July 27, 1893.











*Vipera berus*, part., Camerano, Mon. Ofid. Vip. Ital., Mem. Acc. Tor. (2) xxxix. 1888, p. 35, pl. i. figs. 16-18.

*Vipera berus*, var. *rakosiensis*, Mchely, Zool. Anz. 1893, p. 190.

Eye very small, its horizontal diameter not exceeding its distance from the nostril, its vertical diameter not exceeding its distance from the oral margin.

The shape of the head, which is smaller in proportion than in *V. berus*, is remarkable for the somewhat pointed snout with its very obtuse, although sometimes slightly raised, canthus. The sincipital shields are constantly well developed, the frontal being longer than usual in *V. berus*, its length considerably exceeding its width, at least equalling its distance from the rostral, and usually exceeding the length of the parietals; the frontal is usually separated from the supraocular by a narrow shield or a series of small shields; rostral as broad as deep, or slightly deeper than broad, its tip in contact with a single small (apical) shield, very rarely with two; two canthal shields; upper præocular usually in contact with the nasal; a single series of scales between the eye and the upper labials; six to nine upper labials, usually seven or eight, third, fourth, third and fourth, or fourth and fifth below the eye; usually only one labial, third or fourth, below the eye; six to ten scales round the eye, usually eight or nine.

Scales in 19 rows, exceptionally 21 (21, exceptionally 19 or 23, in *V. berus*), the dorsals narrower and more strongly keeled than in *V. berus*; outer row perfectly smooth.

Ventrals 120 to 135 in males, 125 to 142 in females. On 70 specimens of *V. berus* I find 137 to 148 ventrals in males, 135 to 155 in females.

Subcaudals 30 to 37 in males, 23 to 28 in females. In *V. berus* I find 33 to 41 shields in males, 26 to 35 in females.

Length of tail 7 to 8 times in the total length in males,  $9\frac{1}{2}$  to 11 times in females.

The following are the measurements, in millimetres, and records of the numbers of scales and shields in 40 specimens from Laxenburg:—

Sex.	Total Length.	Length of Tail.	Scales.	Ventrals.	Caudals.
♂	420	55	19	135	34
"	400	50	19	130	33
"	370	50	19	129	33
"	370	48	21	129	32
"	350	45	19	129	32
"	350	45	19	120	33
"	330	45	19	134	30
"	320	40	19	131	30
"	295	43	19	132	34
"	255	37	19	132	36
"	240	35	19	132	37
"	220	30	19	126	36





Flower, William Henry. 1893. "June 20, 1893." *Proceedings of the Zoological Society of London* 1893, 528–611.

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