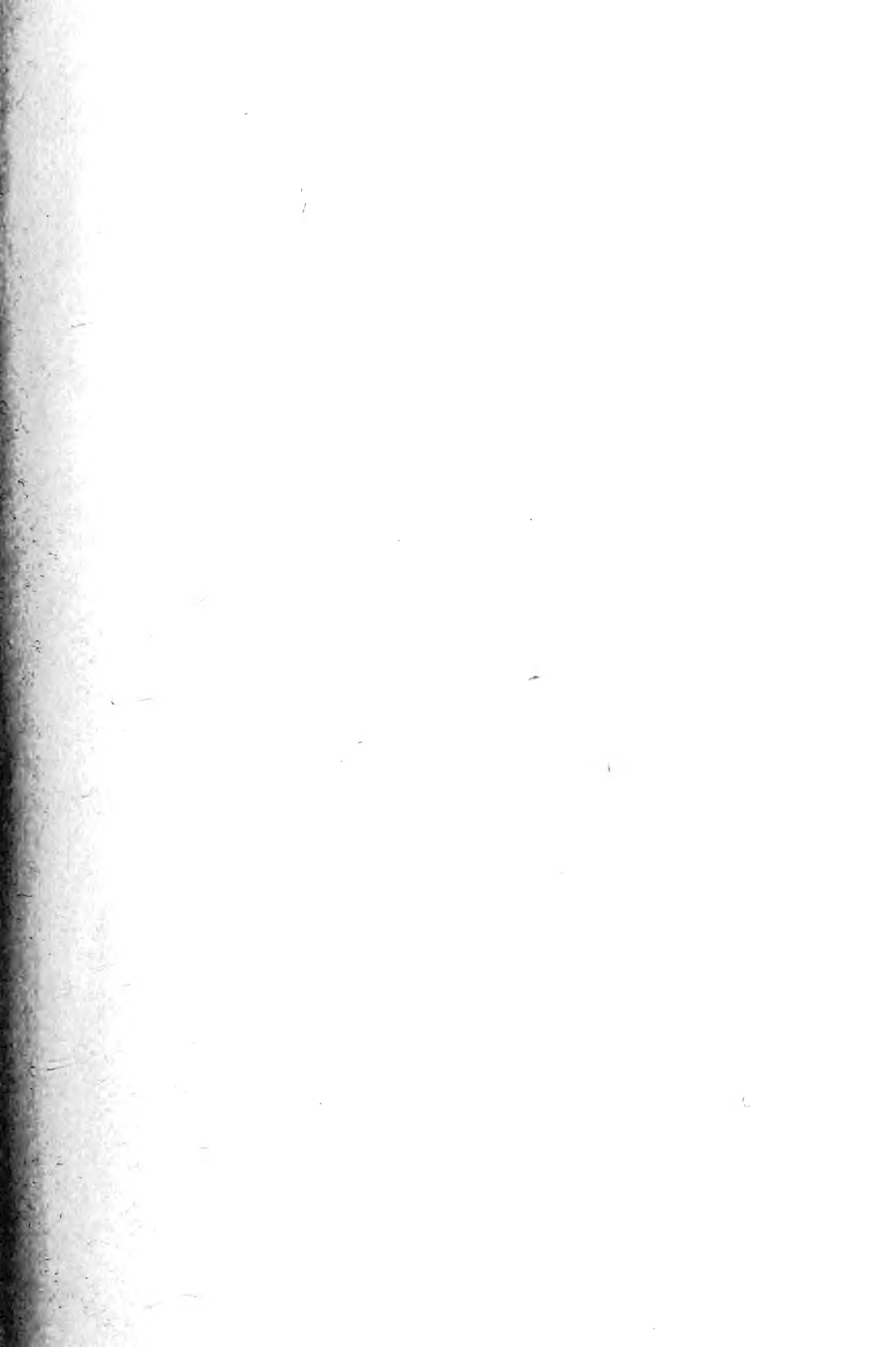


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19/10/78.

PROCEEDINGS
OF THE
SCIENTIFIC MEETINGS
OF THE
ZOOLOGICAL SOCIETY
OF LONDON.

FOR THE YEAR

1878.



PART III.

CONTAINING PAPERS READ IN

MAY AND JUNE.

OCTOBER 1st, 1878.

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May 7, 1878.

F. Du Cane Godman, Esq., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1878:—

The total number of registered additions to the Society's Menagerie during the month of April was 76, of which 33 were by presentation, 26 by purchase, 3 by exchange, 8 by birth, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 90.

The most noticeable additions during the month of April were as follows:—

1. A Squirrel, from Ecuador (*Sciurus stramineus*), of a species new to the Society's collection.

Mr. Alston, who has been paying special attention to the American Scieuridæ, has kindly furnished me with the subjoined note on this species.

“The Squirrel from Ecuador is certainly the same as Gray's *Macroxus fraseri*¹; but I am convinced that this is a synonym of *Sciurus stramineus*, Eydoux et Souleyet². *S. nebouxii* of Is. Geoffroy³ will doubtless prove the same; but I hope very shortly to be able to examine the types of both species. Mr. J. A. Allen⁴ has lately referred three specimens from Ecuador to *S. hypopyrrhus*, Wagl., principally on the strength of their harsh sparse fur and long narrow tails. The last, however, seems to me to be a very variable character; and one of these specimens, which Mr. Allen kindly lent me, agrees very well with our bushy-tailed individual, as well as with Gray's types. The irregular white spots and markings seem characteristic of this species, but are not constant, and, when present, vary in every example. *S. stramineus* was described from Omatope, and *S. nebouxii* from Payta, Peru, while *M. fraseri* and Mr. Allen's specimens were from Ecuador.”

2. A male Beisa Antelope (*Oryx beisa*), presented by H.M. the Sultan of Zanzibar, and kindly brought home for the Society by Capt. Pasley of H.M.S. 'Simoom,' April 27th.

Our excellent correspondent Dr. Kirk, H.B.M. Consul at Zanzibar, to whose kind offices we owe this valuable animal, tells me that it was obtained in the southern part of the Somáli country. Along with it the Sultan sent a specimen of a “Dwarf Koodoo, quite different from the common species.” This would probably be *Strepsiceros imberbis*, Blyth, of which we have never yet received an example.

It is much to be regretted that this animal died on the passage home.

The following papers were read:—

¹ Ann. & Mag. N. H., 3rd ser. vol. xx. p. 430 (1867).

² Zool. Voy. la Bonite, vol. i. p. 37, atlas, Mamm. pl. ix. (1841).

³ Zool. Voy. la Vénus, p. 163, atlas, Mamm. pl. xii. (1855).

⁴ Mon. N. Am. Rodent. p. 746.

79.
6-17.
3.

1. Note on the Stridulating Organ of *Palinurus vulgaris*.

By T. JEFFERY PARKER, ASSOC. R.S.M.

[Received March 27, 1878.]

(Plate XXX.)

On the 5th of March I exhibited to the Society a structure, evidently of the nature of a stridulating organ, which I had found in the common *Palinurus*, and which I then believed had hitherto escaped notice. On the following day, however, Professor Huxley showed me a reference, which he had that morning chanced to meet with, to a paper by Dr. Karl Möbius, in the 'Archiv für Naturgeschichte' for 1867, the title of which, "Ueber die Entstehung der Töne welche *Palinurus vulgaris* mit den äusseren Fühlern hervorbringt," showed at once that I had been anticipated. I hasten, therefore, to render to Dr. Möbius such credit as belongs to the discovery, and take the opportunity, at the same time, of making some criticisms on his paper, as well as a few additional remarks upon the organ in question¹.

The main anatomical features of the stridulating organ are described by Möbius, as they could hardly fail to be, with perfect correctness. He fails, however, to notice either the guiding tubercle (Plate XXX. figs. 3 and 4, *t*), situated just below the ridged pad (*p*) on the antenna, or the groove for its reception on the antennular sternum (fig. 1, *g*): the former, indeed, is shown in his figure; but no reference is made to it. As I mentioned in my former communication, these structures are of great importance, as by their means the apparatus is brought into gear: when the tubercle does not fit into the groove the pad is no longer in close apposition with the smooth surface of the antennular sternum, and the antenna moves noiselessly.

As to the functions of the various parts of the apparatus, the account given by Möbius is altogether at variance with my own. He makes the observation that the lower surface of the flap (figs. 1-4, *f*) which plays over the lateral ridge (figs. 1 and 2, *r*) of the antennular sternum is beset with innumerable close-set minute hairs, inclined with their points upwards, and that, corresponding to these, fine scratches are to be seen on the surface of the ridge itself. All this is perfectly correct: there is no doubt about the presence or the direction of the hairs; and the scratches are quite visible with a hand lens. But Möbius goes on to say that the scratches are produced by the hairs, and that it is the friction of the flap against the smooth edge of the antennular sternum which produces the sound, by the upwardly directed hairs catching against the surface, when the antenna is moved in the same direction. Of course when the antenna moves downwards the hairs will lie flat and present no ob-

¹ I find that Leach, in his 'Malacostraca Podophthalmata Britanniae' (1815), mentions the stridulating of *Palinurus*, and correctly ascribes the sound to the friction of the antenna against the "clypeus" (antennular sternum). He gives, however, no description or figure of the apparatus.

Fig. 1.

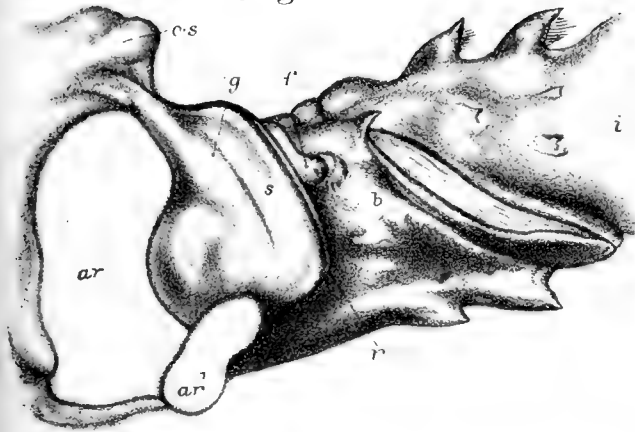


Fig. 6.

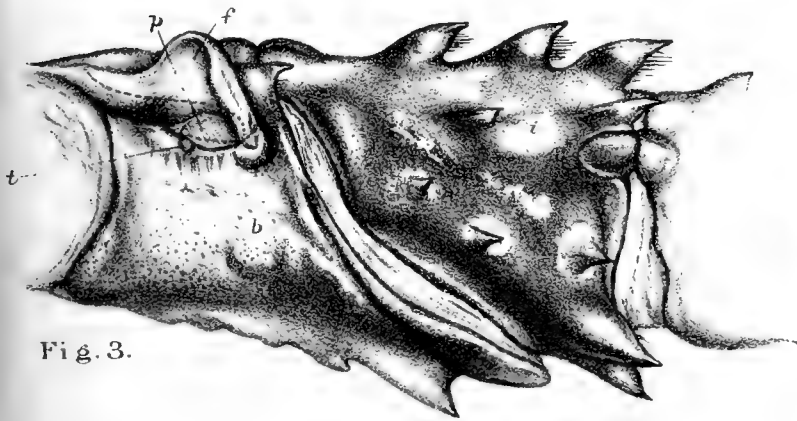
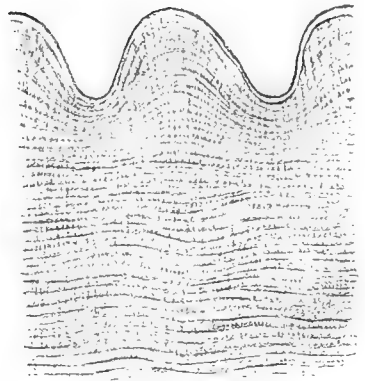
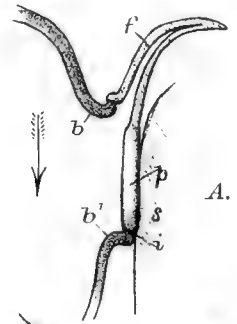


Fig. 3.



A.

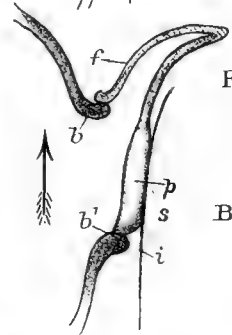


Fig. 5.

B.

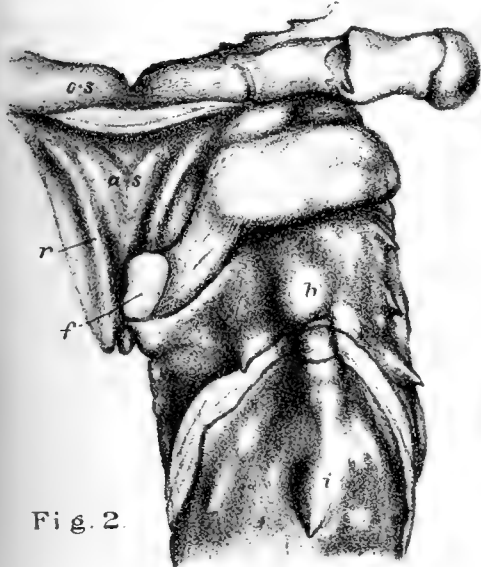
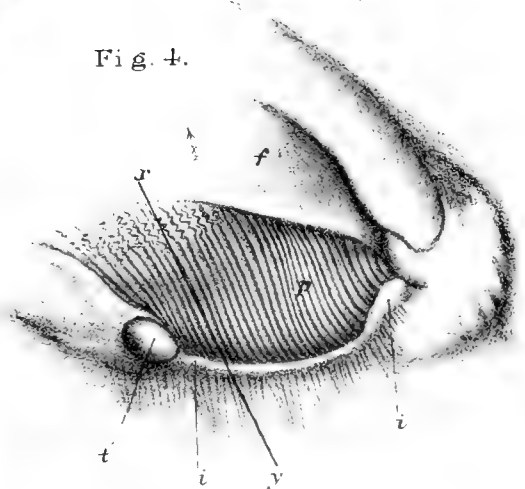


Fig. 2.

Fig. 4.





struction ; and in this way Möbius attempts to account for the fact that no sound accompanies a downward movement.

As to the first of these statements, one finds it rather hard to believe that hairs so fine¹ that the surface they cover has a texture like that of satin, can produce visible scratches ; their effect, one would rather think, would be to impart a fine polish. I should be inclined to suspect that the scratches must be due to fine particles of sand getting in between the flap and the ridge.

With regard to the second statement, that it is the friction of the flap, and not that of the pad, which produces the sound, I can only say that I have removed the flap entirely without any sensible diminution of the noise. The mere observation of the parts while in action is enough to show the true state of things : when looked at from the front it is very evident that the flap exerts hardly any pressure upon the ridge, as, indeed, from the fact that it is a soft structure supported only along one edge, it could scarcely be expected to ; while the pad, on the other hand, is completely flattened out against the smooth surface, and in the most perfect contact with it.

It is not easy to see how such a mistake can have arisen ; but Dr. Möbius's language is sufficiently explicit to leave no doubt of his meaning. He says :—“ Das gefurchte Feld [the ridged pad] bringt keinen Ton hervor, wenn es über die Fläche des Keiles [the antennular sternum] gleitet. Es leistet aber Widerstand gegen die rückwärts gedrängten Haare, da es dicker und steifer als das behaarte Feld [the flap] ist. Ausserdem geben seine Riefen dem Gange der ganzen Platte grössere Sicherheit, da sie diejenige Richtung haben, in welcher die Bewegungen ausgeführt werden.”

The fact that a downward movement of the antenna gives rise to no sound seems to me to be explained by the mode of attachment of the pad. It is connected by its inferior edge (figs. 4 and 5, *ii*) with the lower boundary (fig. 5, *b'*) of the slit or uncalcified portion of the basicerite, while at its superior edge it passes insensibly into the inner wall of the soft flap. The outer wall of the flap, again, is connected with the upper edge (fig. 5, *b*) of the slit in the basicerite. Thus, while the pad is immovably fixed at its inferior edge, it is capable of a considerable amount of displacement in the rest of its extent ; and when pressed upon, by the downward movement of the antenna, in the direction from *y* to *x* (fig. 4), it is forced inwards upon the yielding tissue which underlies it, and never comes into sufficiently close contact with the opposing surface to produce a sound (fig. 5, A). But when it is pressed upon, in consequence of the upward movement of the antenna, in the direction from *x* to *y*, the only effect of the pressure is to cause it to bulge out over the line of attachment *ii*, and so come into closer contact with the opposing surface the stronger the force applied (fig. 5, B).

In the matter of histological structure, the pad does not differ from other chitinous membranes, being formed of fine superposed horizontal laminae, marked by a vertical striation (fig. 5). It is, however, of unusual thickness ; and its horizontal laminae have, for some

¹ They are not more than one seven-hundredth of an inch in length.



distance down, a wavy appearance, corresponding with the ridges into which the surface is raised.

The stridulation is almost equally audible in water and air. As to its production by the living animal, Dr. Möbius states that it was heard by himself and Mr. Lloyd in the Hamburg Aquarium, and that it was made especially when the *Palinuri* were handled; he compares it to the sound produced by pressing the upper leather of a boot against a table-leg. I also heard the sound, and observed the movement of the antenna producing it, in a specimen brought alive to the Biological Laboratory of the School of Mines shortly after making my last communication.

As Dr. Möbius observes, the sound cannot be produced in spirit specimens. These can, however, be again rendered vocal by soaking them for a longer or shorter time in water.

EXPLANATION OF PLATE XXX.

- Fig. 1. The parts concerned in the formation of the stridulating organ, seen from the right side (nat. size): *os*, ophthalmic sternum; *as*, antennular sternum; *r*, one of the projecting ridges which bound it anteriorly; *g*, the groove on its lateral surface; *s*, the smooth surface between the groove and the ridge, against which the pad on the antenna rubs; *ar'*, articular cavity for the right antennule; *ar*, articular cavity for the right antenna; *b*, basicerite, and *i*, ischiocerite of the left antenna; *f*, the flap.
- Fig. 2. The same, seen from above (nat. size). Letters as before.
- Fig. 3. The basicerite and ischiocerite of the left antenna, seen from the inner side (nat. size); the dotted line shows the extent of the uncalcified portion of the basicerite: *p*, the ridged pad; *t*, the guiding tubercle. Other letters as before.
- Fig. 4. The pad, with the guiding tubercle and part of the flap ($\times 4$); the arrow shows the direction taken by the hairs on the inner surface of the flap: *ii*, inferior or attached edge of pad; *xy*, line showing direction of movement. Other letters as before.
- Fig. 5. Diagrammatic cross section of the stridulating apparatus, showing the condition of the parts, (A) when the antenna is moving downwards, (B) when it is moving upwards. The arrows show the direction of movement. *b* upper and *b'* lower lip of the uncalcified slit in the antenna. Other letters as before.
- Fig. 6. Microscopical section of the pad, taken across the ridges. Drawn under a $\frac{1}{8}$ -inch objective.

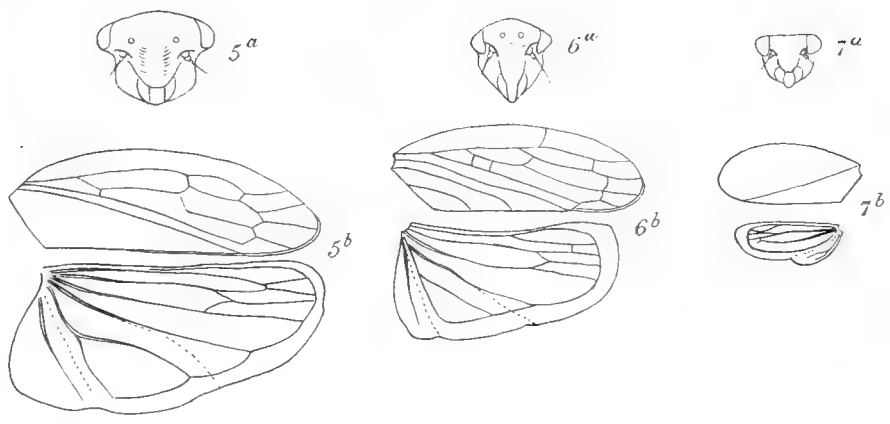
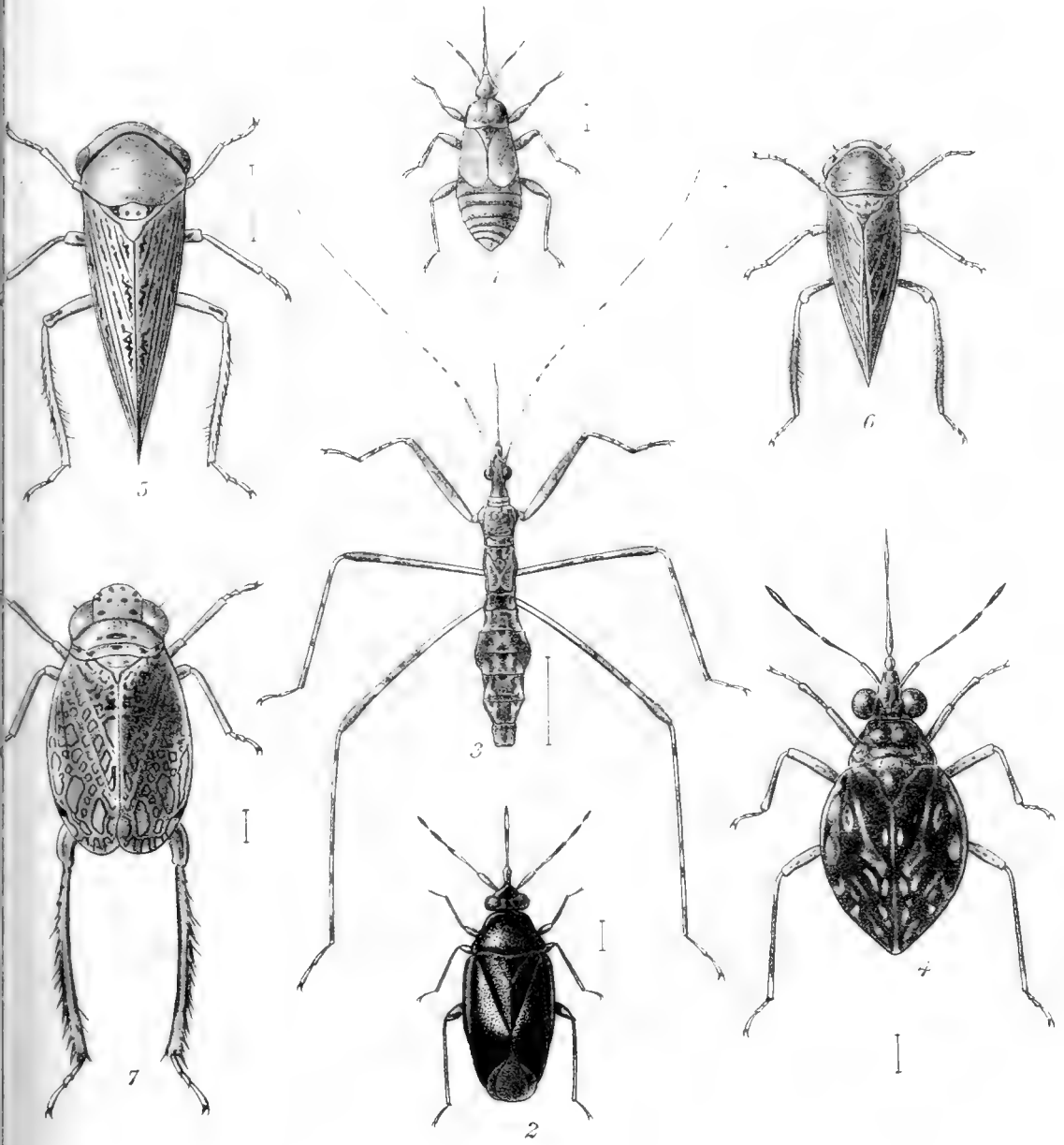
2. Contributions to a Knowledge of the Hemipterous Fauna of St. Helena, and Speculations on its Origin. By F. BUCHANAN WHITE, M.D., F.L.S.

[Received April 8, 1878.]

(Plate XXXI.)

PART I. SPECULATIVE.

“The extreme isolation of St. Helena—which is nearly 1200 miles from the nearest point of the African continent, 1800 from that of South America, and about 700 from even the small and barren island





of Ascension—gives it a degree of importance which it would not otherwise possess ; for about the faunas of remote islands cluster, in an especial manner, a variety of problems which, although they may never be absolutely solved, may yet be brought, by a series of carefully conducted observations, within the sphere of discussion, and be made to throw some additional light, however faint, on the general questions of geographical zoology. From whatever point of view we look at them,—and there are many which at once suggest themselves along the distinct, but ultimately converging, lines of thought,—the statistics of an oceanic rock, far removed from the ordinary effects of immigration and change, and bearing more or less of the impress which was stamped upon it by its aboriginal forms of life, have an interest about them which it is scarcely possible to overrate. How the organisms, as we now see them, came to occupy their present areas of distribution,—to what extent they are, or seem to be, ‘related’ to those of the nearest mainland,—whether there is evidence for believing that they have changed to any considerable extent, in their outward configuration, from the types of which they may be presumed by some naturalists to be the remote descendants,—or whether there is reason to suspect that the Hand, which originally placed them where they are, adapted each separate species to the conditions which it was destined to fulfil, subjecting one and all of them to a law of permanence under which they can never very materially alter,—are but a tithe of the questions which, if not capable of being answered positively, we may at least ventilate and probe, not altogether without profit, in even a small treatise like the present one ; for it cannot be too carefully borne in mind that, within the limited sphere where mere speculation (as such) seems likely to have any permanent value, it is to facts, and not to theories, that we must ultimately appeal”¹.

The sentences which I have quoted form, I think it will be admitted, an appropriate introduction to a paper descriptive of one of the last collections of insects ever made by their eminent and much regretted writer ; but, before proceeding to the special subject of this memoir, I wish to devote a few words to a consideration of the problems suggested by Mr. Wollaston, not, however, with much hope that I shall be able to throw any fresh light on a matter that has puzzled many abler naturalists.

Of what is actually and satisfactorily known regarding the indigenous animals and plants of St. Helena, the following is a brief epitome :—

There are no terrestrial Mammalia, nor any land or freshwater Amphibia, Reptilia, or Fishes.

Of birds there are at least eight indigenous sea species and one land bird (the *Ægialites sanctæ-helenæ*, Harting, very closely allied to the African *Æ. varius*, Vieill.), which is peculiar to the island.

As regards the sea-fishes, Dr. Günther has, in the ‘Proceedings’ of this Society², given an account of the collections made by Mr. Melliss

¹ T. V. Wollaston, *Coleoptera Sanctæ-Helenæ*, pp. vii & viii.

² March 1868 and April 1869.

These included 65 species, of which 17 are peculiar to St. Helena, 31 others, being inhabitants of shallow water, are probably indigenous (their exotic distribution being for the most part on the American and African coasts), and nearly 20 are deep-water species and common in the tropical seas. Much, however, still remains to be done, not only amongst the fishes of St. Helena, but in the other groups of marine animals.

The land mollusks seem to have been more looked after than the marine species. Of the former, 4 (or, including 2 unnamed slugs¹, 6) living, and 20 dead and subfossil native species have been recorded.

Amongst the Insecta, the order Coleoptera has received most attention; and, owing to Mr. Wollaston's researches, the indigenous species of that order are at least fairly, though, perhaps, not entirely, known. Of the 203 species that have been found in the island, 57 have without any doubt been accidentally introduced; 17 others may have been introduced; and the remaining 129 Mr. Wollaston considered to be the descendants of the "autochthones of the soil," and, with one exception, absolutely peculiar to St. Helena.

Of the Hemiptera a small, but probably fairly representative collection was made by Mr. Wollaston. In it I find 30 determinable species; and 2 or 3 more have been recorded from the island. Of the total number 5 have certainly, and 1 has, probably, been introduced, leaving 26, which, with one exception, seem to be peculiar.

The only other group of animals of which there is (as far as I am aware) any satisfactory record is that of the Spiders, Mr. Melliss's collections² of which have been reported on by the Rev. O. P. Cambridge. Out of a total of 40, 18 species seem to be indigenous, and 22 probably introduced.

We will now glance at the flora. The great mass of the present flora consists of introduced species; but of the original flora, as far as it can now be traced³, 40 flowering plants are absolutely peculiar, and the 5 other probable natives are species of wide-spread tropical distribution. Of the 26 ferns, 10 are peculiar. Adding to these the other cryptogamic plants, so far as they are known, we have a total of 77 plants⁴ supposed to be absolutely peculiar to the island.

"Whence and by what means came this very peculiar fauna and flora?" is a question that has given rise to more than one suggestion or theory.

To begin with the flora, Sir J. D. Hooker⁵, after alluding to the causes that have assisted in destroying the ancient flora, and indicating the means by which it is possible to distinguish the aboriginal from the introduced plants, proceeds to say:—"From such fragmentary data it is difficult to form any exact conclusions as to the affinities of this flora; but I think it may be safely regarded as an

¹ J. C. Melliss, 'St. Helena,' p. 118.

² Proc. Zool. Soc. Nov. 1869 and March 1873.

³ Sir J. D. Hooker, "Lecture upon Insular Floras," Brit. Assoc. Adv. of Sci. 1866.

⁴ Melliss, *l. c.* p. 224.

⁵ 'Lecture on Insular Floras,' quoted in Melliss, *l. c.* p. 223, &c.

African one, and characteristic of Southern extra-tropical Africa. The genera *Phyllica*, *Pelargonium*, *Mesembryanthemum*, *Osteospermum*, and *Wahlenbergia* are eminently characteristic of Southern extra-tropical Africa; and I find amongst the others scarcely any indication of an American parentage, except a plant referred to *Physalis*¹. The Ferns tell the same tale: of 26 species, 10 are absolutely peculiar; all the rest are African, though some are also Indian and American. The botany of St. Helena is thus most interesting; it resembles none other in the peculiarity of its indigenous vegetation, in the great rarity of the plants of other countries, or in the number of species that have actually disappeared within the memory of living man Probably 100 St.-Helena plants have thus disappeared from the *Systema Naturæ* since the first introduction of goats on the island. Every one of these was a link in the chain of created beings, which contained within itself evidence of the affinities of other species, both living and extinct, but which evidence is now irrecoverably lost. If such be the fate of organisms that lived in our day, what folly it is to found theories on the assumed perfection of a geological record which has witnessed revolutions in the vegetation of the globe to which that of the flora of St. Helena is as nothing!"

Mr. Melliss, whose interesting work on St. Helena I have had frequent occasion to refer to, says²:—"Other theories may be appealed to in order to account for the presence and position of this wonderfully curious little flora. Continental land at one time spreading over the South Atlantic Ocean, with its own peculiar flora and fauna, has been started as a plausible theory; but the geological investigation of St. Helena forbids us to look upon it as a remaining portion of some disappearing continent to which the last vestige of a flora, still struggling for existence, may be clinging; and the great depth of ocean³ around it also seems to deny the possibility of its connexion at any time with either African or American land. Still we cannot tell what geological changes, hundreds or even thousands of centuries may have witnessed in that portion of the globe, leaving, perhaps, this unique little floral remnant, now fast disappearing, as almost the only record of what once was. So far, therefore, the manner in which this once incandescent mass first received its flora, whether by the agency of birds or atmospheric and oceanic currents, or direct from that Hand by which all things were created, still remains unfathomed."

Of the class Arachnida, Mr. Melliss⁴ states:—"Mr. Cambridge says, in reference to the character of this portion of the island fauna, after his final examination of the several collections, that 'the European stamp observed upon in regard to the spiders of the former collection is thus equally marked in those now recorded and described.' It is worthy of note that the native Spiders are, almost as a rule, least

¹ Subsequently referred to a new genus, *Mellissia*, Hk. f.

² P. 225.

³ "St. Helena is said to be separated from the continents of Africa and America by a depth nowhere less than 12,000 feet."

⁴ *L. c.* p. 206.

abundant now in the island ; in each case where I met with only one specimen, it turned out to be a new species. It is therefore not at all improbable that, like the native plants and the Snails, which we know are fast disappearing, some having gone entirely, the Spiders, for some cause or other, are also yielding up their native land to foreign invaders.”

Mr. Wollaston, whose painstaking investigations of the faunas of the North Atlantic islands, and careful study of the Coleoptera of St. Helena especially qualified him to give an opinion on this subject, thus writes regarding the Beetles¹ :—“The whole of the 129 species to which I have just alluded are, with a single exception (the *Chilomenes lunata*, Fab.), absolutely *peculiar* to St. Helena ; so that the question of geographical distribution would seem to be well-nigh ‘nipped in the bud.’ Moreover, from all that I know of the South-African Coleoptera it has almost nothing in common with these 129 aboriginal St.-Helenians, which stand out singly, as it were, and alone, related more or less *inter se*, but unrelated for the most part, to any recognized continental forms. It is true that two of the most significant of the Rhynchophorous types—namely, *Nesiotes* (of the *Tanyrhynchidæ*) and *Acarodes* (of the *Anthribiidæ*)—are allied conspicuously to *Echinosoma* and *Xenorchestes* of the Madeiran archipelago ; but if any more successful generalizer than myself can develop much from these points of quasi-contact, he is quite welcome to the result. So far as I can understand the evidence before me, any unprejudiced inquiry into the ‘origin’ (as usually understood by that term) of these St.-Helenian Coleoptera, does not elicit, in reply, so much as even an echo ; for not only are they *endemic* (in the strictest sense of the word), but an overwhelming majority of them are attached (or were so originally) to trees and shrubs which would seem to exist nowhere in the world except on this remote rock, 1200 miles from the nearest point of the African coast, surrounded by an all but unfathomable ocean, and which has every appearance of having been piled up by successive eruptions into a basaltic mass at no period *very* considerably larger than that which we now see. ‘Whence then, came its fauna and flora,’ are enigmas which I cannot presume to answer on any known principles of derivation and descent. To a mind which, like my own, can accept the doctrine of creative acts as not necessarily ‘unphilosophical,’ the mysteries, however great, become at least conceivable ; but those which are not able to do this may perhaps succeed in elaborating some special theory of their own, which, even if it does not satisfy all the requirements of the problem, may at least prove convincing to themselves. The St.-Helena fauna cannot, I think, be said to have had much light yet thrown upon it as regards its actual ‘origin’ (except, perhaps, in so far as my individual opinions on the subject may be accepted by others who are predisposed to receive them) ; but its *primitive* (or at all events remote) *state* is another matter, and appears to be capable of some real elucidation from the facts to which we have access.”

¹ Coleoptera Sanctæ-Helenæ, p. xix.

Regarding the Mollusca, the late Edward Forbes thought that both the terrestrial and marine species dimly indicated a closer geographical relationship between the African and American continents than now maintains. "The marine mollusks would seem to point to the submergence of a tract of land probably linking Africa and South America before the elevation of St. Helena. Along the sea-coast of such a tract of land, the creatures common to the West Indies and Senegal might have been diffused." Commenting on this suggestion, Mr. Gwyn Jeffreys¹ writes, "I am not quite satisfied with this hypothesis, and I believe that more information is needed to support it. A few of the marine shells are Mediterranean, while the greater number are well-known inhabitants of the Indian Ocean and the West Indies; all these may have originated anywhere. But it must be borne in mind that St. Helena is separated from Africa and South America in every direction and by very deep water, which is nowhere less than 2000 fathoms or 12,000 feet. It therefore seems scarcely probable that such an abyssal and extensive tract of the sea-bed could have been dry land or 'sea-coast' in a geologically recent period, so as thus to account for the diffusion of littoral species such as *Mytilus edulis*, *M. crenatus*, and *Littorina striata*. I should be rather inclined to attribute the present distribution of the marine fauna of St. Helena (not to a supposed continuity of land between Africa and South America in that or any other direction, but) to the action and influence of the great Agulhas current, which issues from the Indian Ocean and flows round the Cape of Good Hope northwards towards St. Helena, and thence past Ascension to the West Indies."

Mr. Andrew Murray, whose loss to science we have had so recently to deplore, has given² a considerable amount of attention to the origin of the fauna of St. Helena. After stating his conviction that there at one time existed a land communication, now at the bottom of the Atlantic, between the northern and southern hemispheres, and arguing that there are only three great Coleopterous faunæ or stirpes (the Indo-African, the Brazilian, and what he calls, for want of a better name, "the microtypal stirps"), he proceeds to say:—"St. Helena, that great puzzle of naturalists, is a crucial test to my hypothesis of a communication between the northern and southern hemispheres by an Atlantic continent; if that link snaps, the whole chain will fall to the ground. I say that its fauna is certainly microtypal, and, if so, almost necessarily a branch of the Atlantic type of that stirps; there is nothing else microtypal for it to be attached to. Some three years ago Dr. Hooker gave an admirable Lecture on Oceanic Islands, in which he discussed the origin of the flora of St. Helena, and on the whole seemed inclined to refer it to Africa. More in the spirit of 'audi alteram partem' than from any settled conviction of my own, I wrote a reply, in which I gave some reasons for thinking that it might more probably have been

¹ Ann. & Mag. Nat. Hist. April 1872; Melliss, *l. c.* p. 114.

² "On the Geographical Relations of the Chief Coleopterous Faunæ," Journ. Linn. Soc. xi. no. 49.

originally connected with and peopled from Europe, although, also, possibly connected at some period with Africa. More mature consideration and subsequent researches have confirmed my opinion." Mr. Murray then goes on to point out how the fauna (as then known) supported his conclusions as to its European origin. Of the flora he writes:—"The general result which I draw from the whole flora is, that we have here a compound flora, certainly two deep, possibly three deep. We have, in the first place, I believe, a genuine natural Atlantic (that is, European) flora; for in the face of the decided testimony given by the fauna, I cannot accept Dr. Roxburgh's conclusions as to the supposed introduction and naturalization of every species having a European habitat. If they can be proved to have been introduced, good and well; but I object to take the thing to be proved as part of the proof. And in the next place, I believe, we have the traces of an older African flora (why I call it older I will explain when I come to speak of an ancient connexion between Patagonia and South Africa); and I believe that both are due to actual continuity, however circuitous or interrupted, with the respective countries the impress of whose floras they bear.

"Before leaving St. Helena, I have just one other argument to adduce in support of its former connexion with the other Atlantic Islands; and that is, the fact (which has only recently been ascertained, or, at any rate, only recently laid down in our maps) that there is a long band of elevated submarine bottom running north from St. Helena to the Cape-Verd Islands, and embracing in its course Ascension Island and the shoal-ground on the equator."

Subsequently Mr. Murray explains how, in his opinion, there might have been a land connexion between Patagonia and the Cape of Good Hope, "sending out perhaps arms to Tristan d'Acunha and St. Helena, which, however, have the option of what, I think, is a still more ancient union in another direction," namely from Brazil, rounding, but not touching, the Cape of Good Hope to Madagascar. To one or other of these connexions (presumably the first) are owing "the score or so of plants left on St. Helena and Tristan d'Acunha, and a slight sprinkling of microtypal forms which still subsist at the Cape."

I have now given the gist of what I have been able to find suggested as to the origin of the flora and fauna of St. Helena, and, before explaining my own views, will briefly recapitulate.

The facts may be thus stated:—

1. A volcanic island of very ancient origin, very remote from continental land or other islands, and surrounded by an ocean 12,000 feet in depth on almost every side.

2. A terrestrial fauna and flora, the very great majority of the indigenous species comprising which are peculiar, and a marine fauna with a large proportion of peculiar species.

The various theories suggested for the peopling of this island arrange themselves as follows:—

1. Special creation and no special affinities.
2. Land connexion with both Africa and America.

3. As regards the fauna and part of the flora—land connexion from the north, and European affinities.

As regards the peculiar part of the flora—land connexion from the south uniting Africa and America.

4. As regards the marine Mollusca, diffusion by means of the Agulhas current from the south.

5. Affinities of the flora somewhat suggestive of extratropical Southern Africa.

Against the first of these theories (special creation) it may be argued that such a method is contrary to, as far as we can judge, the whole scheme of creation, and that, while many things can be urged against it, there is nothing to support such a belief.

Against the theories which necessitate the existence in time past of a land communication with Africa or America, or both, all the known facts militate. The non-existence in St. Helena of Amphibia and terrestrial mammals¹, the large number of peculiar species, as well as the great depth of the surrounding sea, afford reasons for thinking that it is extremely improbable that the island was ever connected with either of these continents.

The other theories will be alluded to in giving my own.

A careful consideration of all the known facts leads me to believe that two, if not three, epochs in the colonization of the island may be distinguished, and that the great bulk of the inhabitants came from the north, but not by means of a continuity of land.

The first of these epochs, or that in which the earliest inhabitants of St. Helena reached the island, occurred possibly early in the last glacial period, but perhaps and (even probably) in Miocene times; and the reasons for thinking so, as well as for believing that the colonists came from the north, I will now try to prove.

In the first place, all the peculiar species belong either to peculiar genera, or to genera which, if they have not yet been found in Miocene formations, are (like the genera which have been found) so widely distributed that it seems more than probable that they were Miocene genera. The nearest relations of the peculiar genera are also of this character.

To begin with the terrestrial fauna, viz. the Mollusca, the Coleoptera, the Hemiptera, and the Arachnida.

The molluscan genera are *Succinea* (with a peculiar subgenus), *Helix*, *Bulimus*, and *Achatina*—genera which all date from the Eocene, and which are all very widely distributed.

The Coleoptera, being more numerous, are not so easily disposed of. Taking Mr. Wollaston's estimate of what are aboriginal species, we have 40 genera, of which 25 are peculiar. The remaining 15 genera include 10 actually known as Miocene, 4 of wide distribution and therefore probably Miocene, and 1 which is only known from Madeira in addition to St. Helena. Of the 25 peculiar genera, 21 at least belong to families or subfamilies which are Miocene, and 3 are allied to very widely-spread genera.

The Hemiptera are not many in number, nor is our information

¹ C. Darwin, 'Origin of Species,' 6th edition, p. 350.

about their geographical distribution so complete as it is for the Coleoptera. The total number of genera is 21, of which 8 are peculiar. Of the 13 genera not peculiar, 4 have Miocene affinities, 3 are very widely spread, and 6 are more or less widely distributed, but there is a want of information regarding them. Of the 8 peculiar genera, 4 have Miocene affinities, and 3 have relations of very wide distribution, the remaining genus having African affinities.

As the Hemiptera are specially treated of in the second part of this paper, I need not discuss them at length just now.

The supposed indigenous Arachnida belong to 13 genera, none of which are peculiar. All the genera are widely distributed—many very widely, reaching Australia and New Zealand. One genus is Miocene, and 5 belong to families known as Miocene.

As already mentioned, there are no freshwater fishes; and even if the sea-fishes were more extensively known than they are, the continuity of the medium in which they live affords so many facilities for the distribution of the species, that it is not very easy to learn much from them. Still we find that both the geological age and the present distribution of the 7 families to which the 17 peculiar fishes belong are very great, and that, on the whole, they seem to indicate the same Palæarctic origin as the other classes.

The flora alone remains to be considered. The extratropical South-African affinities of the flowering plants have been pointed out by Sir J. D. Hooker. As to the cryptogams, many have a very wide distribution, either as species or genera; and while many, from their geological age, have had ample time for diffusion, it would seem that even at the present day cryptogams have greater facilities for dispersion than phanerogamic plants. In addition, more information as to their geographical distribution is necessary before they can be considered to throw very much light on the subject we are considering.

The facts connected with the aboriginal fauna to which I have just called attention seem to indicate that its probable origin was somewhat after this manner:—

1. That the first settlers arrived at a very early date, and that no very great additions, from outside the island, were made to them from that period up to the time when man's agency came into force.
2. That they did not arrive in a body, but that the colonization of the island was spread over a considerable period.
3. That the road by which they came was not on a continuous land-surface.
4. That the colonists came from the Palæarctic region.

I shall now endeavour to prove these statements seriatim.

1. *The first settlers arrived at a very early date.*

As, thanks to Mr. Wollaston, the Coleoptera form the best-known group of the animals of the island, we will see how they support my argument. If the colonization did not take place at a very early

period, there ought to be some genera represented (amongst those which are not absolutely peculiar) which are of comparatively recent origin; but the facts are that out of 15 genera not peculiar, 10 are actually Miocene¹, and 4 others are of such wide distribution that, though they have not yet been detected in Miocene formations, they must be of Miocene age. The remaining genus may have either been a later importation, or, what is as likely, originated *en route*. The 25 peculiar genera are all, as I have stated, allied to Miocene, or probably Miocene, families; and their great number is an additional argument in favour of the long isolation and consequent early settlement of St. Helena.

The Hemiptera (so far as our defective knowledge of their geological and geographical distribution goes) tell the same tale. Of the 13 genera not peculiar, 4 have at least actual, and 3 probable, Miocene affinities; of the remaining 6 we know less. Of the 8 peculiar genera, 4 have actual and 3 probable Miocene affinities.

Again, we learn the same thing from the Arachnida. The 13 genera are all probably Miocene, 1 being and 5 belonging to families known as Miocene.

The 4 genera of terrestrial Mollusca are all Eocene; and one has a peculiar subgenus. These quite support the evidence learnt from the insects.

2. *The aboriginal fauna did not arrive all at once, but the colonization was spread over a lengthened period.*

This is a question into which I need not enter at length, but merely refer to Mr. Darwin's remarks on the inhabitants of oceanic islands², and point out how the great number of peculiar species in St. Helena bears out his arguments. If all the inhabitants had arrived simultaneously, their mutual relationships would have been undisturbed, and the liability to modification consequently lessened by the absence of new forms of competition. Spread over a lengthened period, the colonization of a new land must inevitably upset the preexisting relationships of the colonists, and result in, as we see in St. Helena, many modifications of form.

3. *The road by which the colonists travelled was not on a continuous land-surface.*

This, too, is a question not requiring lengthy consideration here.

The absence of Batrachians and terrestrial mammals is quite in accordance with what Mr. Darwin has shown is the rule in oceanic islands; and, moreover, the argument in favour of gradual colonization also supports that of want of continuity of land-surface.

4. *The colonists came from the Palæarctic Region.*

This is capable of consideration under two headings:—1, the Palæ-

¹ There seems reason to believe that many genera of insects known as Miocene are also of Eocene age.

² *L. c.* p. 348.

arctic character of the fauna ; and, 2, the road by which it came ; but these will be most conveniently treated of together.

St. Helena is, as has been already said, a small island of ancient volcanic origin, very distant from any continent, and surrounded by very deep sea. The nearest land is Ascension Island, 698 miles north-west of St. Helena ; and nearly double that distance north of Ascension lie the Cape-Verd Islands. Improbable as it may seem to many, this is the route by which, I think, the aboriginal fauna reached St. Helena.

But it is not necessary to believe that the colonists crossed such wide stretches of ocean. "Stepping-stones," in the shape of other islands, doubtless existed ; and, in fact, we can trace the remains of some of them. For, deep as is the ocean round St. Helena, a somewhat shallower sea (still, however, very deep) extends between it and Ascension, and is continued north to the equator, where a yet shallower place is to be found, not more than 700 or 800 miles from the Cape-Verd Islands. It seems not only possible but extremely probable that in this equatorial shoal we have the wreck of an island ; and as the line indicated coincides with an area of depression as well as of volcanic action (extending more or less from Iceland to Trinidad and Tristan d'Acunha), there is no reason why other islands should not have existed, of which (as Mr. Darwin says) "not a wreck now remains."

It may be argued against this theory that, if it were probable, then Ascension should have a larger native fauna than it at present possesses ; but, as far as I can learn, the present Ascension is of comparatively recent origin, and supplies an argument in favour of my view that volcanic action has made great alterations in the supposed line of route. If (as seems probable) the present Ascension is comparatively recent, it by no means follows that an older island did not once occupy its place and possess a larger fauna than its successor, which has been possibly colonized from St. Helena. (I may here call attention to Mr. Melliss's remarks¹, that *Sterna fuliginosa* does not remain all the year at St. Helena, but probably migrates to Ascension, returning to St. Helena at the end of the year. If there is any thing in Mr. Wallace's theory that the lines of migration of birds often coincide with ancient land-connexion²—which, however, Colonel Drummond Hay has shown³ to be by no means invariably the case—then this would seem to point at some closer connexion in former times between St. Helena and Ascension.)

But even assuming that the supposed requisite intermediate islands existed, it is necessary to find some means by which the tide of emigration was induced to flow towards St. Helena.

At the present time both the ocean-currents and the prevailing winds would tend to lessen, if not, as seems more probable, to entirely prevent, emigration in that direction, even if the "stepping-stone" islands still existed. The S.E. trade is the prevailing wind ; and the great Agulhas current sweeps past St. Helena from the

¹ *L. c.* p. 98.

² *Geographical Distribution of Animals*, i. p. 22.

³ *Scottish Naturalist*. 1877-78.

Cape of Good Hope towards the West Indies, and, while effectually stopping any emigration from the north, does, in fact, occasionally (as we shall presently see) bring new inhabitants to the island from the south. Given, therefore, any cause by which the present direction of the winds and currents could be reversed, the probability of colonization from the north would be immensely increased. But when we find, as in reality we do, that one and the same cause not only reversed the winds and currents, but induced an immense tide of migration to flow from the north to the south, then it seems pretty evident whence St. Helena derived its fauna, if that fauna be, as I shall presently show it is, of a Palæarctic character.

The cause I have alluded to is one or other of the northern glacial periods, either the last or one in Miocene times. That during such a period the equatorial currents were reversed, Dr. Croll¹ has shown there are very good reasons for believing; and as regards the flow of migration southwards at the same time, we know that that must necessarily have taken place².

But perhaps it may be argued that similar reasons to those which I have advanced to show that the colonization was from the north may be brought forward to prove, with as great probability, that the colonization was from the south. We have seen, however, that the present configuration of the sea-bottom is much more in favour of the northern than of the southern theory; we, know, moreover, that emigration from the north has always been more powerful than from the south; and I will try to show that the character of the fauna is in favour of the northern view.

It is now generally admitted that the Cape-Verd Islands belong to the Palæarctic region, and have derived their fauna through the Canaries and Madeira. If, then, St. Helena got its fauna by that route from the north, the affinities should be Palæarctic, and the imprint of the fauna of the route should be more or less discernible. That this imprint is not more manifest is explained, I think, by reason that the route was interrupted at the St.-Helena end, and that island cut off, at a very remote date; the other islands being less inaccessible, have had their faunas altered very considerably by later importations, and their original settlers less modified by the fact that the colonization was more *en masse* and that fresh blood has tended to preserve the old types.

Mr. Wollaston, whose opinion must be received with the greatest respect, arrived at the conclusion, as I have already mentioned, that St. Helena had little in common with the faunas of the Atlantic archipelagos to the north; but even he admits that "two of the most significant of the Rhynchophorous types—namely *Nesiotes* (of the *Tanyrhynchidæ*) and *Acarodes* (of the *Anthribidæ*)—are allied conspicuously to *Echinosoma* and *Xenorchestes* of the Madeiran archipelago."

Most of the coleopterous genera not peculiar to St. Helena have already been cited in evidence of the very ancient peopling of the

¹ Quoted in Dr. J. Geikie's 'Great Ice Age,' p. 107, &c.

² Darwin, *l. c.* p. 339, &c.

island. Most of these genera, in addition to being Miocene and of very wide distribution, are characteristic Palæarctic genera at the present time. Amongst the peculiar genera many have their affinities (and, hence, probable ancestry) with Palæarctic genera; while in the North-Atlantic islands there seems to me to be more evidence of alliance with St. Helena than Mr. Wollaston was inclined to admit. Mr. Murray (whose line of migration, in part, at least, coincides, as will have been noticed, with mine—he arguing, however, for continuity of land) was decidedly in favour of affinity with the North-Atlantic islands; and his knowledge of Coleoptera was, it must be allowed, so extensive as to require his opinion to be received with attention. It is true that since he wrote on the subject our knowledge of the St.-Helenian Coleoptera has been immensely increased; but so far as I can see, nothing has been found to invalidate (but rather to increase) the argument in favour of such alliance. Taking Mr. Murray's abstract¹ of the Coleoptera of the North-Atlantic islands, we have in Madeira 266 endemic species against 120 aboriginal European species, the endemic species being all akin to European forms. Then in the Canaries we find that, out of a total of 930, 224 species are identical with Madeiran, the peculiar characters of the Madeiran fauna being there in force. Next come the Cape-Verd Islands, of which Mr. Wollaston says, "Our recent explorations in the Cape-Verdes have shown their coleopterous population to be so far more than I had anticipated on the Canarian and Madeiran type, that I am any thing but certain that it would not be more natural to regard the *whole* of these Atlantic islands as characterized by a *single* fauna unmistakably the same, even whilst necessarily differing as to many of its exact details (and through the fact of mere *distance*) in the more widely separated groups."

In fact we find in the three archipelagos just what might have been expected. As we move southwards the same general character of the fauna is found to be present, but the particulars gradually alter. And this, it seems to me, is apparent even when St. Helena is reached. Making due allowance for its remoteness and different latitude, the character of the fauna is the same, though the details are very considerably altered. For example, in Madeira we have the Heteromorous genera *Hadrus* and *Hegeter*, with 3 and 1 species respectively; in the Canaries *Hadrus* has vanished, but *Hegeter* has no less than 19 species; in the Cape-Verds *Hegeter* has almost disappeared, having but a single species, but its place has been taken by a new genus, *Oxycara*, with 10 species; in St. Helena all these genera have vanished, but are represented by two new and allied genera—*Hadrodes* and *Tarphiophasis*, regarding the first of which Mr. Wollaston remarks that it has a good deal in common with the Madeiran *Hadrus*. *Tarphiophasis* too seems evidently a development of *Hadrodes*, just as the latter is of *Hadrus*. Then, again, Mr. Wollaston remarks of the St.-Helenian *Opatrum hadroides* that it is closely allied to species from the Cape-Verd, Canarian, and Madeiran archipelagos, and is even more akin to one, and probably

¹ L. c. p. 12 &c.

identical with another, Cape-of-Good-Hope species—the significance of which latter facts will be alluded to in connexion with the flora. Again, the genus *Euxestus* was known from Madeira only, till Mr. Wollaston discovered another species in St. Helena.

But as the most remarkable fact in the coleopterous fauna of St. Helena is the enormous preponderance of *Cossonidæ*—more than a quarter of the endemic species belonging to that family—which seem to find there their metropolis, we ought, if the line of migration is by Madeira &c., to find in the latter a significant development of this family. And so we do. “In the Madeiran and Canarian groups,” writes Mr. Wollaston¹, “there is scarcely any fact [the insular-loving nature of the *Cossonidæ*] more distinctly observable—where every detached rock is tenanted by some one representative, or more, of this particular department. Nor are trees and shrubs (which seldom flourish in localities thus weather-beaten and exposed) by any means essential for their support, the pithy stems of the ordinary plants being amply sufficient to sustain them; and I have frequently found the stalks of dead thistles and Umbelliferæ to be perforated through and through by their ravages.” Mr. Wollaston found 19 species in Madeira and 14 in the Canaries. The *Anthribidæ* (which include the next largest number of endemic species in St. Helena) indicate a like derivation; but enough has, I think, been brought forward to show both the Palæarctic origin and probable route of migration of the Coleoptera of St. Helena.

The Hemiptera are not fitted (from the reasons already given) to teach us so much as the Coleoptera; but 12 at least, if not all, of the 13 non-peculiar genera are Palæarctic, and many of them Madeiran. The peculiar genera have also nearly all strong affinities with Palæarctic genera. Just as the whole facies of the Madeiran Hemiptera is European, so that of the St.-Helenian is Madeiran and European.

The characteristics of the Arachnida and of the terrestrial Mollusca have already been pointed out.

But let us now see if there be any thing in the manner of life of the aboriginal animals of St. Helena which would make their passage across the sea not only a possible but a probable occurrence. If we can find that a majority of them are connected with plants, it is not difficult to imagine how they might have been drifted by sea-currents to the island; but if, in addition, it turned out that many inhabited the interior parts of plants, their carriage across the sea would pass from the region of possibility into that of probability. Mr. Wollaston has carefully recorded the *modus vivendi* of the St.-Helenian Coleoptera; so we will try and prove our case from his evidence.

At least half of the 12 endemic species of the genus *Bembidium* have the very abnormal habit, for that genus, of living *within* the dead and rotting stems of the tree ferns. (I may note here that in the Madeiran group 10, in the Canaries 14 (7 peculiar), and in the Cape-Verds 5 species of the genus have been found.) The following St.-Helenian genera are also, amongst others, especially

¹ Trans. Entom. Soc. London, 1873, iv. p. 433.

wood-frequenting—*Anchastus*, *Anobium*, the 17 genera of *Cossonidæ*, *Nesiotes*, &c.

Thus 16 out of the 25 peculiar genera, and nearly 80, at least, out of the 129 peculiar species, live in wood at some period of their existence. The *Anthribidæ*, of which 26 species occur in St. Helena, are not wood-borers, although probably lignivorous as larvæ, but cling rather tenaciously to foliage, dead wood, &c. ; and they, as well as most of the remaining Coleoptera as well as the species of the other groups which are also attached to plants, must be specially liable to transportation in or about drift-wood, &c. In the case of winged species the winds, of course, would assist in the work.

But it is unnecessary to pursue this subject any further, save to mention that though most of the plant-frequenting beetles are attached to some one or other of the peculiar plants, it by no means follows that their ancestors were so restricted ; for, as observed by Mr. Wollaston, some at the present day devour with apparently equal relish, the native arborescent Compositæ and the introduced Coniferæ. Nor is it necessary to suppose that they were introduced with the tree Compositæ, because it is probable that the progenitors of the latter were not arborescent when they arrived in the island, but that that condition was gradually evolved¹. Some of the *Cossonidæ* are quite content with the pithy stems of thistles &c., though the family is essentially wood-loving.

It is also worth while noting the extreme paucity of that section of the Coleoptera known as the *Phytophaga*, which seems to show not only that the lignivorous beetles had more facilities of transport than those that merely fed upon the leaves of plants, but that, as Mr. Wollaston remarks, the early flora of St. Helena was essentially a woody one. Now that the forest has vanished, and though the greater part of the island is suited for the *Phytophaga*, yet the number of species remains the same—showing, I think, that colonization (apart from that brought about by man's unintentional agency) is not now going on.

A word now as to the flora. The aboriginal plants have, as has been already said, most affinity with the flora of Southern extra-tropical Africa. This affinity can surely only arise from a common origin ; and if, as I have attempted to prove, the origin of the fauna is Palæarctic, it seems reasonable to suppose that the origin of the flora is the same, and that the same agencies which brought its fauna to St. Helena brought its flora also. Without going into details of the South-African flora (for which, indeed, I have not the materials), I may mention that there are one or two genera of plants common to it and to St. Helena which are strongly suggestive of a Palæarctic origin and dispersion by the influence of a glacial epoch :—for example, *Sium*, which has an endemic representative in St. Helena ; the very characteristic Cape genus *Pelargonium*, which has a straggler in Syria (where, be it noted, the endemic St.-Helenian coleopterous genus *Haplothorax* has, according to Lacordaire, its nearest allies) ; and others.

¹ Darwin, *l. c.* p. 350.

Here I may be permitted to quote a remark by Mr. Darwin on this point¹:—"In Africa, several forms characteristic of Europe and some few representatives of the flora of the Cape of Good Hope occur on the mountains of Abyssinia. At the Cape of Good Hope a very few European species, believed not to have been introduced by man, and on the mountains several representative European forms are found which have not been discovered in the intertropical parts of Africa. Dr. Hooker has also lately shown that several of the plants living on the upper parts of the lofty island of Fernando Po and on the neighbouring Cameroon Mountains, in the Gulf of Guinea, are closely related to those on the mountains of Abyssinia, and likewise to those of Temperate Europe. It now also appears, as I hear from Dr. Hooker, that some of these same temperate plants have been discovered by the Rev. R. T. Lowe on the mountains of the Cape-Verde Islands. This extension of the same temperate forms, almost under the equator, across the whole continent of Africa and to the mountains of the Cape-Verde archipelago, is one of the most astonishing facts ever recorded in the distribution of plants"². Mr. Darwin then proceeds to show how in a glacial epoch the temperate flora might have invaded the whole of Africa, and at the return of warmer conditions been driven up the mountains, or in some cases become gradually acclimatized.

In connexion with this possible, and, as it seems to me, probable, community of origin of the floras of the Cape (in part) and of St. Helena, the significance of the occurrence at the former place of several Coleoptera and Hemiptera closely allied to, if not identical with, St.-Helenian species, is not to be overlooked³.

It is not to be wondered at, then, that we do not find, in the parts of Africa nearest St. Helena, much, if any, relationship to the island fauna and flora. That such relationship, so far as community of origin is concerned, once existed, I have little doubt; but the return to tropical conditions and the reestablishment of the tropical fauna and flora have obliterated, except on the mountain-summits, all traces. And St. Helena by its isolated position and temperate climate (the mean temperature of the year being only about 61°) is to all purposes a mountain.

The affinity of the Hemipterous genus *Megarhaphis* to the African *Macrorhaphis* (of which one species is from the Cape, and the other—rather doubtful as to the genus—is from the Congo) seems to be an exception; but as we do not know the exact nature of the locality whence the Congo species was derived, and as it is as likely as not to be a mountain and not a tropical insect, it may after all prove our case by being a descendant of one and the same Palæarctic ancestor as the Cape and St.-Helenian species.

There still remain some elements in the fauna and flora of St. Helena to be accounted for.

¹ Origin of Species, p. 337.

² See also Professor Oliver's 'Flora of Tropical Africa,' in which the occurrence of several species, not only European but even Arctic, is recorded.

³ Certain European Hemiptera are also natives of the Cape.

For example, there is the one peculiar land-bird, *Aegialites sanctæ-helenæ*, which is so closely allied to African species that it is, in all probability, a comparatively recent introduction. It seems rather remarkable that there are not more peculiar land-birds; and the absence of Bats (none of which are recorded by Mr. Melliss) is another curious feature in the fauna of the island.

There are also the species of West-Indian fish and marine Mollusca as well as the Indian-Ocean species of the same groups. Not very much can be made out of our present knowledge of these; but it seems to me that no great obstacle exists to their introduction by means of the ocean currents. The present currents might have brought the southern and eastern species, while the reversal of the currents during a glacial period would bring the West-Indian and Brazilian animals. Though I have already invoked the agency of a reversed current for the purpose of bringing the Palæarctic fauna to the island, I think it is improbable that the arrival of the West-Indian fish at St. Helena was contemporaneous with that of the ancestors of the endemic fauna, though, in the case of some of them, it is quite possible. I would rather suppose that, since they are species of presumably later origin (or, should their origin be as remote as that of the endemic species, yet it was elsewhere than at St. Helena), they were brought to the island during a later (or a later part of the last) glacial period than the ancestors of the endemic species.

There are also certain elements in the flora, viz. the five tropical weeds or sea-side plants of very wide distribution, which Sir. J. Hooker refers to. These are almost certainly of later introduction than the endemic and peculiar flora. Mr. Melliss remarks¹ of *Entada scandens*, L., that the large seeds "are cast ashore on the windward side of the island, having been brought from the Mauritius, or elsewhere, by sea-currents. They have been *known to germinate*; but it is doubtful if one now exists there." This fact is suggestive of the origin of the five plants alluded to, as well as of some others thought by Mr. Melliss to be indigenous.

Part II. DESCRIPTIVE.

In his recent work upon St. Helena, Mr. Melliss was able to record the occurrence of only 8 species of Hemiptera. The names of only five species had apparently been determined; and of these 4 were evident introductions.

It was therefore left to Mr. Wollaston to add considerably to our knowledge of the St.-Helenian species of this order. The list which I now submit to the Society embraces the results of his six months' exploration of the island; and though it probably does not include all the native species, yet there is reason to suppose that the collection is a very representative one.

A few months before his lamented death, Mr. Wollaston placed the collection in my hands for determination, with directions that a

¹ *L. c.* p. 266.

“set of types” should be placed in the British Museum, and that the new species should be described in a single paper and not piecemeal. The first of these requests I have already carried out; and the second I now proceed to fulfil. The type specimens of *all* the new species, as well as a larger number of specimens in cases where the species was represented by more than two individuals, will be found in the British Museum.

The following is a list of the species in the collection :—

Order HEMIPTERA.

Suborder HETEROPTERA.

Fam. CIMICINA, Stål.

Subfam. ASOPINA, Stål.

1. *Megarhaphis wollastoni*, Buchanan White.

Subfam. PENTATOMINA, Stål.

2. *Nezara viridula*, L.

Fam. LYGÆIDÆ, Stål.

Subfam. BERYTINA, Stål.

3. *Metacanthus concolor*, Buchanan White.

Subfam. LYGÆINA, Stål.

Div. ORSILLARIA, Stål.

4. *Nysius sanctæ-helenæ*, Buchanan White.
5. *Nysius thymi*, Wolff, var.

Fam. CIMICIDÆ, Stål.

Subfam. ANTHOCORINA, Reut.

Div. ANTHOCORARIA, Reut.

6. *Hapa contorta*, Buchanan White.
7. *Cardiastethus bicolor*, Buchanan White.
8. *Lyctocoris campestris*, F.

Div. MICROPHYSARIA, Reut.

9. *Myrmedobia fuliginea*, Buchanan White.

Subfam. CAPSINA, Reut.

Div. PHYTCORARIA, Reut.

10. *Calocoris (Megacelum) lustratus*, Buchanan White.

Div. CYLLOCORARIA, Reut.

11. *Orthotylus mutabilis*, Buchanan White.

Div. CAPSARIA, Reut.

12. *Lygus apicalis*, Meyer.

DIV. PLAGIOGNATHARIA, Reut.

- 13. *Agrametra æthiops*, Buchanan White.
- 14. *Psallus flavosparsus*, Buchanan White.
- 15. *Psallus lutosus*, Buchanan White.
- 16. *Psallus vinaceus*, Buchanan White.

Fam. NABIDÆ, Stål.

Subfam. NABINA (= CORISCINA, Stål).

- 17. *Nabis capsiformis*, Germ.
- 18. *Vernonia wollastoniana*, Buchanan White.

Fam. SALDIDÆ.

- 19. *Salda aberrans*, Buchanan White.

Suborder HOMOPTERA.

Fam. FULGORINA.

Subfam. ISSINI.

- 20. *Issus coleoptratus*, F.

Subfam. DELPHACINI.

- 21. *Liburnia (Ilburnia) ignobilis*, Buchanan White.

Fam. JASSINA.

Subfam. BYTHOSCOPINI.

- 22. *Stonasia undulata*, Buchanan White.
- 23. *Stonasia consors*, Buchanan White.
- 24. *Nehela vulturina*, Buchanan White.

Subfam. ACOEPHALINI.

- 25. *Argaterma alticola*, Buchanan White.
- 26. *Argaterma multisignata*, Buchanan White.

Subfam. JASSINI.

- 27. *Grypotes (?) insularis*, Buchanan White.
- 28. *Thamnotettix sanctæ-helenæ*, Buchanan White.
- 29. *Jassus wollastoni*, Buchanan White.

Subfam. TYPHLOCYBINI.

- 30. *Chlorita edithæ*, Buchanan White.

There were besides in the collection several species in immature condition and hence undeterminable. One of these species, which is a native of the high central ridge, appears to belong to the Coreini; and any future explorer of the island would do well to search for it. To the list must also be added *Acanthia lectularia*, L., a doubtless introduced species recorded by Mr. Melliss, and *Cixius sanctæ-helenæ*, Stål (Eugenies Resa, Entomol. Bidr. 272. 148), a probably endemic species. Mr. Melliss also mentions the occurrence of several

Aphides and *Cocci*. Of the 30 determinable species in Mr. Wollaston's collection 5 species—

<i>Nezara viridula</i> , L.,	|	<i>Nabis capsiformis</i> , Germ.,
<i>Lycocoris campestris</i> , F.,		and
<i>Lygus apicalis</i> , Meyer,		<i>Issus coleoptratus</i> , F.,

have been probably introduced since the island was discovered. The species which I have referred to *Nysius thymi*, Wolff, may also be an introduction; but I am more inclined to consider it a native.

The remaining 24 species seem to be all peculiar to the island; and for the reception of 10 of them I have been obliged to create 7 new genera and 1 new subgenus. Mr. Wollaston has not, unfortunately, recorded for the Hemiptera, as he has done for the Coleoptera, the special *modus vivendi* of each species; but as the particular part of the island inhabited by each was briefly noted by him, I have been careful to give all the information I can.

MEGARHAPHIS, gen. nov.

Genus *Macrorhaphidi* valde affine. *Caput* apice subtruncatum, lobis æquilongis. *Rostrum* articulo 2° 4°que subæquilongis, singulatim 3° longioribus. *Thorax* marginibus lateralibus subcallosis, vix transversim rugosus. *Scutellum* parte apicali retrorsum angustata, frenis ultra medium scutelli continuatis. *Carina mesosternalis* mediocris, nec lata nec sulcata. *Venter* spina basali longa compressa armatus, apud marem maculis sericeis haud instructus. *Femora* antica subtus apicem versus spina parva armata. *Tibiæ* antiçæ vix dilatatæ. *Membrana costis* 8 instructa.

There is no doubt that *Megarhaphis* is closely allied to Dallas's genus *Macrorhaphis*; but it seems to me that the characters pointed out above are of importance sufficient to necessitate the creation of a new genus for the species described below. The difference in the comparative proportions of the joints of the rostrum, the narrow and unfurrowed keel of the mesosternum, the absence of the two silky spots on the venter of the male, and other points will at once distinguish *Megarhaphis* from *Macrorhaphis*.

1. MEGARHAPHIS WOLLASTONI, sp. n.

M. elongata, rufo-brunnea, rude et dense nigro-punctata; thoracis angulis lateralibus prominulis obtusiusculis; pedibus corpore concoloribus; antennis paullo pallidioribus; capitis lineis 2 longitudinalibus ocellos includentibus, marginibus tyli, vitta centrali capitis subtus sternique, maculis marginalibus dorsi abdominis, nebulisque ventris nigris; spina basali ventrali ad apicem testacea; membrana brunneo-fusca. Capitis lineis 2 longitudinalibus inter ocellos ad apicem currentibus, margine inferiore orbitæ, tyloque, pronoti callis irregularibus prope marginem anticum, necnon carina longitudinali angusta, scutelli linea apicali longitudinali subelevata, corii spatii irregularibus (una ad medium, altera prope apicem), haud vel vix punctatis; sterno ventreque minus dense

punctatis, carina ventrali lævigata; scutello fovea parva sed profunda utrinque ad basin prope pronoti angulos posticos sat productos instructo.

♂. Long. 13, lat. 6 m. m.

Hab. "West Lodge" (exemplar unicum).

M. wollastoni agrees in many points of sculpture &c. with the description of *Macrorhaphis* (?) *acuta*, Dall. (List, i. 88. 2), from Congo, which species may perhaps pertain to the genus *Megarrhaphis*.

2. NEZARA VIRIDULA, L.

Two examples without note of locality. This almost worldwide species is probably an introduction.

3. METACANTHUS CONCOLOR, sp. n.

M. ochraceus; antennarum articulo 1° annulis, uno prope basin, altero sat lato ad apicem, articulo ultimo (apice excepto), rostro ad apicem, oculis, scutello (basi spinaque exceptis), femorum tibiarumque apicibus tarsisque necnon corii marginibus angustissime exteriore et interiore apicali plus minus piceis aut piceo-nigris; capitis vertice linea elevata longitudinali instructo; pronoti lobo antico rude punctato, sulco sat profundo inter lobos callis 3 irregularibus instructo, lobo posteriore postice valde elevato et longitudinaliter carinato; mesosterni spina laterali longissima, primum recta, deinde retro curvata.

♂. Long. 5 m. m.

Hab. ad "The Barn," ubi *Aster glutinosus* (Roxb.) (anglice "Scrubwood") occurrit.

I have seen only one specimen.

4. NYSIUS SANCTÆ-HELENÆ, sp. n.

N. oblongus, ochraceus, setulis brevibus concoloribus vestitus; antennis, rostro, capite, pronoti impressione lineari transversa anteriore, scutelli basi sternoque plus minus rufo-brunneis; antennis articulo 4° basi excepto, rostro ad apicem, capite vitta utrinque inter oculos, punctis pronoti maculisque utrinque ante marginem posticum, scutelli punctis, costis et maculis clavo dissecorarii, hujus margine apicali plus minus interrupte, membrana maculis irregularibus, femoribus maculis, apice tarsorum, sterno ad medium, necnon maculis ventris nigris vel fusco-nigris. Bucculis basin capitis vix attingentibus, pone medium retrorsum sensim humilioribus; articulo 1° rostri pone bucculas extenso et basin capitis attingente; capite cum oculis quam apex pronoti latiore; antennarum articulo 2° quam 3^{us} longiore; pronoto et scutello (illius basi excavata excepta) carina levissima instructis; mesosterno distincte sulcato; margine costali corii antice recto, dein rotundato-ampliato.

♂ ♀. Long. $5\frac{1}{2}$ – $6\frac{1}{2}$, lat. 2 – $2\frac{1}{2}$ m. m.

Hab. in intermediis editioribusque insulæ—"Plantation," "West Lodge," "Luffkins," et ad "Diana's Peak."

Nysius sanctæ-helenæ varies considerably both in the number and intensity of the darker markings. Sometimes the whole of the clavus and disk of the corium are fuscous with pale spots, and the apical margin entirely infuscated; but the widened anterior margin of the corium is almost always immaculate, except that sometimes there is a dark streak near the apical margin.

This species belongs to the section *aa* of the genus *Nysius* in Stål's 'Enumeratio;' but it does not appear to be very closely allied to any of the species therein placed.

5. NYSIUS THYMI, Wolff.

Hab. in intermediis editoribusque insulæ—"Plantation," "West Lodge," et ad "Diana's Peak."

I cannot find any points of distinction between British and St.-Helena specimens of this common and variable European species, except that the latter seem to be rather smaller and to have more slender antennæ and legs.

It does not appear to have been previously found out of Europe.

HAPA, gen. nov.

Corpus oblongo-ovatum, parce hirsutum. Caput sulca transversa curvata inter oculos anteriori præditum, inter oculos latum, modice productum, collari mediocri instructum, pone oculos læve nitidumque. Antennæ pilosæ, articulo 1° apicem capitis superante, 2° sursum leviter incrassato, 3° 4°que filiformibus. Rostrum medium mesosterni attingens, articulo 1° oculos attingente. Pronotum haud vel obsoletissimo collari instructum, transversum, apice truncato, basi levissime concava, angulis anticis rotundatis et maxime depressis, lateribus acutis; discus anteriori convexo transverse rugosus, posteriori depressus et leviter concavus ante angulos posticos, ad medium sulco longitudinali plus minus obsoleto instructus. Scutellum anguste transversum, ad basin convexum concavum ad marginem utrinque pone basin, apice leviter acuminato, disco leviter concavo et leviter longitudinaliter rugoso. Elytra macropterorum apicem abdominis paullo superantia et membrana obsolete 3-venosa. Elytra sæpius tantum dimidio abdominis æquilonga, membrana haud instructa. Femora antica maris reliquis crassiora; tibiæ anticæ apicem versus distincte incrassatæ, margine inferiore serie brevissimarum spinularum instructo; tibiæ posticæ spinis nonnullis setiformibus instructæ. Pedes femine graciliores, tibiis anticis haud incrassatis nec ut in ♂ formatis. Quartum et sequentia segmenta abdominis maris sinistrorsum asymmetrica, supra 4°, 5° 6°que abdominalibus et 1° genitali segmenti sinistrorsum maxime abbreviatis; segmento 1° genitali fere contecto ad marginem sinistrum; segmento genitali ultimo (ut videtur) triangulari, levitur sinistrorsum contorto, latere sinistro foramine calloso-marginato (quod fere æquilongum est ac segmentum), instructo. Quarti segmenti abdominis subtus margo posticus ad latus sinistrum profunde sinuatum. Abdomen femine symmetricum. Apex abdominis ♂ et ♀ pilis nonnullis longis apicem versus instructus.

Genus *Piezostetho* affine.

Nomen a Maori "hapa" (contortus).

Obs. In *Piezostethus*, to which the genus is allied, the males have also unsymmetrical hind bodies—a fact, by the way, that I do not see noticed in any of my books.

6. HAPA CONTORTA, sp. n. (Plate XXXI. fig. 1.)

H. *piceo-nigra*, pilis brunneis vestita; capitis apice, antennis, pronoti margine postico, elytris, pedibus abdomineque plus minus piceo-brunneis; rostro, antennarum articulis duobus ultimis, cuneo ad basin, trochanteribus, femoribus ad basin, tibiis ad basin apicemque et tarsis plus minus dilutioribus; abdomine obscure variegato. Macropteronum clavi disco, corii margine antico basin versus, et macula ad medium basale membranæ paullo dilutioribus; membrana fusco-luteo-brunnea, venis obscurioribus.

♂ ♀. Long. 3–3½, lat. 1½ m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

I have seen but a single macropterous specimen, and that rather mutilated.

7. CARDIASTETHUS BICOLOR, sp. n.

C. *niger*, capillis pallidissime brunneis vestitus; antennis, rostri apice, elytris pedibusque luteo-brunneis; capite nitido rufo-brunneo, clypeo dilutiore; rostro (apice excepto), antennarum articulis 2 ultimis, elytrorum suturis, margine interiore lato embolii, margine interiore discoque cunei plus minus fusco-brunneis; membrana luteo-fusca. Capite lævi; clypeo sat angusto; pronoto (callo excepto), scutello elytrisque subtiliter punctatis.

Long. circa 2½ m. m.

Hab. in intermediis insulæ—"Plantation."

Rather closely allied to *C. testaceus*; but, besides differing in colour, *C. bicolor* is a narrower and more slender insect.

9. MYRMEDOBIA FULIGINEA, sp. n.

M. *atra*; antennis piceis, articulo 1° dilutiore ad basin, articulo 2° ad basin medium apicemque albido, articulo ultimo ad apicem rufo-piceo; pedibus piceo-nigris, femoribus posticis ad apicem, annulis 2 ad medium tibiaram anticarum intermediarumque, et dimidio basali tarsorum omnium albidis; capite convexo; antennis subtiliter pubescentibus, articulis 2° 3°que subæquilongis; pronoto maxime convexo, annulo male definito, sulco transverso, nullo; elytris margine antico anguste reflexo.

♀. Long. 1 m. m.

Hab. locos editiores supra "West Lodge."

10. CALOCORIS (MEGACCELUM) LUSTRATUS, sp. n.

C. *sordide stramineo-testaceus*, maculis parvis fuscis rufisque remote et obscure notatus, capillis tenuibus adpressis pallido-aureis vestitus; pronoto obsolete punctulato; oculis, maculis parvis

in disco et ante marginem posticum pronoti, macula geminata ad basin scutelli, dimidioque apicali femorum posticorum plus minus brunneo- vel rufo-fuscis; apicibus rostri scutellique fusco-nigris; antennarum articulo 3° ad apicem et articulo 4° toto, apice imo tibiæ anticarum, apicibusque tarsorum omnium pallide fusco-brunneis; capite, antennarum articulo 1°, dimidio apicali femorum anticorum intermediorumque, tibiis omnibus ad basin, et interdum elytris et lateribus abdominis supra subtusque, sat conferte rufo-sparsis.

♂ ♀. Long. 6, lat. 2 m. m.

Hab. in intermediis insulæ—"Plantation."

Sometimes the apical half of the antennæ is vinous-red in colour and the fuscous markings generally more suffused with red.

11. ORTHOTYLUS MUTABILIS, sp. n.

O. pallide fusco-brunneus, capillis pallidis vestitus; pronoti margine postico elytrorumque margine exteriori anguste fusco-nigris; elytris lutescenti- vel viridescenti-fuscis; antennis pedibusque rufo-fuscis, illarum articulis 1° ad basin, 2° ad apicem, 3° 4°que, necnon tarsorum articulo ultimo et interdum tibiis ad basin, obscurioribus; rostro ochraceo, apice fusco-nigro; membrana pallide fusca venis dilutioribus. Sat angustus, elongatus; antennis $\frac{4}{5}$ corporis æquilongis, articulo 3° plus dimidio 2ⁱ longiore, 4° $\frac{1}{2}$ 3ⁱ subæquilongo; rostro coxas posticas haud superante; pronoti lateribus vix sinuatis, callis parvis; scutello convexo, ante medium transverse depresso.

♂ ♀. Long. 4 m. m.

Hab. editioribus insulæ—"West Lodge" et "Diana's Peak."

Very variable in the intensity of the coloration. It is allied, but not very closely, to *O. nassutus*, and belongs to the same group of the genus.

12. LYGUS APICALIS, Mey., Fieb.

Hab. in intermediis insulæ—"Plantation."

A South-European species, probably introduced into St. Helena.

AGRAMETRA, gen. nov.

Corpus oblongo-ovatum, sat rude punctatum, nudum. Caput nutans, latum, convexum; clypeo modice producto, compresso, a fronte parum discreto; vertice immarginato; gula brevi. Oculi oblongi, leviter granulati, pronoto contigui. Antennæ sat crassæ, ad oculorum medium internum insertæ, corporis dimidio subæquilongæ, articulo 1° crasso apicem clypei longe superante. Rostrum coxas posticas vix attingens, articulo 1° capitis basin vix superante. Pronotum trapeziforme, convexum, latitudine apicali vix longius, basi quam apice $\frac{1}{3}$ latius, apice, lateribus et basi ante scutellum leviter sinuatis. Scutellum ad basin detectum. Hemelytra completa, corii margine exteriori ad basin subito dilatato-explanato; clavo, corio cuneoque coriaceis; membrana biareolata. Alæ hamo instructæ. Pedes sat breves; femoribus sat incrassatis; tibiis

modice fusco-spinulosis sed haud punctatis; tarsi postici longioribus, articulo ultimo duobus primis simul sumptis paullo brevioribus.

Generibus *Plagiognatho* et *Sthenaro* subaffinis.

13. *AGRAMETRA ÆTHIOPS*, sp. n. (Plate XXXI. fig. 2.)

A. piceo-nigra nitida; rostro (apice excepto), coxis, femoribus, tarsorumque articulo ultimo piceo-brunneis; antennis, tibiis, tarsorumque articulis duobus primis sordide ochraceis; antennarum articulo 1° ima basi, articulo 2° ad apicem, 3° 4°que piceo-nigris, imis apicibus 2ⁱ 4ⁱque dilutioribus; membrana fusca, venis parvæ cellulæ exterioris rufis; antennis, pedibus abdomineque capillis tenuibus pallide fuscis vestitis; antennarum articulo 1° paullo supra basin subito incrassato, valido, cylindrico; 2° sursum sensim incrassato, quam pronoti basis brevior, 3° 4°que fusiformibus, 3° $\frac{1}{4}$ 2ⁱ paullo longiore, 4° $\frac{2}{3}$ 3ⁱ subæquilongis.

♂ ♀. Long. $3\frac{1}{2}$ m. m.

Hab. in regione *Commidendri robusti* DC. (anglice "Gumwood") — "Luffkins" et "Thompson's Wood."

14. *PSALLUS FLAVOSPARSUS*, sp. n.

P. testaceus, capillis pallidissime aureis vestitus, capite thoraceque præterea pilis nigris validioribus instructis; capite, pronoto scutelloque ad basin fusco-atris indistincte nigro-guttulosis et maculis flavidis (una ad marginem interiorem oculi, una utrinque pone marginem anticam et altera in disco pronoti, necnon una distinctiore in angulis anticis scutelli) ornatis; angulis imis posticis pronoti testaceis; scutello ad apicem clavogue flavo-guttulosis, corio cuneoque flavo- et fusco-sparsis, macula orbiculari prope apicem clavi et macula irregulari oblonga ante mediam basin cunei fusco-nigris; membrana dilute fusca, iridescente, basi et fascia angusta transversa pone albas venas dilutioribus; antennis testaceis, annulo prope basin et macula ad interiorem articuli 1ⁱ, annulis basali apicalique 2ⁱ, 3° 4°que fusco-nigris; femoribus anticis et intermediis ad apicem, margine apicali antico femorum posteriorum, necnon tibiis omnibus e punctis nigris nigro-spinulosis; articulo ultimo tarsorum fusco; antennis mutilatis, sed, ut videtur, articulis 3° 4°que simul sumptis saltem 2° æquilongis.

♀. Long. 3 m. m.

Hab. in regione *Commidendri robusti* DC. (anglice "Gumwood") — "Thompson's Wood."

15. *PSALLUS LUTOSUS*, sp. n.

P. Sat robustus, testaceus, opacus, aureo-pubescentibus, rufescenti-brunneo dense irroratus; signaturis obscuris plus minus confluentibus, præsertim in parte antica pronoti, medio apiceque scutelli, apicibus clavi coriique necnon femoribus; antennis rufo-brunneis, articulo 1° ad apicem testaceo, articulo 2° ad basin apicemque et articulis duobus ultimis fusco-brunneis; tibiis testaceis, annulis

plurimis angustis rufescenti-brunneis notatis et e punctis nigris nigro-spinulosis; membrana fusca pallide transverso-fasciata, venis albidis. Antennarum articulis 2 ultimis simul sumptis 2° brevioribus, 4° $\frac{1}{2}$ 3ⁱ subæquilongis.

Long. 4, lat. 2 m. m.

Hab. in regione *Commidendri robusti* DC., ad "Peak Gut."

16. *PSALLUS VINACEUS*, sp. n.

P. gracilis, obscure vinaceus, nitidus, capillis pallidis sublongis vestitus; antennarum articulo 1° et 2° ad apicem, rostro, scutello ad apicem, clavi disco, guttulis in disco corii, sutura inter corium cuneumque, cuneo ad apicem, femoribus ad apicem, tibiis tarsisque plus minus testaceis vel vinaceo-testaceis; clavi parte pallida, femoribus posticis ad apicem et tibiis posticis plus minus vinaceo maculatis; apicibus rostri tarsorumque necnon membrana fuscis, hac basi et fascia transversa pone cellulas dilutioribus, venis albidis, venis cellulæ exterioris interdum rufis; tibiis e punctis nigris nigro-spinulosis. Antennarum articulis 2 ultimis simul sumptis 2° æquilongis, 4° quam dimidium 3ⁱ brevioris.

♂ ♀. Long. 3–3 $\frac{1}{2}$, lat. 1 $\frac{3}{4}$ m. m.

Hab. in editioribus insulæ, ad "Diana's Peak."

Very like a small dark form of *Psallus lutosus*, but distinguished by its slenderer and more shining form, longer and less golden pubescence, more slender legs and antennæ, the more uniform darker markings, and more convex pronotum with less concave hind margin.

17. *NABIS CAPSIFORMIS*, Germ.

Hab. in intermediis insulæ, ad "Plantation."

An African and American species, possibly (probably?) introduced.

VERNONIA, gen. nov.

Corpus elongatum. Caput ante oculos oblongo-productum, parte anteculari parti postoculari subæquali; clypeo distinctissime convexo-elevato, angusto, jugis depresso-rotundatis, medium versus constrictis, ad apicem leviter incrassatis. Oculi sat magni. Ocelli desunt. Rostrum 4-articulatum, coxas posticas attingens, gracile, articulo 1° brevi, duplo longiore quam latiore, 2° 3°que longis, subæqualibus. Antennæ setaceæ, gracillimæ, corpore $\frac{1}{4}$ longiores, articulo 1° quam caput $\frac{1}{4}$ longiore, 2° quam primus $\frac{1}{4}$ longiore, 3° 2° æquilongis, 4° brevissimo. Pronoti lobus anticus lobo postico angustior; lobus posticus lateribus subparallelis obtuse et callose marginatis instructus, ante marginem posticum truncatum leviter transverse sulcatus. Scutellum latius quam longius, ad basin transverse modice elevatum. Elytra abbreviata, scutello tantum duplo longiora, ad apicem rotundata, coriacea, marginata. Acetabula antica postice aperta, a basi prostethii excisa; mesosternum carina, pone medium distinctissima, instructum; orificia subobscura ante coxas posticas sita. Pedes gracillimi et longissimi; coxæ longiusculæ; tibiæ anticæ seriebus duabus, tibiæ

intermediæ serie unica, dentium nigrorum tenuissimorum instructæ; femora antica modice incrassata, deorsum sensim angustata, tibiis paullo longiora; tibiæ omnes ad apicem leviter incrassatæ; pedes postici longissimi; femora postica ad apicem modice incrassata; tarsi omnes sat longi, articulo 1° brevissimo, duobus ultimis subæquilongis. Abdomen elongato-ovale, connexivo dilatato ad segmenta 3^{um} 4^{um}que latissimo, illinc apicem basinque versus sensim angustato.

Genus *Arbelæ* affine, memoriæ viri celeberrimi beati Thomas Vernon Wollaston dicatum.

18. *VERNONIA WOLLASTONIANA*, sp. n. (Plate XXXI. fig. 3.)

V. *rufo-brunnea* (♂) vel *rufo-lutea* (♀) *rufo-sanguineo variegata; capitis parte anteoculari, antennis pedibusque pilis brevibus pallide brunneis vestitis; antennarum articulo 1° rufescente annulis latis obscurioribus, ad apicem basinque distinctioribus, ornato; articulo 2° flavescente annulis 5 vel 6 fuscis, quarum 3 in dimidio basali et ad apicem distinctiores sunt, instructo, 3° 4°que fusco-brunneis obscure annulatis; pedibus plus minus distincte fusco vel rufo fusco-annulatis, ad basin testaceis; abdomine supra sanguineo-variegata, subtus testacea vitta angusta centrali et vitta latiore laterali utrinque ornata; abdominis segmento 6° ad medium supra subtusque sinuato.*

♂ *Segmento genitali quadrato, ad apicem truncato.*

♂ ♀. Long. 10–12, lat. pronoti $1\frac{1}{2}$ – $1\frac{3}{4}$; abdominis ♂ $2\frac{1}{2}$, ♀ 4 m. m.

Habitat in excelsioribus centralibus insulæ, inter *Compositas* arborescentes.

19. *SALDA ABERRANS*, sp. n. (Plate XXXI. fig. 4.)

S. *obovata, atra, opaca, pilis brevibus erectis nigris, aliis depressis aureis intermixtis, vestita; antennarum articulo basilari (apice excepto), clypeo nitido, rostro, callo utrinque ad medium interne oculorum, pronoti marginibus lateralibus anguste, marginibus exterioribus interioribusque (illo basin versus latiore dilutioreque) elytrorum, necnon maculis nonnullis irregularibus corii pedumque brunneis vel pallide piceo-brunneis; clavi maculis triangularibus, una pone medium, duabus prope apicem, linea ante medium suturæ clavalis, corii maculis 5 propemarginem anticum et nonnullis in disco albidis; tibiis ad apicem anguste pallidis, apice imo et articulo ultimo tarsorum piceo-nigris; unguiculis piceo-brunneis. Late obovata, pone medium latior; capite cum oculis quam pronoti apex latiore; vertice ante ocellos foveolato, margine antico subobtusè incrassato; antennis vix incrassatis; rostro longo, coxas posticas attingente; pronoti margine postico quam margo anticus duplo latiore, marginibus lateralibus anguste reflexis; callo antico magno, sulco profundo longitudinaliter diviso, pone callum sulco angusto profundo fovea obliqua ad angulum posticum currente utrinque conjuncto; scutello convexo, ad medium semicirculariter transverse sulcato; elytris totis coriaceis convexis, margine antico rotundato*

et reflexo præcipue ad basin, margine interiore pone apicem scutelli recto, margini elytri alterius haud incumbente; (membrana alæque desunt;) pedibus modicis, tibiis ad apicem subincrassatis; tarsorum articulo 1° brevi, articulo ultimo longissimo.

♂ ♀. Long 3-5, lat. (pone medium) 2-3 m. m.

Hab. in editioribus insulæ, juxta "Diana's Peak."

The absence of the membrane prevents me referring this to any of the sections given by Dr. Stål in his 'Enumeratio.' It may perhaps belong to a new genus; but as it has all the facies of a *Salda*, I have placed it in that genus.

S. aberrans is very variable in the intensity of the brown markings. Frequently the corium is more or less of a rich fulvous brown with anastomosing black lines; the whitish spots also vary in intensity. There is, moreover, a considerable range of variation in the size of the animal.

20. ISSUS COLEOPTRATUS, F.

Hab. intermedis insulæ, ad "Plantation."

A common European species, and doubtless introduced into St. Helena.

LIBURNIA, Stål.

ILBURNIA, subgen. nov.

Antennarum articulus primus articulo secundo æquilongus vel paullo longior. Tibia postica tarso postico parte quarta longior.

21. LIBURNIA (ILBURNIA) IGNOBILIS, sp. n.

L. testaceo-brunnea; fronte distincte, clypeo, pronoto scutelloque obsolete (carinis exceptis), sterni maculis nonnullis abdomineque plus minus brunneis; dorso abdominis utrinque vitta longitudinali pallida, in segmentis 1° ad apicem, 2° et 3° ad basin distinctiore, et in segmentis 1°, 4°, 5°, 6°que interne magis, externe minus brunneo-marginata; connexivo brunneo, angulis exterioribus apicalibus pallidis; tarsorum unguiculis piceo-nigris; elytris subhyalinis, concoloribus, vix dimidium abdominis tegentibus; oculis subrufis; capite desuper viso et pronoto longitudine subæqualibus, illo inter oculos breviter prominulo, vertice singulo oculo subæquilato; carinis omnibus discretis; fronte longa, deorsum dilatata, carina centrali ad verticem brevissime furcata; clypei carina centrali obsoleta; pronoto scutelloque distinctissime carinatis, illius carinis lateralibus obliquis rectis marginem posticum attingentibus; alis abbreviatis.

♀. Long. 5, lat. 2 m. m.

Habitat in excelsioribus insulæ, ad "Diana's Peak."

Ilburnia diverges from the characters of *Liburnia* by the longer first joint of the antennæ, and the shorter hind tarsus. In the collection are two other Homoptera belonging to this family: one, which is much broken, is perhaps the ♂ of the above; and the other seems to be an immature *Stiroma*?

STONASLA, gen. nov.

Corpus cylindricum, elongatum. Caput obtusissimum, latum, thoraci æquilatum seu paullo latius, desuper visum brevissimum, subangulato-arcuatum, vertice maximam ad partem declivi; facie dilatata, transversa, fere subquadrata; apice obtusissime angulato; marginibus lateralibus ante oculos distinctissime sinuatis, dein valde rotundato-dilatatis; plica supraantennali valde obliqua, oculos haud attingente. Ocelli inter oculos in parte antrorsum vergente verticis positi, ab oculis remoti, sed inter se quam ab oculis longius distantes. Pronotum transversum, sat longum, antice subangulato-rotundatum. Scutellum mediocre, latius quam longius. Elytra alæque apicem abdominis longe superantia. Elytra pone clavum angustissime marginata. Venæ elytrorum alarumque fere ut in Bythoscopo formatae; membranæ cellulæ apicales 4. Ala ante apicem emarginatæ. Tibiæ posticæ spinosissimæ.

Genus *Bythoscopo* affine, forma faciei &c. divergens. [Typus *S. undulata*.]

22. STONASLA UNULATA, sp. n. (Plate XXXI. fig. 5.)

St. sordide virescenti-flavescentis, subopaca; capitis macula parva irregulari inter oculos et ocellos (necnon interdum macula inter ocellos, maculaque utrinque in margine postico pone ocellos), fovea utrinque ante antennas, parte antica suturæ frontalis, et basi (media et lateribus prope basin clypei exceptis), pronoti macula parva utrinque ad marginem anticum, scutelli basi centrali anguste, macula triangulari utrinque prope angulos basales, maculis parvis rotundis in disco, sulco transversali ad medium angustissime, necnon apice imo, elytrorum venarum punctis irregularibus subconfluentibus et lineis dentato-fractis inter venas (membranæ exceptis), alarum venis, sterno (lateribus exceptis), macula ad apicem superiorem femorum omnium, tibiaram posticarum margine exteriori superiore, unguiculisque necnon abdomine brunneo-nigris; oculis, ocellis, frontis serie linearum irregularium transversarum utrinque, femorum maculis irregularibus, et tarsis anticis intermediisque plus minus brunneis; alis infuscatis. Elytris oblongo-lanceolatis.

♂ ♀. Long. 8-9½, lat. 3-3½ m. m.

Hab. in editioribus insulæ, ad "Cason's."

23. STONASLA CONSORS, sp. n.

St. testaceo-brunnea, opaca, elytra subopaca; capitis macula rotunda pone ocellos et prope marginem posticum, fovea ante antennas, frontis sutura antice, basi (media excepta) et lateribus prope basin clypei, necnon serie utrinque lineolarum transversarum, pronoti linea longitudinali centrali nec apicem nec basin attingente, macula parva utrinque prope marginem anticum et macula majore utrinque in disco, scutellum acula parva ad mediam basim et macula triangulari prope angulos basales necnon sulco transverso angustissime, clavi venis irregulariter, corii venis distincte, femorum intermediorum posticorumque macula superiore apicali, unguiculis

et abdomine subtus brunneo-nigris; scutelli dimidio apicali testaceo-flavido; oculis ocellisque brunneis.

♂ ♀. Long. $7\frac{1}{2}$ –9, lat. $2\frac{1}{2}$ –3 m. m.

Hab. in editoribus insulæ, ad “Diana’s Peak” et “Halley’s Mount.”

In addition to the differences of coloration, this species may be distinguished from the last by the internal sector of the elytra having three cells exteriorly between the base of the elytron and the apex of the clavus instead of two, as well as by the somewhat smaller stature.

NEHELA, gen. nov.

Corpus cylindricum, elongatum. Caput obtusissimum, latum, thoraci æquilatum, desuper visum brevissimum angulato-arcuatum; vertice magnam ad partem declivi; facie dilatata, subtriangulari, apice producto, lateribus ante oculos late sinuatis, dein leviter rotundatis; plica supraantennali valde obliqua, oculos fere attingente. Ocelli inter oculos in parte antrorsum vergente verticis positi, ab oculis et inter se fere æquidistantes. Clypeus distincte productus, sulco inter basin et frontis apicem haud instructus. Pronotum transversum, sat longum, antice subangulato-rotundatum. Scutellum mediocre, latius quam longius. Elytra apicem abdominis superantia, pone clavum anguste marginata. Elytrorum alarumque venæ ut in Stonasla formata. Tibiæ posticæ spinosissimæ.

Genus *Stonasla* valde affine, forma faciei, situ ocellorum, et clypeo distinctius producto divergens.

24. NEHELA VULTURINA, sp. n. (Plate XXXI. fig. 6.)

N. atra, opaca; capitis vertice (maculis parvis 2 ad ocellos et 4 ad marginem posticum exceptis), oculis, macula triangulari in medio frontis, antennis et lateribus, pronoti marginibus lateralibus interne angulatis, margine postico et maculis 2 parvis in disco (interdum obsoletis), scutelli macula utrinque ad marginem ante apicem, elytrorum (clavo excepto) lineolis longitudinalibus latis inter venas, necnon marginibus antico interioreque corii, pedibus anticis intermediiisque (unguiculis exceptis), coxis posticis, femoribus posticis ad apicem, tibiæ posticarum basi spinisque et articulis 2 primis tarsorum posticorum testaceo-brunneis.

♂ ♀. Long. 7– $7\frac{1}{2}$, lat. 2– $2\frac{1}{2}$ m. m.

Hab. in excelsioribus insulæ, ad “Diana’s Peak” et “High Peak.”

Frequently the veins of the clavus are more or less brown; and more rarely the whole of the elytra is entirely black.

ARGATERMA, gen. nov.

Corpus oblongum, paullo depressum. Caput breve, pronoto paullo brevior et latior, margine antico acuto; vertice inter oculos quam singulus oculus duplo latior, horizontali, concavo præsertim antice, margine antico arcuato, acuto, inter ocellos angustissime reflexo. Ocelli in margine antico prope oculos positi. Facies convexa, dilatata, subquadrata, apice obtusissime rotundato, lateribus ante oculos sinuatis, dein leviter rotundatis; sutura frontali ocellos attingente. Pronotum transversum, antice arcuatum, inter oculos

prominulum, postice truncatum. Scutellum transversum, latius quam longius. Elytra subcoriacea, tectiformia, oblonga, apicem abdominis vix superantia, areis pluribus subquadratis instructa. Alæ areis apicalibus 4 instructæ, venis in venam periphericam terminantibus, marginem haud attingentibus. Pedes mediocres, femoribus posticis paullo compressis, tibiis posticis spinosissimis, tarsis posticis articulo 1° articulis 2° una cum 3° æquilongo, articulo 2° quam 3^{us} brevior.

Genus *Sivæ* et *Selenocephalo* affine. [Typus *A. alticola*.]

25. ARGATERMA ALTICOLA, sp. n. (Plate XXXI. fig. 7.)

♂ *late fulvus, nitidus; verticis limbis, pronoti vitta centrali longitudinali et limbo postico, scutelli apice imo, clavi marginibus interne erosis, et fascia ante medium, corii marginibus (exteriore ad basin excepto), fascia ante medium et maculis pone medium, necnon areis apicalibus albidis; verticis marginibus imis antico posticoque, macula utrinque ad oculos posterius, maculis 4 ad marginem anticum (2 intermediis geminatis, 1 lunata utrinque pone ocellos), facie, pronoti maculis parvis 5 ad marginem posticum, sterno ad medium, corii marginibus macularum albidarum pone medium et arearum apicalium nigris; abdominis dorso nigro, segmentis 4°, 5° 6°que et ventre, necnon segmentis genitalibus et pedibus brunneo-testaceis; oculis, alis, tibiarum posticarum margine postico, maculis marginis antici apiceque, tarsorum posticorum articularum apicibus, necnon unguiculis omnibus nigro-brunneis.*

♀ *læte fulva, verticis limbo antico, pronoti limbo postico, scutelli apice imo, elytrorum areis apicalibus flavescenti-albidis; verticis marginibus imis antico posticoque, macula utrinque ad oculos posterius, maculis 2 in disco, et 4 ad marginem anticum (2 intermediis interdum postice conjunctis, 1 lunata utrinque pone ocellos), pronoti maculis 5 ad marginem posticum, elytrorum arearum plurium parvarum subquadratarum, areolarum elongatarum pone medium, necnon arearum apicalium marginibus nigris; cetera ut in ♂.*

♂ ♀. Long. $3\frac{1}{2}$ –5, lat. $1\frac{1}{2}$ –2 m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

I have seen but one ♂; and it is possibly a variety. The elytra of the ♀ have numerous black-margined cells or cell-like spots more or less variable. On the clavus and corium, to beyond the middle, these are small and vary in size, but are more or less square. Between these and the apical cells there is a transverse row of 4, more elongate, cells, of which one or more are sometimes subdivided. Beyond these are 5 marginal cells at the apex of the elytron. The veins of the elytron are scarcely distinguishable.

26. ARGATERMA MULTISIGNATA, sp. n.

A. fulva, nitida; verticis limbo antico, pronoti margine imo postico, elytrorum areis apicalibus flavescenti-albidis; verticis marginibus imis antico posticoque, macula utrinque posterius ad oculos, maculis 2 in disco, 3 ad marginem anticum (1 in medio interdum fissa, 1

utrinque pone ocellos), pronoti margine antico maculis 7, 3 intermediis elongatis magnis transversis in fasciam sæpe confluentibus, disco fascia transversa abbreviata, limbo postico, necnon macula parva utrinque ad angulos laterales, scutelli macula elongata utrinque ad basin, elytrorum maculis plurimis subquadratis areiformibus, sterno abdomineque nigris; sterni lateribus, abdominis segmentis 6^o et genitalibus (his nigro-signatis) pedibusque brunneo-testaceis; femoribus anticis et intermediis supra, posticis totis (basi apiceque exceptis), tibiis posticis magnam ad partem, tarsis anticis et intermediis ad apicem, posticorum apicibus articularum omnium, unguiculis oculisque nigro-brunneis; alis nigro-fuscis nigro-venosis; elytris areis apicalibus marginalibus nigro-marginatis 6 instructis.

♂ ♀. Long. 3–4½, lat. 1½–2 m. m.

Hab. in excelsioribus insulæ, ad “Diana’s Peak.”

In stature and general colouring rather like the preceding, but distinguished at first sight by the much more numerous markings. Vertex more obtusely rounded in front and less prominent. Elytra with the veins scarcely distinguishable, covered with many somewhat square-shaped cell-like black markings, arranged in longitudinal rows. Apex of the elytron with six marginal cells, of which the first and the last are the largest. Venation of the wing different from what it is in *A. alticola*. There are four apical cells bounded by a peripheral vein as in that species; but the second cell (counting the apical as the first) is pedunculate, the peduncle joining the first and second sectors; and at the base of the fourth cell is a smaller cell formed by a transverse vein cutting off the base of the fourth cell. The venation is otherwise normal, but rather subject to variation. The elytra have sometimes obscure pale markings on the inner margin of the clavus, and vary also in the intensity of the black markings of the pronotum and scutellum.

27. GRYPOTES (?) INSULARIS, sp. n.

G. aurantio-flavescens, nitidus; verticis macula subquadrata utrinque anterius et macula posterius prope oculos, frontis lineolis transversis in medio interruptis, clypei vitta centrali ad apicem dilatata, lororum marginibus, linea ante et macula pone antennas, maculaque ante oculos brunneis vel pallide brunneis; vertice utrinque linea obliqua brevi, pedibus maculis nonnullis, abdominis dorso, et corpore subtus maculis paucis nigris; scutello, abdominis dorsi lateribus, et corpore subtus flavescentibus; elytrorum margine antico late et venis, necnon valvulis genitalibus flavescenti-albidis; membrana dilutissime fusca.

♂ ♀. Long. 5 m. m.

Hab. in editioribus insulæ, ad “West Lodge.”

Perhaps scarcely correctly placed in *Grypotes*. Head, seen from above, angularly rounded and prominent between the eyes; as long as the hind margin between the eyes; broadly concave and with a fine impressed middle line; ocelli near the eyes; face very convex, and clypeus produced but scarcely curved; pronotum a little broader than

the head. There are sometimes additional brown markings on the vertex or face; and the spots on the legs are also occasionally confluent.

28. *THAMNOTETIX SANCTÆ-HELENÆ*, sp. n.

T. pallide aurantiacus, nitidus; capitis maculis 2 parvis obsoletis inter oculos, frontis lineolis obsoletissimis transversis, pronoti margine postico, scutelli angulis basalibus, clavi nebulis 2 male definitis (1 ante, 1 pone medium), corii nebulis 3 (1 ante, 1 pone medium) alteraque ad basin membranæ indistincte dilutioribus; corpore subtus abdomineque supra et subtus flavescens; tibiis posticis maculis nonnullis et unguiculis omnibus nigris.

♂ ♀. Long. 5 m. m.

Hab. in excelsioribus insulæ, ad "Diana's Peak."

The always ill-defined pale markings are sometimes scarcely perceptible. The head, seen from above, is prominent and obtusely angularly rounded between the eyes; the face is very convex, and the pronotum broader than the head.

29. *JASSUS WOLLASTONI*, sp. n.

J. flavescens-albidus; verticis vitta transversa inter oculos, frontis vittis 2 latis longitudinalibus, clypei dimidio apicali saltem et macula utrinque ante oculos, pronoto (marginibus postico et lateralibus exceptis), sterni maculis ad latera, scutelli macula quadrata ad medium basale, clavi vitta ad suturam clavalem et vitta centrali a basi ad medium, corii vitta subundulata a medio ad membranam currente, lineis longitudinalibus 2 minoribus (1 inter vittam centralem et basin elytri, 1 inter vittam centralem et apicem corii), margine antico toto corii, tibiis anticis intermediisque et tarsis omnibus aurantiacis vel pallide aurantiacis; clavi linea juxta apicem marginis antici, membranæ margine basali, sterni maculis nonnullis ad medium, abdomine (marginibus segmentorum exceptis) nigrescentibus; membrana, alis fere totis, unguiculisque fuscis vel brunneo-fuscis; venis ad apicem corii membranæque pallide flavidis, venis ceteris obsoletis; capite pronoto fere æquilongus, rotundatus et levissime prominulus inter oculos; verticis margine postico quam singulus oculus paullo latiore; vertice leviter dilatato antrorsum, foveola parva utrinque instructo; fronte haud carinata; marginibus oculorum desuper visorum divergentibus; ocellis prope oculos sitis; elytris oblongis.

♂ ♀. Long 6, lat. 2 m. m.

Hab. in editoribus insulæ, ad "Cason's," "Diana's Peak," et "Vine-tree Gut."

Sometimes the clavus and inner margin of corium are infuscated, and the hind tibiæ have a row of black dots on the outside.

30. *CHLORITA EDITHÆ*, sp. n.

C. pallide flavescens-albida; verticis maculis 2 elongatis inter oculos, et pronoti maculis 2 in disco sanguineis; scutello (macula quadrata ad medium basale excepta), clavi linea ad marginem internam ab apice scutelli currente, corii margine interno fere





a basi ad apicem clavi, vitta dilutiore centrali inter apicem clavi et margine antico posita, et nebula ad marginem anticum apicem versus elytri læte aurantiacis; oculis, unguiculis et macula ad basin membranæ nigrescentibus; membrana pallide fusca, ad basin obscuriore, venis late pallide flavescenti-albidis, maculas 5 marginales (4 apicales) et 2 centrales cingentibus; femoribus tibiisque ad apicem flavescitibus; capite obtuse angulariter rotundato-prominulo inter oculos, longiore supra quam ad marginem posticum inter oculos; pronoto semicirculari, dimidio marginis postici æquilongo.

♂ ♀. Long. 3 m. m.

Hab. in editoribus insulæ, ad "Cason's," "High Peak," et "Diana's Peak."

Species venusta, in honorem Dominæ Edith Wollaston, quæ Lepidoptera et Coleoptera insulæ Sanctæ-Helenæ diligentissime collegit, dicata.

EXPLANATION OF PLATE XXXI.

Fig. 1. *Hapa contorta*, p. 466.

2. *Agrame'tra æthiops*, p. 468.

3. *Vernonia wollastoniana*, p. 470.

4. *Salda aberrans*, p. 470.

Fig. 5. *Stonasia undulata*, p. 472.

6. *Nehela vulturina*, p. 473.

7. *Argaterma alticola*, p. 474.

3. Further Remarks on *Fuligula nationi*. By P. L. SCLATER.

[Received April 12, 1878.]

(Plate XXXII.)

Professor Nation of Lima, Peru, has now forwarded to me a second specimen of the remarkable new *Fuligula* which Mr. Salvin and I described in the Society's 'Proceedings' last year (1877, p. 522), and dedicated to its discoverer. This is a male, the former example having been a female; but, as will be seen on comparison, there is not a great difference in plumage between the sexes. Prof. Nation says that this bird is rare in the neighbourhood of Lima, but that he has lately ascertained that it is common in the north of Peru, and is found in great numbers on the lakes near the coast in certain months of the year.

The species may now be diagnosed more correctly as follows:—

FULIGULA NATIONI. (Plate XXXII.)

Fusco-atra fere unicolor, in ventre brunnescentior, hypochondriis et genis in brunneum transeuntibus; secundariorum parte basali, fasciam distinctam alarem constituyente, alba; subalaribus nigris; remigum pagina inferiore obscure cineracea; rostro et pedibus nigris: long. tota 18·0, alæ 8·5, caudæ 2·5, tarsi 1·45, dig. med. cum ungue 2·6, rostri a rictu lin. dir. 2·2. Femina omnino brunnescentior, supra et in ventre tenuissime nigro vermiculata; capitis lateribus in brunnescenti-castaneum trahentibus; et crassitie minore.

Hab. Peruvia occidentalis, prope Lima (*Nation*).

Fig. 1.

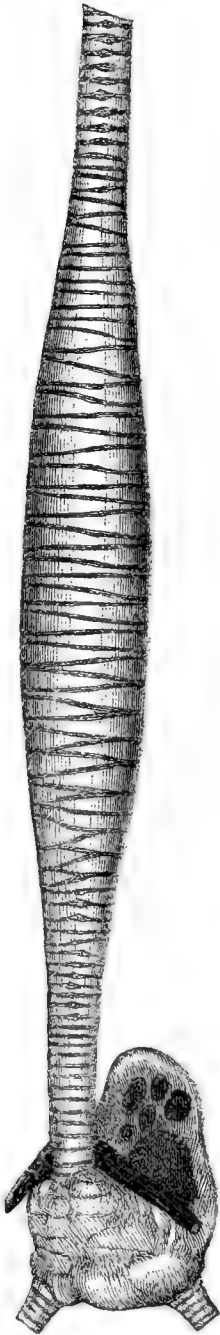
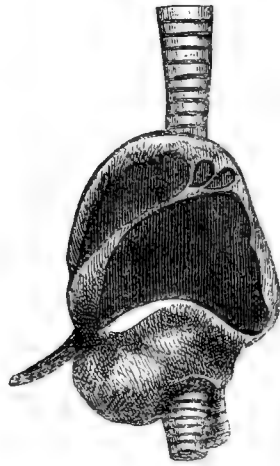


Fig. 2.



Trachea of *Fuligula nationi* ♂.

Fig. 1. Front view.

Fig. 2. Dilatation at its lower end, seen from the left side.

This species appears to be a true Fuliginine duck, the only known representative of the group in South America. In colour it is quite different from any other species of the genus known to me, being immediately recognizable by its black dress and the transverse white bar on the wing.

The characteristic Fuliginine white spot between the rami of the mandible is small in the male but quite distinct, larger in the female. The white colour in the secondaries occupies rather more than the basal two thirds, but does not extend onto the outer elongated feathers; it likewise pervades portions of both webs of some of the inmost primaries. The hinder toe has a well-developed lobe, almost as broad as in *F. collaris*.

Prof. Nation has also sent to me the dried trachea of the male specimen, for the preparation of a figure and description of which I am indebted to Prof. Garrod.

"In the trachea," Prof. Garrod remarks, "of this duck, as in the males of the sea-ducks generally, there is a large dilatation at the lower end, on the left side, composed of an osseous framework supporting membranous walls. The outer one of these is traversed by an intervening osseous bar (see fig. 2), which courses backwards and upwards from its anterior inferior angle, and sends two small extra bars to the supero-marginal rim, and so forms a pair of oval fontanelles, before it terminates at the superior and posterior angle of the outer wall.

"The wall of the tracheal box which faces inwards is ossified through nearly its entire extent, a few small membrane-covered fontanelles being found not far from its superior margin. In this respect the species differs from *Fuligula rufina*, in which the wall under consideration is almost entirely membranous, whilst it is almost identical with *F. marila*.

"The outer aspect of the terminal tracheal box is represented in fig. 2.

"Fig. 1 gives a front view of the trachea, which is seen to be considerably and fusiformly dilated in its middle part, in very much the same way as in *Fuligula rufina*, *F. marila*, *Nyroca leucophthalma*, *Clangula vulgaris*, and *Mergus serrator*¹, except that in the last-named species the enlargement is situated somewhat nearer the mouth.

"In *F. rufina* the dilatation of the middle of the trachea is rather more considerable and more localized to the lower portion of the windpipe, whilst in *F. marila* it is more extended and not quite so considerable in breadth. In fact *F. nationi* is almost exactly intermediate between the two, tending, if at all, towards the latter species.

"In the South-American *Metopiana peposaca* the mid-tracheal dilatation is much more decided and more limited, forming a nearly globose cavity² like that in *Melanitta fusca* and *Clangula histrionica*."

¹ Vide Eyton, 'Monograph of the Anatidæ,' 1838, p. 63.

² See P. Z. S. 1868, p. 146, and 1875, p. 154.

4. On a small Collection of Lepidoptera from Jamaica. By
ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received April 12, 1878.]

The Lepidoptera enumerated in the present paper were collected at or near Kingstown, Jamaica, by Mr. James John Bowrey, who has kindly permitted a selection to be made from them of all the species required for the national collection.

Among the Butterflies, as might have been expected, there is very little new, a species of *Pamphila* being the only one to which I have ventured to give a name; but among the more obscure and small Moths there are about two dozen novelties.

RHOPALOCERA.

1. *DANAIS ARCHIPPUS*, Fabricius, Ent. Syst. iii. 1, p. 49 (1793).

The males from Jamaica seem to possess a constant peculiarity in the immaculate black border of the secondaries.

2. *DANAIS JAMAICENSIS*, Bates, Ent. Mo. Mag. i. p. 33 (1864).

3. *CALISTO ZANGIS*, Fabricius, Syst. Ent. p. 486 (1775).

4. *PAPHIA PORTIA*, Fabricius, Syst. Ent. p. 507 (1775).

5. *AGANISTHOS ORION*, Fabricius, Syst. Ent. p. 485 (1775).

6. *HETEROCHROA ABYLA*, Hewitson, Ann. Nat. Hist. ser. 2, vol. vi. pl. 9. fig. 7 (1850).

7. *EUBAGIS EGÆA*, Fabricius, Syst. Ent. p. 496 (1775).

8. *LUCINIA CADMA*, Drury, Ill. Ex. Ent. ii. pl. 18. figs. 1, 2 (1773).

9. *MARPESIA ELEUCHA*, Hübner, Samml. exot. Schm. ii. pl. 50 (1816-24).

10. *GYNÆCIA DIRCE*, Linnæus, Mus. Lud. Ulr. p. 287 (1764).

11. *ANARTIA JATROPHÆ*, Linnæus, Mus. Lud. Ulr. p. 289 (1764).

12. *JUNONIA GENOVEVA*, Cramer, Pap. Exot. iv. pl. 290. figs. E, F (1782).

13. *CYSTINEURA DORCAS*, Fabricius, Syst. Ent. p. 508 (1775).

14. *PHYCIODES FRISIA*, Poey, Cent. Lep. (1833?).

15. *EUNICA TATILA*, Herrich-Schäffer, Ausl. Schm. figs. 69-72 (1852-58).

In the examples from Jamaica the white spots are smaller than in the figure.

16. EUPTOIETA HEGESIA, Cramer, Pap. Exot. iii. pl. 209. figs. E, F (1782).
 17. DIONE VANILLÆ, Linnæus, Mus. Lud. Ulr. p. 306 (1764).
 18. COLÆNIS DELILA, Fabricius, Syst. Ent. p. 510 (1775).
 19. HELICONIUS CHARITHONIA, Linnæus, Syst. Nat. i. 2, p. 757 (1766).
 20. LAMPIDES CERAUNUS, Fabricius, Ent. Syst. iii. 1, p. 303 (1793).
 21. TMOLUS COLUMELLA, Fabricius, Ent. Syst. iii. 1, p. 282 (1793).
 22. TMOLUS PAN, Drury, Ill. Ex. Ent. ii. pl. 23. figs 3, 4 (1773).
 23. NATHALIS IOLE, Boisduval, Sp. Gén. i. p. 589 (1836).
 24. TERIAS GNATHENE, Boisduval, Sp. Gén. i. p. 680 (1836).
- Mr. Bowrey has observed this species flying over low bushes. The flight of *Terias* is always very low.
25. TERIAS ELATHEA, Cramer, Pap. Exot. ii. pl. 99. figs. C, D (1779).
 26. TERIAS EUTERPE, Ménétréés, Bull. Mosc. p. 299 (1832).
 27. KRICOGONIA TERISSA, Lucas, Rev. Zool. p. 429 (1852).
 28. KRICOGONIA LYSIDE, Godart, Enc. Méth. ix. p. 98 (1819).
 29. AMYNTHIA MÆRULA, Fabricius, Syst. Ent. p. 479 (1775).
 30. CALLIDRYAS SENNÆ, Linnæus, Syst. Nat. i. 2, p. 764 (1766).
- Mr. Bowrey has seen vast clouds of this species passing over the town of Kingston, sometimes for a week at a time.
31. APPIAS POEYI, Butler, P. Z. S. p. 49 (1872).
 32. SYNCHLOË JOPPA, Boisduval, Sp. Gén. i. p. 495 (1836).
 33. PAPILIO POLYDAMAS, Linnæus, Mus. Lud. Ulr. p. 192 (1764).
 34. PAPILIO SINON, Fabricius, Syst. Ent. p. 452 (1775).
 35. PAPILIO PELAUS, Fabricius, Syst. Ent. p. 444 (1775).
 36. PAPILIO HOMERUS, Fabricius, Ent. Syst. iii. 1, p. 29 (1793).
 37. PAPILIO CRESPHONTÈS, Cramer, Pap. Exot. ii. pl. 165. fig. A, 166. fig. B (1779).
 38. PAPILIO THERSITES, Fabricius, Syst. Ent. p. 453 (1775).
 39. GONIURUS PROTEUS, Linnæus, Mus. Lud. Ulr. p. 333 (1764).

40. *GONIURUS CATILLUS*, Cramer, Pap. Exot. iii. pl. 260. figs. F, G (1782).

41. *TELEGONUS*, sp.? (Olive-brown, dull green at the base.)

This species is quite common in collections, and therefore is sure to have been described; but it would be necessary to work out nearly the whole family in order to identify it, many of the descriptions of *Hesperiidæ* being so bad that their determination is simply impossible.

42. *PROTEIDES AMYNTAS*, Fabricius, Syst. Ent. p. 533 (1775).

43. *PAMPHILA ETHLIUS*, Cramer, Pap. Exot. iv. pl. 392, figs. A, B (1782).

44. *PAMPHILA NYCTELIUS*, Latreille, Enc. Méth. ix. p. 746 (1823).

45. *PAMPHILA PHYLUS*, Drury, Ill. Ex. Ent. i. pl. 13. figs. 4, 5 (1773).

46. *PAMPHILA UTHA*, Hewitson, Descr. Hesp. p. 37. n. 32 (1868).

The form from Jamaica being rather different from that of St. Domingo (and probably of Cuba), I append a description.

Wings above bright tawny, reddish at the base; a broad chocolate brown marginal belt from the end of the cell of each wing round the outer border to the external or anal angle, where the fringe becomes tawny; primaries with a large dark brown spot across the median vein; head and collar metallic green, bordered and crossed by testaceous lines of upright scales; remainder of the body above dull tawny, slightly olivaceous in front, yellowish below, with blackish spots down the centre of the venter. Primaries below with the disk of a yellower tint than above; the blackish median spot extended to the base, a blackish spot beyond the cell; outer border broadly brown, becoming ferruginous upon the costa: secondaries ferruginous, with a spot in the cell and a squamose angulated discal belt more or less orange; anal fringe bright orange. Expanse 2 inches.

I have to thank Mr. Du Cane Godman for the identification of this handsome species. I think it may be the insect intended by the description of *Eudamus capucinus*, Lefebvre; but the Latin of that description cannot be translated. It runs thus:—" *E. alis paululum subrotundatis, supra piceo-fuscis ad basin ochraceo-rubrescentibus; anticis in mare supra arcu minuto subtus macula fere dubia, in disco luteis (fæminæ utrinque maculis duabus geminis eodem colore) nervula sectis; subtus anticis ad basin et disco inferiori nigris; omnibus alis fuscis atomis rubris griseisque omnino rubrescentibus.*"

The whole of the descriptions of Lepidoptera in Ramon de la Sagra's 'Cuba' are of this character. *E. trinitad* is said to have three front wings on each side, with transparent unequal and yellowish spots, "*anticis utrinque tribus maculis translucidis inæquali-*

bus et flavescens;" and although in this case it is evident what is intended, in other cases it is not so¹. Surely where a Latin diagnosis defies all possibility of translation it ought to be ignored.

47. *PAMPHILA INSOLATA*, n. sp.

♂. Primaries bronzy chocolate-brown, with tawny basal area; a large black patch below the cell, its anterior border embossed and greyish: secondaries tawny ochraceous; the costal area, outer border, and veins blackish: body greenish, abdomen dull tawny, palpi below sulphur-yellow; legs tawny. Wings below sordid ochraceous; primaries with the basal half of a brighter tint, the interno-basal area and a spot below the cell blackish; internal border dark greyish. Expanse 1 inch 8 lines.

Quite unlike any other species known to me.

48. *PAMPHILA OTHO*, Smith & Abbot, Lep. Ins. Georg. i. pl. 11 (1797).

49. *ACHLYODES POTRILLO?*, Lefebvre, Ramon de la Sagra's Cuba, p. 641 (1857).

The single example taken by Mr. Bowrey has only four hyaline apical dots on each of the primaries; but this may be what is intended by "anticis ad apicem 8 punctis translucensibus albis circulatim dispositis," the only difficulty being the arrangement of four dots so as to produce a circle.

HETEROCERA.

50. *ENYO CAMERTUS*, Cramer, Pap. Exot. iii. pl. 225. fig. A (1782).

51. *CHÆROCAMPA CHIRON*, Drury, Ill. Ex. Ent. i. pl. 26. fig. 3 (1770).

52. *DEILEPHILA LINEATA*, Fabricius, Ent. Syst. iii. p. 541 (1775).

53. *PHILAMPELUS SATELLITIA*, Linnæus, Mantissa, i. p. 539 (1771).

54. *PACHYLIA FICUS*, Linnæus, Mus. Lud. Ulr. p. 352 (1764).

55. *AMBULYX STRIGILIS*, Linnæus, Mantissa, i. p. 538 (1771).

56. *AMPHONYX CLUENTIUS*, Cramer, Pap. Exot. i. p. 124, pl. 78. fig. B (1779).

57. *ANCERYX FASCIATA*, Swainson, Zool. Ill. 2nd ser. vol. iii. pl. 150 (1823).

58. *DILOPHONOTA ELLO*, Linnæus, Mus. Lud. Ulr. p. 351 (1764).

¹ Examine the description of *Hesperia baracoa* as an example.

59. *DILOPHONOTA ÆNOTRUS*, Cramer, Pap. Exot. iv. pl. 201. fig. C (1782).

60. *DILOPHONOTA OMPHALEÆ*, Boisduval, Lép. Guat. p. 72 (1870).

61. *PROTOPARCE RUSTICA*, Fabricius, Syst. Ent. p. 540 (1775).

62. *PROTOPARCE JAMAICENSIS*, Butler, Trans. Zool. Soc. ix. p. 608 (1876).

63. *PROTOPARCE CINGULATA*, Fabricius, Syst. Ent. p. 545 (1775).

64. *PSEUDOSPHEX TETRIO*, Linnæus, Mantissa, i. p. 538 (1771).

The larva of *P. tetrio* is well known to Mr. Bowrey, who describes it as "black with yellow bands, and with the head, feet, anal claspers, and horn scarlet."

65. *COSMOSOMA TYRRHENE*, Hübner, Samml. ex. Schm. Zutr. figs. 483, 484.

66. *COSMOSOMA AUGÆ*, Linnæus, Syst. Nat. ii. p. 807. n. 46 (1766).

67. *EMPYREUMA PUGIONE*, Linnæus, Syst. Nat. ii. p. 807. n. 45 (1766).

68. *ARE MARGINATA*, Drury, Ill. Ex. Ent. ii. pl. 22. fig. 2 (1773).

69. *COMPOSIA SYBARIS*, Cramer, Pap. Exot. i. pl. 71. fig. E (1779).

70. *EUCHÆTES INSULATA*, Walker, Lep. Het. iii. p. 734. n. 5 (1855).

71. *DEIOPEIA SPECIOSA*, Walker, Lep. Het. ii. p. 568 (1854).

Common in grass. The larva much resembles that of our European *Callimorpha jacobææ*: it is orange, banded with warty-black bands, and with rather long black bristles projecting from the warts; head and legs reddish.

72. *CINCIA PALLIDA*, n. sp.

Primaries white, with cream-coloured veins, a black dot at the base; four oblique parallel equidistant angular series of black dots, also a marginal series; secondaries pearly grey; head and collar white; thorax white dotted with black; abdomen pearly grey. Under surface pale greyish, the spots obsolete; costal margin of primaries white, with three pale brown spots beyond the middle; body whitish. Expanse 1 inch 1 line.

73. *MULONA LAPIDARIA*, Walker, Lep. Het. Suppl. v. p. 1896 (1866).

74. *GLISSA VARIEGATA*, Walker, Lep. Het. ii. p. 380 (1854).

This beautiful little species seems to be not uncommon. Mr. Bowrey found it settled on the under surface of the leaves of coffee.

75. *LAURONA ERGOLIS*, Walker, Lep. Het. ii. p. 335 (1854).

This common species is said to have a hairy caterpillar.

76. *EUTHISANOTIA TIMAIS*, Cramer, Pap. Exot. iii. pl. 275. fig. B (1782).77. *EUGLYPHIA HIEROGLYPHICA*, Cramer, Pap. Exot. ii. pl. 147. fig. D (1779).

The larva of this species, which is slightly hairy, feeds on lilies.

78. *OCHRIA NIVEOPICTA*, n. sp.

Primaries above deep coppery red; the orbicular and reniform spots represented by circles of white dots enclosing white spots; costal margin white-dotted; a few scattered white dots on basal area, a discal series and a marginal series; a submarginal series of white spots: secondaries shining brown, slightly darker at outer border: body corresponding in colour with the wings. Under surface pinky brown; internal areas of the wings more or less broadly white; primaries with pale discocellular spot and outer border. Expanse 1 inch 4 lines.

79. *PRODENIA IGNOBILIS*, n. sp.

Primaries above shining whity brown; costal margin whitish, crossed by oblique brown spots; two black dots and a small brown spot at the end of the cell; a double discal series of black dots on the veins; an ill-defined series of internervular bronzy streaks; an oblique bronzy streak from the second median interspace to near the base of the inner margin, where it terminates in a black line; a marginal series of black dots; fringe bronzy, crossed by white lines from the ends of the veins, and with a white internal margin: secondaries semitransparent opaline white: body pale brown, the head, collar, and tegulæ whitish; a darker brown patch on each side of the collar. Wings below white, most of the markings obsolete; primaries sericeous, with bronzy-tinted fringe and costa; a marginal series of black dots; body below whitish, varied with pale reddish brown. Expanse 1 inch 3 lines.

This species and the next have the general aspect of *Leucania*.

80. *PRODENIA PAUPER*, n. sp.

Primaries above shining whity brown, with five or six black costal dots and three (indicating the reniform spot) at the end of the cell; an arched discal series of minute black dots on the veins; outer border rather dusky; a marginal series of minute black dots: secondaries semitransparent opaline white; the apex with a brown marginal line; costal area pale brown: body whity brown; front of the collar brown, with a black posterior edge. Under surface shining, the markings obsolete. Expanse 1 inch 3 lines.

81. *CONDICA PALPALIS*, Walker, Lep. Het. ix. p. 240 (1856).

82. *APAMEA INTERMITTENS*, Walker, Lep. Het. xv. p. 1686 (1858).

83. *PERIGEIA MOBILIS*, Walker, Lep. Het. x. p. 277 (1856).

84. *HADENA ABIDA*, Felder, Reise der Nov. Lep. iv. pl. 109. fig. 7 (?).

The example from Jamaica has the apices of the primaries rather more rounded and the pattern less strongly indicated than in Felder's figure; still it is so like it that it would be unsafe to regard it as a distinct species.

85. *ELOUSA ALBICANS*, Walker, Lep. Het. xiii. p. 1118 (1857).

This genus is nearly allied to *Erastria*; the same species is described subsequently by Walker under the name of *Erastria includens*.

86. *GONODONTA NUTRIX*, Cramer, Pap. Exot. iv. pl. 312. fig. B (1782).

87. *HYBLÆA PUERA*, Cramer, Pap. Exot. ii. pl. 103. figs. D, E (1779).

88. *COSMOPHILA EROSA*, Hübner, Samml. ex. Schm. Zutr. figs. 287, 288.

89. *DECELEA BOWREYI*, n. sp.

Primaries pale brown mottled with black; a broad central band (the internal third of which is black and the remainder of the ground-colour), limited internally by a black line, and externally by an angulated and slightly irregular white line; a black line across the base, terminating on interno-median area in a triangular black patch; several black costal dashes and an oblique black line from the costa across the central band; a subcostal greyish lunule partly bordered by pearly scales beyond the central band; a very irregular dentate-sinuate whity-brown discal stripe with dark borders; a sub-marginal series of black bracket-like markings separated by white dots upon the veins; fringe spotted with dark brown: secondaries reddish brown, darker towards the outer border; a black sinuated marginal line interrupted on the veins by white dots; fringe pale brown, bordered and intersected by parallel dusky lunules: body pale brown speckled with black; collar with an ill-defined central black line, the border pearly; a few pearly whitish scales scattered over the thorax; abdomen with three very prominent dark brown dorsal tufts or masses of scales. Primaries below pale olive-brown slightly sericeous; a black costal spot before the middle, and a second smaller one beyond the middle; the remainder of the costa alternately brown and white; disk darker than the rest of the wing, crossed by a nearly straight dusky line, and limited externally by a very irregular dentate-sinuate line; a sinuated black marginal line, interrupted by white dots upon the veins; fringe with red-brown

external spots: secondaries pinky brown, crossed by two dark lines which form a central semicircular area, in the middle of which is the dark discocellular lunule; a dusky submarginal belt; margin and fringe as above: body below pinky-brown; tarsi black, banded with testaceous or pinky whitish. Expanse 1 inch 6 lines.

This singular species has somewhat the aspect of a *Dasychira*; it seems, however, to be allied to the genus *Nænia*.

90. *HOMOPTERA TERROSA*, Guénée, Noct. iii. p. 11. n. 1332 (1852).

Whether Walker has rightly identified this species I cannot say, but his *H. posterior* is the same as his *H. terrosa*.

91. *BOLINA FASCIOLARIS*, Hübner, Samml. ex. Schm. Zutr. figs. 443, 444.

92. *BOLINA CUNEARIS*, Guénée, Noct. iii. p. 70. n. 1414 (1852).

93. *BOLINA PERPENDICULARIS*, Guénée, Noct. iii. p. 65. n. 1404 (1852).

94. *BOLINA EVELINA*, n. sp.

Markings nearly as in *B. ochrodes*, but the primaries slaty grey, the large reniform patch of the same colour, the internal two thirds of the central band whity brown mottled with greyish brown; two triangular black subcostal spots resting upon the inner margin of the trisinate red-brown discal stripe; external area soft silver-grey; marginal line yellowish; fringe brown, white at external angle; secondaries with the basal half and fringe white, the external half black; thorax lilacine, abdomen grey. Wings below with the basal half and fringe white, the external half blackish; primaries with a white spot just beyond the cell; fringes tipped with black; body white; the palpi and legs fringed with pink. Expanse 1 inch 9 lines.

Most like *B. agrotoides* in the pattern and coloration of the primaries.

95. *BOLINA?* *CONFIRMANS*, Walker, Lep. Het. xiii. p. 1157. n. 25 (1857).

This species would, in my opinion, be better placed with *Biula*. I can find no difference whatever between *Syneda limbolaris* (a species much like a *Bolina*) and *Grammodes grandirena* of Walker's Catalogue.

96. *PEOSINA NUMERIA*, Drury, Ill. Ex. Ent. i. pl. 23. fig. 5 (1770).

The species from Venezuela is quite distinct, the specimens from St. Domingo identified by Walker as *P. mexicana* being referable to *P. numeria*. For Walker's *P. numeria* I would propose the name of *Hypogramma confusa*; it is nearly allied to *Hypogramma sublucida*.

97. *THYSANIA ZENOBIA*, Cramer, Pap. Exot. ii. pl. 115. A, B (1779).

98. *EREBUS ODORA*, Linnæus, Syst. Nat. ii. p. 811. n. 11 (1766).

The chrysalis of this species is enclosed in a slight cocoon, to which leaves are attached.

It appears to me that at least five species have been confounded under this name; of these three are already figured as follows:—

1. *E. odora* of Linnæus, in which both sexes are alike in general pattern and both shot with purple; Drury's figure represents a specimen in which the purple seems to have faded. Jamaica and St. Domingo.

2. *E. odorata* of Clerk, in which both sexes are again alike, but different from *E. odora*, a strongly dentate whitish belt intersected by black lines running through both wings. St. Domingo and New Granada.

3. *E. agarista* of Cramer, in which the male has a pale discal sinuated belt, and the wings from the centre shot with rose-colour; whilst the female has the belt snow-white, intersected by black lines and a feeble lilacine tint beyond the centre of the wings. Brazil.

E. agarista is the most richly-coloured species.

We also have a female from Havannah, which is certainly different, and examples of a species which seems to be distinct from St. Kitts, Nevis, and New Granada.

99. *PHURYS GARNOTI*, Guénée, Noct. iii. p. 307 (1852).

In my opinion this species would be better placed in *Trigonodes* than in *Phurys*.

100. *ACHÆA INDISTINCTA*, n. sp.

Primaries red-brown, the base and a diffused belt beyond the middle paler; a nearly triangular subapical costal chocolate-brown patch bounded externally by a white line; an apical dark-brown spot; costa greyish: secondaries smoky brown, crossed at the middle by a whitish stripe; fringe white; a submarginal sordid white spot near the anal angle: body whitish. Wings below pale olive-brown, with the basal area whitish; primaries with an abbreviated sordid white discal band; a bifid subapical white spot: secondaries with brown discocellulars, followed by a white central band; a marginal sub-anal white spot; fringe snow-white: body creamy-white. Expanse 1 inch 9 lines.

Allied to *A. cyllota*.

101. *POAPHILA CINEREA*, n. sp.

Ashy grey, wings with diffused chocolate-brown external area; a faint indication of an irregular central belt, expressed by zigzag limiting lines; an indistinct grey zigzag discal line across the brown area; primaries with a white spot at the inferior angle of the discoidal cell. Under surface paler; the outer edge of the indistinct

central belt relieved by a whitish border; primaries without the white spot; secondaries with an ill-defined dusky discal belt; fringe white. Expanse 1 inch 3 lines.

102. *REMIGIA DISSEVERANS*, Walker, Lep. Het. xiv. p. 1495 (1857).

This species is identical with *R. persubtilis* of Walker, and allied to his *Ophiusa delinquens*.

103. *RHESCIPIHA ELEGANS*, n. sp.

Allied to *R. servia*, but with narrower wings, the palpi much more slender; the primaries with less distinctly sinuated margin; a small white dot on lower median interspace close to the margin; no yellow spots; secondaries pale reddish instead of smoky brown, the base and costal area white; thorax burnt-sienna red like the primaries; abdomen very pale brown, almost white: wings below much whiter than in *R. servia*; body below snow-white, palpi and tibiæ of anterior and middle pairs of legs brown. Expanse 1 inch 7 lines.

I find that the genus *Rhescipha* is most nearly allied to *Tetracera*.

104. *THERMESIA GEMMATALIS*, Guénée, Noct. iii. p. 355. n. 1828 (1852).

105. *AZAZIA MONSTRATURA*, Walker, Lep. Het. xv. p. 1564 (1858).

This species is certainly nearer to *Azazia* than to *Thermesia*, with which genus Walker placed it.

The following genus has been a puzzle to me; but it appears to be more nearly allied to *Euclidia* than to any thing else.

CALLISCOTUS, n. gen.

Form and general structure of *Euclidia*, but the body less robust, the palpi shorter, with very short terminal joint, porrect; abdomen shorter; primaries comparatively longer; subcostal branches of secondaries emitted from a footstalk; discocellulars concave but very oblique. Type *C. bowreyi*.

106. *CALLISCOTUS BOWREYI*, n. sp.

Primaries pale brown, crossed by numerous irregularly dentate-sinuate black lines; a broad dark-brown subbasal belt, beyond which are two large patches a little paler than the ground-colour, outlined in black; in the middle of the upper one is a small ocellus, representing the reniform spot, and pale brown edged with black and encircled by a yellowish iris; a few scattered white scales on the external area; subapical area dusky; a dentate-sinuate pale line, white, and followed by triangular black spots between the veins; an interrupted black marginal line: secondaries fuliginous brown, with dusky external border; a dark angulated discal stripe and a blackish anal spot: body whitly brown. Wings below whitly brown,

with discocellular spots, angulated discal stripes, and external borders black; the apices, a triangular spot at the centre of each outer margin, the fringes, and some spots at the anal angle of secondaries white; body below whitish. Expanse 1 inch 7 lines.

A pretty species, somewhat calling to mind the Geometrid genus *Scotosia*.

107. *CAPNODES? CALIDA*, n. sp.

Bright clay-colour; wings with two very irregular central brown-bordered whitish dentate-sinuate lines from costa to inner margin, each dens terminating in a white dot; outer border red-brown, bounded internally by a pale zigzag line; a nearly marginal series of dots black internally and white externally: primaries with a snow-white spot and one or two dots at the end of the cell; secondaries with a black-centred whitish spot at the end of the cell. Wings below considerably paler and irrorated with smoky brown; secondaries whitish towards the base and inner border, the spots at the end of the cell less strongly defined than above, the lines obsolete. Expanse 1 inch 2 lines.

This species has rather long palpi for a *Capnodes*, but in general form, style of coloration, and every thing else agrees with that genus.

108. *URANIA SLOANUS*, Cramer, Pap. Exot. i. pl. 85. figs. E, F (1779).

109. *NYCTALÆMON ÆGISTUS*, Fabricius, Mant. Ins. ii. p. 10. n. 93.

110. *CHÆRODES TRANSTINCTA*, var., Walker, Lep. Het. xx. p. 20 (1860).

111. *DREPANODES PIONARIA*, var., Walker, Lep. Het. xx. p. 71 (1860).

112. *BOARMIA DELICATA*, n. sp.

Wings above chalky white; the basal area and disk of primaries, and the external half of secondaries, crossed by parallel undulated testaceous bands; a well-defined zigzag stripe across the middle of the disk; two central angulated slender black lines, between which is a black discocellular annulus on each wing; a marginal series of black dots: body white; abdomen banded with testaceous. Under surface white; wings with black discocellular spots, pale greyish-brown discal belt, and black marginal dots; primaries with the costa black-spotted. Expanse 1 inch 6 lines.

113. *AMPHIDASYS ARNOBIA*, Cramer, Pap. Exot. iv. pl. 383. fig. I (1782).

114. *JODIS KINSTONENSIS*, n. sp.

Wings above emerald-green, crossed by a wavy yellowish discal line; fringes lemon-yellow, tipped with white; discocellular spots

black, encircled with orange: frons deep red, with white angles and a central longitudinal green stripe; crest deep red, speckled with white; antennæ deep red, annulated with white; back of head, collar, and tegulæ emerald-green; thorax and abdomen pale pinky brown or flesh-colour. Wings below much paler than above, especially at outer margin, sericeous; primaries with a small red apical spot; palpi above dark red tipped with white, below pearly white; pectus snow-white, legs and venter pearly white. Expanse 1 inch 1 line.

115. *MECOCERAS BITACTARIA*, Walker, Lep. Het. xxii. p. 607 (1861).

116. *HYRIA VINACEA*, n. sp.

Laky purple, with rather broad ochreous outer border, between which and the general colour is a belt, reddish externally and slaty grey internally; abdomen with ochreous margins: wings below paler than above, the border cream-coloured; body below cream-coloured. Expanse 7 lines.

A pretty little species.

117. *EROSIA INCONGRUA*, n. sp.

Sordid white, reticulated and speckled with brown: primaries with the base of costa cinereous; an irregularly elbowed testaceous line across the basal third; an angulated dark brown discal line (blood-red in certain lights), terminating on inner margin in a semi-circular brown spot; four submarginal brown spots on the apical half of outer border: secondaries with a black-edged sagittiform streak through the cell; a white-edged elbowed blackish line across the disk, bounded internally near the abdominal margin by an oblong patch of red-brown; apical area clouded with reddish brown; border between the caudal processes greyish, black-edged internally; two submarginal black dots on the median interspaces: body white, with grey head and collar. Under surface sordid white, speckled with black. Expanse 9 lines.

118. *ACIDALIA UMBILICATA*, Guénée, Phal. i. p. 504. n. 872 (1857).

119. *ACIDALIA APPARITARIA*, Walker, Lep. Het. xxii. p. 733. n. 145 (1861).

120. *MACARIA ACIDALIATA*?, Walker, Lep. Het. xxiii. p. 893. n. 33 (1861).

There is a broken example of what appears to be a species of *Anisodes*; but I hope Mr. Bowrey will send us a good example some day, and thus enable me to identify it with certainty.

121. *YPSIPETES*? *ANOMALA*, n. sp.

Primaries above with the basal third and costa stramineous, the rest of the wing silvery brown; basal area crossed by sinuated red-

dish ochraceous lines, and the rest of the wing by sepia-brown lines; a discal series of white-edged spots, black on the discoidal interspaces, otherwise brown; median vein and bases of the branches black-spotted: secondaries semitransparent sordid white, with opaque outer border and grey submarginal stripe: body stramineous, streaked with reddish ochraceous. Wings below cream-coloured, with greyish-brown submarginal belt; body white. Expanse 1 inch.

The only example obtained of this singular species is, unfortunately, rather rubbed.

122. *SCOTOSIA CATOCALARIA*, Walker, Lep. Het. xxxv. p. 1689 (1866).

123. *PTEROCYPHA STELLATA*, Guénée, Phal. ii. p. 443. n. 1627 (1857).

124. *HYPOSIDRA OCHREA*, n. sp.

Ochreous; wings with a silvery gloss, excepting the outer border, a discal belt, and a costal dash upon the primaries, which are of a clearer yellow colour; primaries with the lower half of the discal belt edged externally with orange and plumbaginous; edge of fringe orange: secondaries with two parallel zigzag purplish-brown streaks across the abdominal half, the upper streak intersected by a plumbaginous line; edge of fringe orange: head brown. Wings below bright ochreous, with an oblique discal purplish streak; primaries with diffused silvery-whitish external area; pectus whitish, legs testaceous. Expanse 1 inch 3 lines.

I have to thank Mr. F. Moore for the identification of this genus, the type of which is a Javan species, not in the Museum collection.

125. *HYPENA LUNIFERA*, n. sp.

Primaries above lilacine brown, crossed by two slender blackish zigzag lines, between which is an orange lunule, with its inferior extremity white and edged with black, representing the reniform spot; an orange dot at the costal extremity of the second black line, and two subcostal dots of the same colour close to apex; a marginal series of black dots: secondaries pale smoky brown, darker towards the outer margin, crossed at the middle by an arched series of black spots; a marginal series of black dots: body dark brown, back of thorax slightly lilacine. Primaries below greyish brown; costal area speckled with whity brown; the discocellulars and an arched discal series of spots dusky; a marginal series of depressed triangular spots: secondaries sordid white, speckled with dark brown; a black discocellular lunule; two discal parallel zigzag dark brown lines, the outer one ill-defined; a marginal series of black spots, as in primaries; pectus smoky brown. Expanse 1 inch.

126. *SYNGAMIA FLORELLA*, Cramer, Pap. Exot. iv. pl. 348. fig. L (1782).

127. *DESMIA ORBALIS*, Guénée, Delt. p. 192. n. 128 (1854).

128. *DESMIA PROGNEALIS*, Walker, Lep. Het. xvii. p. 346. n. 22 (1859).

129. *SAMEA CHLOROPHASMA*, n. sp.

Wings hyaline, slightly yellowish, with stramineous borders; outer border spotted with rust-red; primaries with three mustard-yellow irregular lines across the basal area, followed by a straight golden brown transverse line, then a stramineous belt margined with brown, followed by a quadrate spot of the same character at the end of the cell (its inner edge continued as a single line to internal margin); an angulated brown discal line, terminating at inner margin in a rusty reddish spot: secondaries with a black-edged stramineous discocellular spot, from which a brown line runs obliquely to inner margin; an angulated brown discal line, terminating at anal angle in a quadrate rusty reddish spot: thorax stramineous, streaked with mustard-yellow; abdomen testaceous. Wings below altogether paler than above, the markings less distinct; body below silvery white; palpi yellow; legs cream-coloured. Expanse 10 lines.

A delicate golden-looking little species.

130. *AGATHODES MONSTRALIS*, Guénée, Delt. p. 209. n. 165 (1854).

131. *HYMENIA PERSPECTALIS*, Hübner, Ex. Schm. Zutr. fig. 101.

132. *CONCHYLODES DIPHTHERALIS*, Hübner, Ex. Schm. Zutr. figs. 691, 692.

133. *PHAKELLURA HYALINATA*, Linn. Syst. Nat. iii. 2, p. 873 (1766).

134. *PHAKELLURA NITIDALIS*, Cramer, Pap. Exot. iv. pl. 371. fig. F (1782).

Mr. Bowrey says that he found the species of *Phakellura* feeding upon the flowers of gourds.

135. *MARGARONIA QUADRISTIGMALIS*, Guénée, Delt. p. 304. n. 319 (1854).

136. *BOTYS BUTYROSA*, n. sp.

Wings dull lemon-yellow: primaries with the costa sericeous, a feeble opaline tint beyond the middle, an angular pale brown line across the basal third, and a sickle-shaped pale brown line across the disk; marginal line tawny: secondaries with opaline costal area; marginal line tawny: head and prothorax yellow; rest of the body shining creamy white; abdomen with a yellow dorsal line; projecting frontal tuft white; palpi brown above, white below. Body below pearly white; legs pearly white, with the femora and the anterior tibiæ brown; wings below opaline. Expanse 1 inch 7 lines.

137. *BOTYS LUCILLA*, n. sp.

Bright golden yellow, with a very slight pinky spot; wings with the two usual lines greyish; primaries with the discoidal spots represented by grey dots; secondaries with whitish abdominal area; head pearly white; abdomen pale yellow. Wings below paler than above, opaline; body pearly white. Expanse 9 lines.

138. *BOTYS PRINCIPALIS*, Lederer, Wien. ent. Monatschr. vii. pl. 10. fig. 17 (1873).

139. *BOTYS GLAUCUSALIS*, Walker, Lep. Het. xviii. p. 576. n. 51 (1859).

140. *BOTYS AGAVEALIS*, Walker, Lep. Het. xviii. p. 574. n. 47 (1859).

141. *BOTYS EURYTALIS*, Walker, Lep. Het. xviii. p. 576. n. 50 (1859).

142. *BOTYS CAMPALIS*, Guénée, Delt. p. 344. n. 397 (1854).

143. *BOTYS GASTRALIS*, Guénée, Delt. p. 346. n. 400 (1854).

144. *BOTYS ERATALIS*, Walker, Lep. Het. xviii. p. 578. n. 54 (1859).

145. *BOTYS OLIVIA*, n. sp.

Pale olive-brown, with bright bronze reflections; the usual lines grey; orbicular and reniform spots outlined in grey; body greyish brown. Wings below considerably paler, whitish towards the base, sericeous; inner line absent; body white. Expanse 10 lines.

Nearly allied to *B. plebeialis*.

146. *BOTYS HELCITALIS*, Walker, Lep. Het. xviii. p. 574. n. 46 (1859).

147. *MECYNA REVERSALIS*, Guénée, Delt. p. 409. n. 531 (1854).

148. *ANERASTIA IGNOBILIS*, n. sp.

Primaries above pale pinky brownish or flesh-colour, the infero-exterior quarter of the wing slaty grey; the median vein, its two superior branches, the terminal portions of the subcostal branches, the extreme ends of the remaining veins, and the centre of the submedian vein silvery white; an abbreviated longitudinal apical streak and a subcostal streak black; one or two minute black dots on the median and submedian veins: secondaries hyaline, iridescent, with dusky outer border: thorax red-brown, streaked with pinky white; head and palpi white; abdomen grey. Primaries and body below pale shining brown; secondaries as above. Expanse 11 lines.

149. *ARGYRIA VESTALIS*, n. sp.

Silvery white: primaries with a small triangular spot at the

middle of costa, an oblique dash followed by a triangular spot near apex, and a submarginal stripe, with zigzag inner edge dark chocolate-brown; outer border and fringe pale brown, traversed by two straight dusky lines; a minute brown spot at middle of inner margin: base and sides of palpi chocolate-brown. Below silvery white; the costal area of primaries pale brownish. Expanse 11 millimetres.

Like *A. insons* of Felder, but only half as large; also allied to *A. chrysogyrans*, Walker (MS.?).

150. *CYDOSIA NOBILITELLA*, Cramer, Pap. Exot. iii. pl. 264. fig. G (1782).

151. *TINEA?*, sp.

This insect has lost all the fringes of its wings, so that I cannot recognize its genus. The neuration of the secondaries seems to be exactly that of *Tinea*; but the head is too broad, and the palpi are too long and robust; in coloration and the general form of its wings it is most like *Cerostoma vittella*.

152. *PTEROPHORUS ASPILODACTYLUS*, Walker, Lep. Het. xxx. p. 941. n. 43 (1864).

5. Descriptions of new Land-Shell from Japan and Borneo. By EDGAR A. SMITH, F.Z.S.

[Received April 15, 1878.]

HELIX (*CAMENA*) *LEWISII*.

Testa dextrorsa, conoideo-globosa, subanguste umbilicata, oblique striata, alba, epidermide tenui luteo-olivacea induta, fascia angusta fusca ad peripheriam picta; anfract. 6½, convexiusculi, sensim crescentes, ultimus rotundatus, antice breviter descendens; apertura obliqua, intus alba; perist. undique expansum, margine columellari sordido-roseo tincto, superne late expanso et reflexo.

Diam. max. 35 mill., min. 29; alt. 24.

Hab. Japan (*George Lewis*).

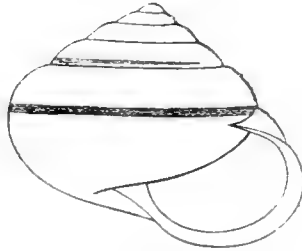
Perhaps the most closely allied Japanese species to this one is *H. miranda*, A. Adams. From it *H. lewisii* differs in having a more conical spire, a narrower umbilicus, finer oblique striæ, and no spiral sculpture.

The oblique striæ at the suture are rather deeply incised and more crowded than on the other parts of the whorls, many of them extending only about a line from the suture and then gradually fading away. The first four whorls differ from the last two in being obliquely punctato-striate, instead of exhibiting an ordinary striation. The brown band is situated a very little above the middle of the body-whorl, and passing just above its suture, is visible on two

or three of the preceding volutions. The umbilicus is very deep and penetrable to the apex of the shell, but rather narrow, occupying about one seventh of the smallest diameter.

The peristome rather broadly expanded and white, with the exception of the columellar and basal margins, which are stained with a dirty pinkish colour. Over the umbilicus it is broadly expanded, reflexed, and joined to the upper margin by a thin callosity. This species is quite distinct from *H. myomphala*, Martens, and, al-

Fig. 1.

*Helix (Camena) lewisii.*

though agreeing in the style of coloration, differs in form and the umbilicus.

The single example in the British Museum was presented by Mr. George Lewis.

HELIX (CAMENA) CONGENITA.

Testa suborbicularis; spira breviter conica, subaperte umbilicata, tenuiuscula, pallide straminea, zona lata interrupta irregulari fusca, vel strigis latis fuscis infra medium anfr. ultimi ornata et hic illic supra strigis obliquis paucis indistinctis notata, interdum ad peripheriam zona angusta fusca cincta, et umbilico aliquando fusco tincto; anfractus 5½-6, convexiusculi, lineis incrementi elevatis, filiformibus, obliquis, flexuosis et striis minutissimis spiralibus inter lineas elevatas sculpti, ultimus angustiusculus, antice prope labrum breviter subitoque descendens; apertura subhorizontalis, intus livida, fusco tincta; peristoma tenue, livido-fusco et albo diverse pictum, undique reflexum et expansum.

Diam. max. 30 mill., min. 25, alt. 19; apert. 16½ long., 14 lat.

Hab. Japan.

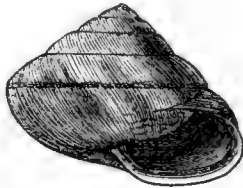
This species partakes in a great measure of the form of *H. congener*, recently described by me in these 'Proceedings' (1878, p. 105). The spire, however, is a little more elevated, the last whorl a trifle less robust, and the aperture narrower.

The sculpture of this species is much coarser, the lines of growth being developed into thread-like liræ, and the spiral striæ invisible to the naked eye, and more conspicuous between than upon the

oblique thread-like lines of growth when viewed under a lens. The descent of the body-whorl is very sudden and brief. The whorl, owing to the expansion of the peritreme, has a constricted appearance in that part.

The umbilicus is a little more open than in *H. congener*, and consequently more perspective. The coloration of this species is not easily definable. The ground-colour is pale straw, the oblique raised liræ being more opaque and yellower. The body-whorl below the periphery is stained with brown, or looks as if it were scorched. The colouring takes the form of a very broad interrupted transverse band, or, in other words, of wide blotches or stripes. The latter are sometimes continued upon the upper half of the whorl, and are also here and there faintly observable on the upper volutions. One

Fig. 2.

*Helix (Camaena) congenita.*

specimen has a narrow peripheral brown band. The body-whorl is stained with brown outside the tip; and this, owing to the thinness of the shell, produces a brownish labrum, which in some places, particularly at the extreme edge and in the columellar region, is somewhat whitish. It is rather widely expanded at the base and columella, and is a trifle reflexed everywhere. The aperture is very transverse, in fact almost horizontal; it is of a livid white colour within, exhibiting the brown marking of the exterior.

Subgen. MYXOSTOMA, Troschel.

Testa plus minusve discoidea, late umbilicata; apertura circularis; peristoma duplex, margine interiore superne plerumque leviter sinuato, externo supra sinum alatum expanso. Operculum corneum, crassum, inferne paulo concavum, in medio nucleo prominulo, extus marginibus anfractuum lamellosis.

This section of *Cyclophorus* agrees with *Pterocyclos* in the form of the shell and its peristome, but differs in having a thick horny operculum, with the margins of the whorls lamellated exteriorly, that of *Pterocyclos* being calcareous and spirally laminated.

CYCLOPHORUS (MYXOSTOMA) BATHYRHAPHE.

Testa discoidea, apertissime umbilicata, spira parum elevata, sub epidermide luteo-olivacea sordide vel cæruleo-albida; anfr. 5½, rotundati, sutura valde canaliculata sejncti, ultimus sat magnus

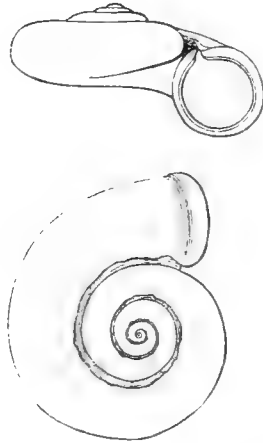
superne ad canalem suturalem carina lamelliformi munitus, lineis incrementi tenuibus leviter obliquis sculptus; apertura oblique circularis, intus cæruleo-alba; peristoma duplicatum, margine interiori lævi vix expanso, superne prope anfractum parum profunde sinuato, externo anguste expanso, superne ala parva leviter fornicata instructo. Operculum corneum, concentricum, multispirale, utrinque concavum, extus lamellis brevibus striatis obtectum.

Diam. max. 31 mill., min. 22, alt. 15, apert. diam. intern. 9.

Hab. Borneo (*G. B. Sowerby*).

Shell discoidal, openly umbilicated, and clothed with a thin uniform yellowish-olivaceous epidermis. Beneath this it is of a dirty or bluish-white tint. The spire is only slightly raised above the last whorl. The whorls, about five in number, are convex and bordered by a deep and broadish channel at the suture, the outer margin of the canalication being produced into a thin lamellar ridge or keel; and outside this carina the whorls are a trifle depressed or excavated.

Fig. 3.



Cyclophorus (Myxostoma) bathyraphe.

The sculpture consists merely of the lines of growth, which are fine and somewhat oblique. The aperture is slopingly circular, bluish white, and has a double lip. The inner edge is thicker than the outer, and scarcely at all everted. The sinus is distinct, moderately deep, and situated at the termination of the sutural canalication. The outer rim is somewhat expanded but not reflexed, narrowest on the left side where it touches the whorl, and thin and sharp at the extreme edge. Above it is expanded in the form of a small wing, which slightly arches over the sinus and has a tendency to a deflection in front.

This species in the nature of its operculum agrees with the genus *Myxostoma*, which was founded by Troschel ('*Zeitschrift für Mala-*

kozologie,' 1847, p. 44) for the reception of the curious shell figured by Martyn under the name of *Lituus brevis*.

It only differs from *Myxostoma* in having the inner lip of the aperture sinuated above, and in the wing-like expansion of the outer rim not leaning upon the penultimate whorl. The canaliculate suture, I presume, is only a specific character.

In all respects agreeing with this species are two others, *Cyclostoma planorbulus*, Lamarck, and *Pterocyclos albersi*, Pfr. The former has had several localities quoted as its home, among which are Senegal?, Philippine Islands, Bengal, Java, Borneo, Sumatra (in Mus. Cuming), and Pulo Condore Island. Which of these is the true habitat I cannot say with certainty, nor am I aware that it has ever been definitely settled; there is, however, some slight evidence to show that the last locality is the correct one. We are also in the same state of uncertainty respecting *Pt. albersi*. Pfeiffer described the species not knowing its locality; and Benson ('Annals of Nat. Hist.' 1857, vol. xix. p. 208) is wrong in attributing a shell found at Teria Ghát, Khasia hills, India, to this species; for it was, as shown by Hanley ('Conchologia Indica,' p. 56), only a variety of *Pt. parvus*, Pearson.

Here, then, is a small group of four species, all having a Pterocycloid expansion of the outer rim of the lip, and an operculum of precisely the same structure. Three of them have channelled sutures to the whorls, are of a depressed orbicular form, and have the inner lip sinuated at the termination of the sutural channel. The fourth (*brevis*) and the type of *Myxostoma* lacks the channelled suture, and has only the slightest trace of a sinus in the lip—both of which characters, especially the former, I consider more specific than generic. From *Cyclophorus* with its simple concentric thin horny operculum and simple lip to the aperture, the different operculum and expansion of the lip of *Myxostoma* warrant, at all events, a subgenerie separation.

There are two or three Burmese species (*Cyclophorus pinnulifer*, Benson, *C. calyx*, Benson, and *C. hispidulus*, Blanford) which will also conveniently range under this genus. They are depressed subdiscoid shells with a double rim to the aperture, the outer lip with a small superior wing-like expansion, and the operculum thick, horny, with the outer margins of the whorls lamellated. For this group Blanford proposed the name *Scabrina* (Journ. Asiatic Soc. Bengal, 1863, p. 322).

The museum is indebted to Mr. J. B. Sowerby for a single specimen of this interesting species.

6. On the Fruit-Pigeons of the Genus *Ptilopus*.

By D. G. ELLIOT, F.R.S.E. &c.

[Received April 16, 1878.]

(Plates XXXIII. & XXXIV.)

My material for the present paper has been most ample, and was derived from the following sources :—the collection of the Paris Museum, rich in the types of the older authors, such as Hombron and Jacquinot, Lesson, Quoy and Gaimard, Bonaparte, Temminck, Knip, &c. ; the collection of the British Museum, containing the types of Gray, Gould, Wallace, &c. ; a series of special desiderata from the Museum at Genoa, collected by D'Albertis, Bruijn, &c., and from the Museum of Count Turati at Milan ; a large number of various species from different localities brought by Laglaize, and especially by M. Raffray, now in the Paris Museum ; the species of *Ptilopus* procured by the 'Challenger' Expedition, also those from Duke-of-York Island sent by Mr. Brown ; specimens in Messrs. Salvin and Godman's collection obtained by Mr. Layard in the Fiji Islands ; and, lastly, the type specimen of Dr. Finsch's recently described *Pt. ponapensis*.

Probably no such complete series, illustrating the species of this group from all localities, has ever before been at the disposal of any one wishing to study these birds ; and it is very safe to say that, unless I had had before me the actual specimens described and figured by the earlier writers, especially of those species belonging to the islands of the Polynesian subregion, this paper could never have been written without great danger of adding to the confusion already existing in these perplexing birds. The descriptions in many instances are so meagre and unsatisfactory, and the illustrations, in certain cases, so totally unlike the originals, that it is utterly impossible to recognize the species by them ; but having had the specimens, in the majority of instances, before me, I have been enabled to ascertain without difficulty to what species these doubtful birds (made such by their authors) really belonged. Some of my conclusions may be found to be quite at variance from those of other authors ; but in all cases (unless otherwise stated), let it be remembered, I have judged from the vast material at my command, and, having brought to my task a mind totally unprejudiced by any preconceived opinions, it will not perhaps be deemed too great a request should I ask that, if any of the decisions arrived at in this paper are rejected, they may be condemned only after the examination of material at least approximating somewhat to that which I have consulted, and such as will clearly show my views to be erroneous.

Probably there are but few groups of birds so liable to lead a naturalist astray as those species of *Ptilopus* inhabiting the Pacific islands ; and, without an ample series before him, no one could accurately diagnose the forms that really are distinct. In this special division of the genus the collection of the Paris Museum is rich,



HOUGHTON AND COMPANY

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PTILOPUS PICTINENTRIS

J. Smith del.







probably beyond all others, through the material brought to France by the scientific expeditions known as the voyages of the 'Astrolabe,' 'Coquille,' 'Vénus,' 'Zélé,' 'Pôle Sud,' &c. Many types are among these specimens; and it has been by their assistance I have worked out the synonymy of the species of the Polynesian subregion. All the species figured by Bonaparte in his 'Iconographie des Pigeons' are also in the Museum, and have been invaluable in enabling me to arrange the synonymy and determine the species to which they belong, which has not been always possible from the work itself, some curious and unaccountable errors having been committed by the authors.

Man is fallible, and it is not to be supposed that in an extensive review of some seventy species no errors have been committed; but, having endeavoured to verify every statement made in this paper (taking nothing for granted), I may venture to hope that inaccuracies have been reduced to a minimum.

The pleasing duty now alone remains for me to express my thanks to those who have assisted me with material during the time I have been occupied with this memoir, without whose aid it certainly never could have been properly completed. To my friend Prof. A. Milne-Edwards, to whom I have already so often given my testimony as to his willingness to accord every facility for the study and examination of the unequalled collection of birds and quadrupeds under his charge, I am again under obligations for every assistance rendered to me during the months I have been engaged upon this group. Not only was every specimen the Museum contained continually at my disposal, but also many books from his own library were placed at my service as, from time to time, I had need of them. It is only by such enlightened assistance and cooperation from those who are at the heads of great departments in European museums that any satisfactory work can be accomplished by a naturalist who may not be himself attached to such institutions. To Dr. Oustalet, Aide-Naturaliste, I also desire to express my thanks for much assistance continually and freely given. To my friend Count T. Salvadori I would acknowledge my indebtedness for a very valuable series of specimens not otherwise obtainable, procured by the consent of the Marquis G. Doria from the Museum at Genoa, among which were some types of Count Salvadori's lately described species. To Count H. Turati I am also obliged for specimens from his magnificent museum. To my friend Dr. Sclater I am indebted for opportunities of examining the collection of the 'Challenger' Expedition, and also those sent to him from different islands in the Pacific, containing various types of the species described by him from time to time; and to Messrs. Salvin and Godman for specimens from their collection obtained by Mr. Layard, and which I brought to Paris for comparison with those in the Museum collection. To Mr. Sharpe, who placed at my disposal all the specimens of this genus in the British Museum, among which were various types of much service in determining some doubtful points, I am greatly obliged. And, lastly, to the Directors of the Museum Godeffroy, who sent me the types of *Ptilopus pona-*

pensis described lately in this Journal by Dr. Finsch, I am much indebted.

I commence with a brief review of the literature of the genus:—

1766. LINNÆUS, 'Systema Naturæ.'

But one species was known to this author belonging to the present genus, and was named by him *Columba viridis*. Species 1.

1788. GMELIN, 'Systema Naturæ.'

In this work three species are given, two of which are described the first time—*C. viridis*, *C. jambu*, and *C. melanocephalus*. Another one is mentioned, the *C. purpurata*, based on Latham's "Purple-crowned Pigeon." This, however, describes no species known, but is taken from portions of two different ones, and therefore cannot be recognized. Species 3.

1813. TEMMINCK, 'Histoire Naturelle des Pigeons et des Gallinacées.'

Two species are here described belonging to the genus *Ptilopus*, viz. *Pt. cinctus* and *Pt. superbus*, placed in the genus *Columba*. Species 5.

1820-39. TEMMINCK, 'Planches Coloriées.'

Eight species are described in this work belonging to this genus, all under the term *Columba*, seven of which are given for the first time, viz. *Pt. magnificus*, *Pt. monachus*, *Pt. pulchellus*, *Pt. hyogaster*, *Pt. porphyreus*, *Pt. perlatus*, and *Pt. nanus*. The *Pt. xanthogaster* of Wagl. is renamed *diademata*. Species 12.

1825. SWAINSON, 'Zoological Journal.'

Pt. regina, from Australia, described as *Columba purpurata*, var. *regina*. Species 13.

1826. LESSON, 'Voyage de la Coquille.'

In the volume devoted to the zoology of this expedition one species is described belonging to this genus, viz. *Pt. taitensis* as *Columba kurukuru*, var. *taitensis*, from Otaheite. Species 14.

1827. LESSON, 'Bulletin des Sciences Naturelles.'

The *Colombe amarante* of the 'Voyage of the Coquille' is here named *Columba puella*. Species 15.

1827. WAGLER, 'Systema Avium.'

Pt. xanthogaster first described as *Columba xanthogaster*. Species 16.

1829. WAGLER, in the 'Isis.'

In his list of the Columbæ several species of this genus are given. Two are described for the first time, viz. *Pt. pectoralis* and *Pt. purpuratus*, ex Tonga Tabou. *Pt. taitensis*, Less., is renamed *Columba oopa*. Species 18.

1830. QUOY & GAIMARD, in the 'Voyage of the Astrolabe.'

Pt. gularis is here described and figured as *Columba gularis*.
Species 19.

1831. LESSON, 'Traité d'Ornithologie.'

Under the term *Ptilonopus* eight species are given, one of them for the first time, *Pt. roseicapillus*. Four of the remainder are valid species, viz. *melanocephalus*, *jambu*, *porphyreus*, and *taitensis*. *Pt. cyanovirens* is the female of *superbus*, *Pt. virens* is the female of *pectoralis*, and *Pt. purpuratus* is *Pt. ewingii*. Species 20.

1838? KNIP AND PRÉVOST, 'Histoire Naturelle Générale des Pigeons.'

Ptilopus rivoli described as *Columba rivoli*. Species 21.

1840. NEBOUX, in the 'Revue Zoologique.'

Pt. dupetit-thouarsi first described as *Columba dupetit-thouarsii*.
Species 22.

1841. HOMBRON AND JACQUINOT, 'Annales des Sciences Naturelles.'

Pt. luteovirens described in the genus *Columba*. Species 23.

1842. GOULD, in the 'Proceedings of the Zoological Society of London.'

Pt. ewingii described. Species 24.

1844. GRAY AND MITCHELL, 'Genera of Birds.'

Twenty-five species are here recorded, of which three do not belong to this genus, viz. *Pt. holosericeus*, Temm., *maculatus*, Gmel., and *pulcherrimus*, Scop. *Pt. purpuratus*, Lath., is a made-up species, *Pt. virens* = *pectoralis*, Wagl.; *Pt. cyanovirens* = *superbus* ♀, Temm.; *Pt. purpureo-leucocephalus* = *dupetit-thouarsi*, Neboux; *Pt. swainsoni* = *regina*, Swains.; *Pt. roseicollis* = *porphyreus*, Temm.; *Pt. viridissimus*, Temm. = *fasciatus*, Peale. The remaining species are valid, among which *Pt. occipitalis* is given for the first time and a plate published. Species 25.

1848. PEALE, 'United-States Exploring Expedition, Ornithology.'

A list of the species belonging to this group, collected by this Expedition, is given, four in all, among which three are described for the first time, viz. *Pt. coralensis*, *Pt. perousii*, and *Pt. fasciatus*; the fourth, *Pt. furcatus*, is the *Pt. taitensis* of Lesson. Species 28.

1850. GOULD, in 'Jardine's Contributions to Ornithology.'

Pt. strophium described for the first time. Species 29.

1850. GOULD, 'Proceedings of the Zoological Society of London.'

A race of *Pt. magnificus* is named *Pt. assimilis*. Species 30.

1853. GRAY, 'Proceedings of the Zoological Society of London.'

Pt. chrysogaster described. Species 31.

1853. JACQUINOT AND PUCHERAN, 'Voyage au Pôle Sud' (text). Young of *Pt. luteovirens* described as *Pt. feliciæ*.

1854. BONAPARTE, in the 'Comptes Rendus.'

In a paper contributed to this Journal, Bonaparte divided the then known species of *Ptilopus* into various genera as follows:—*Leucotreron*, *Cyanotreron*, *Rhamphiculus*, *Omeotreron*, *Kurutreron*, *Thouarsitreron*, *Lamprotreron*, *Iotreron*, and *Chryscæna*. These are founded mainly upon the coloration of plumage (a dangerous character (?) always), and in this case not particularly well selected. In the case of *Rhamphiculus* and *Omeotreron*, the former is created for the young (!), and the latter for the adult (!), of *Ptilopus occipitalis*; and in *Cyanotreron* is placed the female (?) of *Ptilopus superbus*, while the male (!) of the same species is made the type of the genus *Lamprotreron*. In *Omeotreron*, also, is placed the young of *Pt. luteovirens*, while the adult is the type of the genus *Chryscæna*! It does not appear to me necessary, or even advisable, to adopt any of this author's genera for this group.

1854. BONAPARTE, in the 'Comptes Rendus.'

The young of *Pt. occipitalis* is called *Pt. batilda*, and *Pt. apicalis* is first described. Species 32.

1855. DESMURS AND PRÉVOST, 'Voyage de la Vénus.'

Pt. mercieri and *Pt. temminckii* first described. Species 34.

1855. BONAPARTE, in the 'Comptes Rendus.'

Pt. leclancheri described as *Trerolæma leclancheri*. Species 35.

1856. GRAY, 'List Birds British Museum.'

Among the members of this genus here recorded *Pt. greyi* is named but not described. Species 36.

1856. GOULD, 'Proceedings of the Zoological Society of London.'

Pt. eugeniæ from the Solomon Islands described. Species 37.

1857. BONAPARTE, 'Conspectus Generum Avium.'

In this publication this author made a subfamily of this group, and divided it into the genera proposed by him in the 'Comptes Rendus' three years previously. *Pt. xanthogaster*, Wagl., is called *diademata*, after Temminck; *Drepanoptila holosericea* is placed in the genus *Lamprotreron* with *superba* and *porphyreus*! In *Ptilopus* are *purpuratus*, Wagl., as *porphyraceus*, Forst., ex Tonga-Tabou; *regina*, Swains., as *swainsoni*, Gould; *Pt. ewingii*, Gould, from Timor, is separated as *flavicollis*, after Gray; *Pt. coralensis*, Peale, redescribed as *viridissimus*; the species ex Vanikoro (!) (errore) called *purpuratus*, Wagl. [this bird comes from Balaou, not Vanikoro, and was afterwards named *bonapartei* by Gray]; *Pt. roseicapillus*, *mercieri*, *fasciatus*, Peale (as *clementinæ*, Hombr. & Jacq.); *perousii*, Peale (as *maricæ*, Hombr. & Jacq.); *pulchellus* and *apicalis*. *Cyanotreron* has *cyanovirens* (= *superbus*, Temm., ♀) and *monachus*, Temm. *Iotreron* contains *viridis*, Linn., *melanocephalus*, Gmel., *rivoli*, Prév. & Knip, *iogaster*, Temm., and *nana*,

Temm. *Kurutreron* possesses *oopa*, Wagl. (= *taitensis*, Less.), *chrysogaster*, Gray, and *coralensis*, Peale. *Omeotreron* has *batilda* (= *occipitalis*, juv.), *virens* (= *pectoralis*, Wagl.), and *feliciæ*, Hombr. and Jacq. (= *luteovirens*, Hombr. & Jacq., juv.). In *Chryscæna* is placed *luteovirens*. *Phapitreron* is also included in this subfamily, containing the *Columba leucotis*, Temm., and *Ph. amethystina*, Bon.; but these birds have but little in common with those of the genus *Ptilopus*.

1858. GRAY, 'Proceedings of the Zoological Society of London.'

Five species are here described for the first time, viz. *Pt. prasinorrhous*, *Pt. iozonus*, *Pt. aurantiifrons*, *Pt. coronulatus*, and *Pt. wallacei*. Species 42.

1859. GRAY, 'List of Birds of the Tropical Islands of the Pacific Ocean.'

Nineteen species of the genus *Ptilopus* are recorded in this catalogue of the species of the Pacific islands contained in the British Museum. One species is described as distinct—*Pt. chalcurus*. Species 43.

1860. GRAY, 'Proceedings of the Zoological Society of London.'
Pt. temminckii, Des Murs & Prév., described as *Pt. formosus*.

1861. Schlegel, 'Nederlandsch Tijdschrift voor de Dierkunde.'
Pt. insolitus described. Species 44.

1862. WALLACE, 'Proceedings of the Zoological Society of London.'
Pt. humeralis first described. Species 45.

1863. WALLACE, 'Proceedings of the Zoological Society of London.'
Pt. albocinctus first named. Species 46.

1863. SCHLEGEL, 'Nederlandsch Tijdschrift voor de Dierkunde.'
Pt. bernsteini first described. Species 47.

1868. HARTLAUB AND FINSCH, 'Proceedings of the Zoological Society of London.'

Pt. pelewensis described. Species 48.

1867. FINSCH AND HARTLAUB, 'Fauna Centralpolynesiens.'

This standard work on the Central Polynesian avifauna contains all the species of this genus that were known at the time of its publication. *Pt. purpuratus*, Wagl., ex Tonga Tabou, is called *Pt. porphyraceus*, Forst.; *Pt. purpuratus*, Temm., is referred to *C. forsteri*, Desm.; and the genus *Chryscæna* is employed for *Pt. luteovirens*. *Drepanoptila holosericea* is also retained in the genus *Ptilopus*. No new species are described. Many of the species given had not been seen by the authors.

1870. GRAY, 'Hand-list of Birds.'

A list of the known species is here given, without any especial attempt to arrange their synonymy being made. The birds figured by Bonaparte on pl. xix. of his 'Iconographie des Pigeons' are named *Pt. bonapartii*. Species 49.

1871. HARTLAUB AND FINSCH, in the 'Proceedings of the Zoological Society of London.'

Pt. rarotongensis described. Species 50.

1871. SCHLEGEL, 'Nederlandsch Tijdschrift voor de Dierkunde.'

Three species are here described, viz. *Pt. speciosus*, *Pt. ornatus*, and *Pt. geelvinckianus*, the last as *Pt. viridis geelvinckianus*. Species 53.

1871. GOULD, in the 'Proceedings of the Zoological Society of London.'

Pt. victor described. Species 54.

1873. SCHLEGEL, 'Muséum des Pays-Bas.'

A catalogue is here given of the species contained in the Leyden Museum belonging to the genus *Ptilopus*. Some are included which should be separated into different genera, such as *Drepanoptila holosericea* and the members of *Funingus*. Three species are described as new—*Pt. neglectus*, *Pt. lettiensis* (called *Pt. cinctus lettiensis*), and *Pt. jobiensis* (called *Pt. humeralis jobiensis*). Species 57.

1873. SCLATER, in the 'Proceedings of the Zoological Society of London.'

Pt. bellus described. Species 58.

1874. FINSCH, in the 'Proceedings of the Zoological Society of London.'

Pt. huttoni described. Species 59.

1875. SALVADORI, 'Annali del Museo Civico Naturale di Genova.'

In different lists of birds inhabiting New Guinea, six species of *Ptilopus* are described, viz. *Pt. gestroi*, *Pt. melanospilus*, *Pt. chrysothorax*, *Pt. xanthorhous*, *Pt. geminus*, and *Pt. trigeminus*. Species 65.

1875. LAYARD, in the 'Proceedings of the Zoological Society of London.'

Pt. viridis, as *Chryscenas viridis*, described. This is the *Pt. layardi* of the present paper. The name *viridis*, having been given by Linnæus to another species of *Ptilopus*, cannot stand. Species 66.

1876. SALVADORI, 'Annali del Museo Civico Naturale di Genova.'

Pt. zonurus described. Species 67.

1876. RAMSAY, in the 'Proceedings of the Linnean Society of New South Wales.'

Pt. corriei described. Species 68.

1876. BRÜGGEMANN, 'Abhandlungen des naturwissenschaftlichen Vereins zu Bremen.'

Pt. fischeri described. Species 69.

1877. SCLATER, in the 'Proceedings of the Zoological Society of London.'

Pt. johannis described. Species 70.

1877. FINSCH, in the 'Proceedings of the Zoological Society of London.'

Pt. fasciatus, Peale, described as *Pt. ponapensis*.

1878. D. G. ELLIOT, 'Annals and Magazine of Natural History.'

Pt. pictiventris described. Species 71.

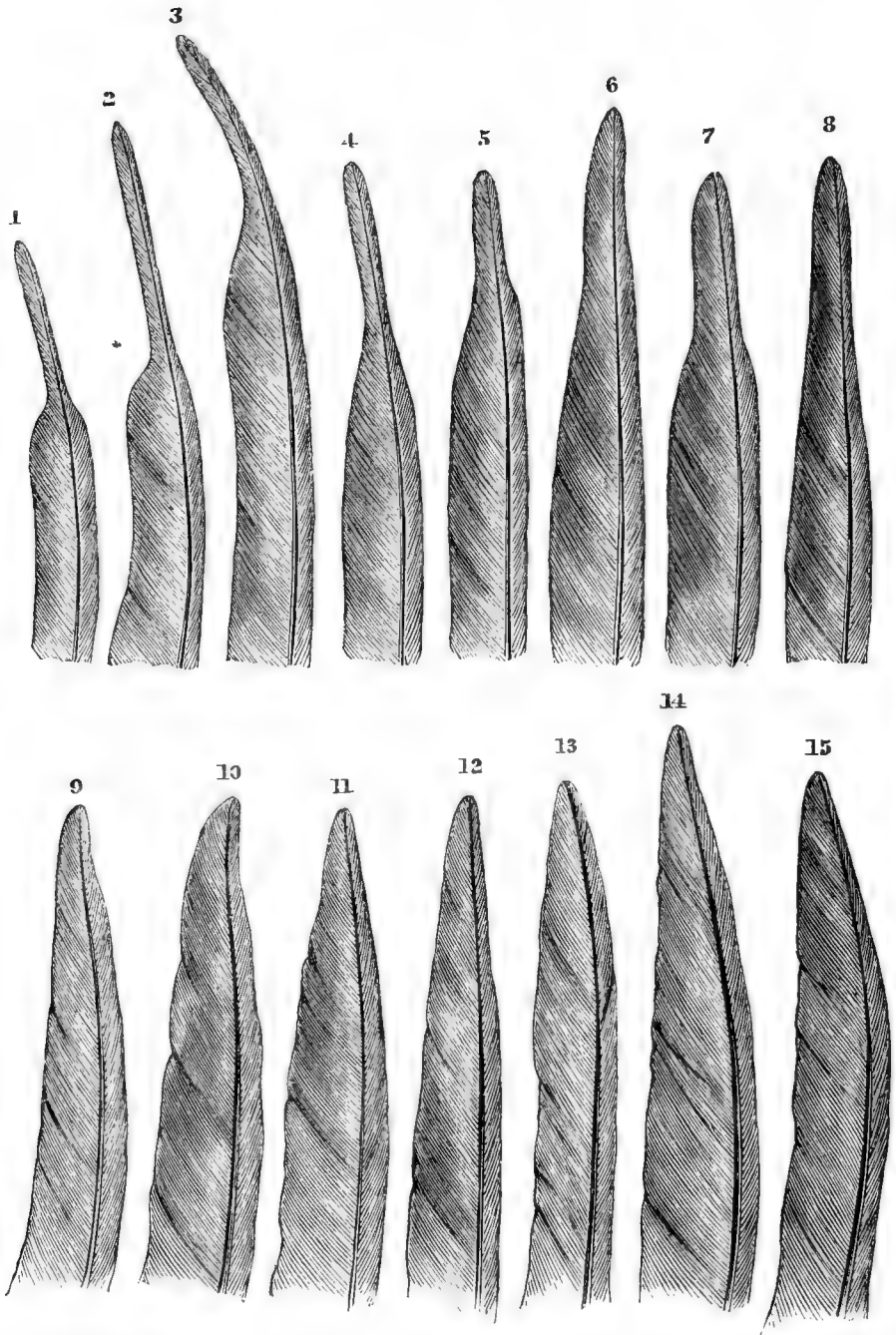
As the term "*purpuratus*" has been applied to so many different species by authors, it occurs to me that it may be useful if I give a list of these, referring each one to the species for which it was intended. For the reasons given in the article on *Pt. purpuratus* of this paper, I accept for this term the species so designated in 1829 by Wagler, considering that the *purpuratus* of Gmelin should be rejected from the nomenclature of the group as not representing any known species, but one formed from the characters possessed by two distinct ones.

- (1813) *Columba purpurata* (prem. var.), Temm. Pig. & Gall.
tom. i. p. 282..... = *Pt. regina*, Swains.
- (1813) " " Temm. Pig. & Gall. tom. i. p. 280 = *Pt. ewingii*, Gould.
- (1821-34) " " Jard. & Selby, Illustr. Zool.
vol. ii. pl. 70 = *Pt. regina*, Swains.
- (1824) " " Temm. Plan. Col. livr. 43 = *Pt. xanthogaster*, Wagl.
- (1826) *Ptilonopus purpuratus*, Steph. Cont. Shaw Gen.
Zool. vol. xiv. p. 277..... = *Pt. xanthogaster*, Wagl.
- (1829) *Columba purpurata*, Wagl. Isis, p. 742 = *Pt. purpuratus*, ex Tonga.
- (1835) *Ptilinopus purpuratus*, Selby, Nat. Libr. vol. v.
p. 103, pl. 3 = *Pt. ewingii*, Gould.
- (1844) *Ptilonopus purpuratus*, Gray, List Birds Brit. Mus.
p. 2, Gall. = *Pt. ewingii*, Gould.
- (1855) *Kurukuru purpuratus*, Des Murs & Prév. Voy. Vé-
nus, Zool. p. 222 = *Pt. taitensis*, Less.
- (1857) *Ptilopus purpuratus*, Bon. Consp. Gen. Av. vol. ii.
p. 19 = *Pt. greyi*, Gray.
- (1857) " " Bon. Iconogr. Fig. pl. xix. adult. = *Pt. bonapartei*, Gray.
- (1857) " " " " " " juv. . = *Pt. purpuratus*, Wagl.
- (1858) *Ptilonopus purpuratus*, Cass. U.S. Expl. Exped.
Ornith. pl. 30. p. 269 ... = *Pt. taitensis*, Less.
- (1859) " " Gray, List Birds of the
Trop. Isl. = *Pt. taitensis*, Less.
- (1867) *Ptilinopus purpuratus*, Finsch & Hartl. Faun. Cen-
tralpolyn. p. 122 = *Pt. taitensis*, Less.
- (1873) *Ptilopus purpuratus*, Schleg. Mus. Pays-B. p. 15 ... = *Pt. taitensis*, Less.

GENERA.

Quite a number of genera have been proposed for these birds ; but only one is necessary. The term *Ptilopus* was given to them by Swainson in 1825, its derivation being $\pi\tau\acute{\iota}\lambda\omicron\nu$, $\rho\omicron\upsilon\varsigma$. Swainson wrote it *Ptilonopus*, which was afterwards corrected by Strickland in 1841. Various ways of spelling the name of this genus have been adopted, viz. *Ptilonopus*, *Ptilinopus*, *Ptinilopus*!, all of which are incorrect, and should not be used. *Ptilopus* is an artificial genus, by which I mean to express that the birds placed together in it do not possess any characters common to them all, either of form, structure, or coloration, which will serve to distinguish them from other groups

Fig. 1.



1. *Pt. purpuratus.*
2. *Pt. chrysogaster.*
3. *Pt. mercieri.*
4. *Pt. dupetithouarsii.*
5. *Pt. jobiensis.*

6. *Pt. xanthorrhous.*
7. *Pt. insolitus.*
8. *Pt. taitensis.*
9. *Pt. aurantiifrons.*
10. *Pt. luteovirens.*

11. *Pt. lettiensis.*
12. *Pt. ornatus.*
13. *Pt. pectoralis.*
14. *Pt. bellus.*
15. *Pt. victor.*

in the family. Some authors have separated them from the rest of the Pigeons on account of the abruptly attenuated first primary. This is utterly worthless, either as a generic or a specific character, as among the species which are included in *Ptilopus* every gradation of the first primary is procurable, from the most abrupt attenuation to the normal shape of feather.

I here give (fig. 1), in proof of this assertion, a series of drawings of first primaries, together with the name of the species to which each belongs, so that any one can verify it for himself; and I may state that it would not have been at all difficult to have arranged a more minute gradation from the species at my disposal if it had been necessary; but those given will be found, I think, amply sufficient for the purpose.

Another so-called character, which has been adopted by some to distinguish the members of the genus *Ptilopus*, and one which is expressed by the term itself, is the *tarsus feathered to the foot*. This proves to be of no more value, generically or specifically, than the attenuated primary. Species with or without the last-named character have the tarsus covered or partly bare, as do also those with the graduated or normal shape of this feather. The drawings (pp. 510, 511) of the partly bare and partly covered tarsus, together with the first primary of several species, will show clearly how very unsatisfactory these characters are.

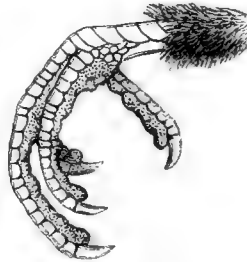
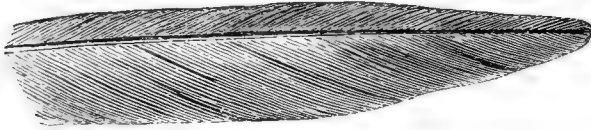
Relative lengths of wing and tail, as given by some writers for the separation of some of these birds into different genera, also are not constant, as the tail can be found shorter than the wing, or nearly equal to it in length. This last is the main character given by Reichenbach for separating the birds placed by him in his genus *Megaloprepia*, as all the others are common to different species of *Ptilopus*. He says:—"Schwanz fast so lang wie die Flügel. Vorderschwinge nicht verschmälert." The species included by him, it is true, have not this last character; but *Pt. perlatus* has the tail only a little over half the length of the wing, while *Pt. cinctus* and *Pt. gularis*, neither of which are included in *Megaloprepia*, have the *tail nearly as long as the wing*, with the first primary *abruptly attenuated*. I do not see that there is a single character remaining among those given by Reichenbach which can distinguish the birds included in his genus from those of the genus *Ptilopus*.

For those who deem colour sufficient to establish a genus, it might be supposed that among these gaily plumaged birds certain patterns might be found which would answer for a generic character. But this, again, fails; for the variety of the coloration is so great that it would be necessary to divide the group into numerous genera (as has, indeed, been attempted), and many of the species would be left alone to represent a genus. I do not find any thing better to designate the genus than the following formula:—*Ptilopus*. Size moderate; wings usually reaching two thirds the length of the tail; rectrices fourteen in number, excepting *Pt. occipitalis*, which has apparently sixteen; tarsi partly or wholly covered with feathers; colours of plumage usually bright, and often strongly

opposed: distinguished from *Treron* (with which it constitutes the subfamily *Treroninae*) by not possessing the scallop on the inner web of the third primary.

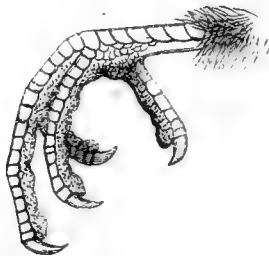
Ptilopus is well placed between *Treron* and *Carpophaga*, leading

Fig. 2.

*Ptilopus iogaster*. Celebes.

First primary only narrowing slightly; tarsus partly bare.

Fig. 3.

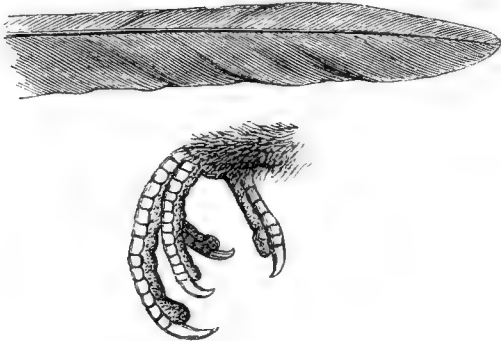
*Ptilopus fasciatus*. Upolu, Samoa.

First primary abruptly attenuated; tarsus partly bare.

up to the latter genus through the different races of *Ptilopus magnificus*. It is the absence of the scallop on the third primary which is the chief distinction between *Ptilopus* and *Treron*. To any one who will study this group with ample materials, such as has fortunately been at my disposal, I think the difficulty, nay, impossibility, of discovering any trenchant generic characters will be readily acknowledged. Those who have had but a few species before them, represented by two or three individuals of each, might easily imagine that some one character of those which I have mentioned is really

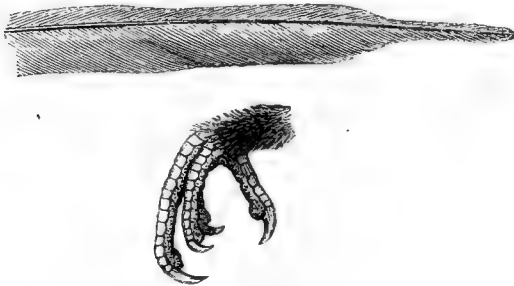
of generic value ; and it is only when a great series has been obtained that it is perceived how these gradually disappear or become evolved into something quite different. It is from the lack of material to show this fact that such a genus (among others) as *Chrysaena* has been accepted for *Pt. victor* and *Pt. luteovirens*. First established for the latter species, chiefly on account of the lanceolate form of the feathers, it was quickly perceived, on the discovery of *Pt. victor*, that the genus could not rest on this character ; for the two species

Fig 4.

*Ptilopus geelvinckianus*. Mafor.

First primary normal in shape ; tarsus completely feathered.

Fig. 5.

*Ptilopus coronulatus*. Aru.

First primary abruptly attenuated ; tarsus completely feathered.

were generically essentially the same, and yet *Pt. victor* did not possess lanceolate feathers. The partly covered tarsus is not sufficient to separate them from *Ptilopus* ; for, as I have shown, many species of that genus have also the tarsus half nude. The normal shape of the first primary also fails, as this is also possessed by other species of *Ptilopus* ; and therefore no characters remain worthy of separating these birds generically from the other members of the group, those that exist being only of specific value. Bonaparte has proposed most of the generic divisions ; and he founded them mainly upon the colour of plumage, sometimes placing the two sexes, or adult and young, of the same species in different genera (vide *Pt. superbus*, *Pt. luteovirens*, &c.). I have not been able to discover

any reasons (after a careful examination of the species separated generically by him) for accepting his divisions. The species named by Schlegel *Pt. insolitus* has been made the type of a genus, *Edirhinus*, by Cabanis and Reichenow. The same peculiarity exhibited by this bird—a bony protuberance upon the base of the culmen—is also found in certain members of the genus *Carpophaga*; and I see no more reason for separating *Pt. insolitus* from the other members of this genus than exists for placing these *Carpophagæ* in a new generic division. The term *Megaloprepia*, instituted by Reichenbach for certain birds of this group, was so oddly selected, at least in one instance (*Pt. perlatus*) that a doubt arises in my mind if the author had ever had an opportunity of examining specimens. No characters were given by him which were not also to be found in other species of *Ptilopus*; and although the term has been employed by some authors, it seems to me to be entirely unnecessary; for it is impossible to designate in a large series of *Ptilopi* where the genus (?) should commence, as the species graduate into one another from the smallest to the largest.

Prof. Garrod, in the 'Proceedings' of this Society for 1874, in his paper on the "Anatomy of the Columbæ," states that the members of the genus *Ptilopus* possess a form of gizzard such as is not found in any other bird, and gives figures exhibiting its peculiarities as compared with *Treron*. If this is ascertained to be a constant formation in all the species of *Ptilopus*, it may well be deemed of sufficient importance to constitute a generic character; but, unfortunately, as yet, it cannot be said to be proven; for out of the seventy-one species considered in this memoir as belonging to *Ptilopus*, Prof. Garrod has only been able to dissect three, a number too insignificant for it to be decided that all the members of the genus have the same formation. The *Carpophagæ* do not possess a similar gizzard; yet certain species of *Ptilopus*, viz. *Pt. magnificus* with its races *assimilis* and *puella*, and *Pt. gularis*, in their outward form resemble certain species of *Carpophaga*; and it is possible that in some of these at least a modified form of gizzard may be found to exist. It will be interesting to learn if such be the case, or if really the species of *Ptilopus* are separated from all other Pigeons by an abrupt alteration in the gizzard's shape, one not approached by that of any other bird. A large number of species must be first examined before this can be definitively ascertained.

The following are the principal generic terms which have been proposed for these birds.

	Type.
(1825) <i>Ptilonopus</i> , err. Swains. Zool. Journ. vol. i. p. 473	<i>Pt. reginæ</i> .
(1841) <i>Ptilopus</i> , corr. Strickl. Ann. Nat. Hist. vii. p. 36.	
(1854) <i>Leucotreron</i> , Bon. Compt. Rend. vol. xxxix. p. 876	<i>Pt. cinctus</i> .
(1854) <i>Cyanotreron</i> , Bon. tom. cit. p. 878	<i>Pt. monachus</i> .
(1854) <i>Rhamphiculus</i> , Bon. ibid.	<i>Pt. occipitalis</i> .
(1854) <i>Omeotreron</i> , Bon. ibid.	<i>Pt. occipitalis</i> .
(1854) <i>Kaurutreron</i> , Bon. ibid.	<i>Pt. purpuratus</i> .
(1854) <i>Chrysaena</i> , Bon. ibid.	<i>Pt. luteovirens</i> .
(1854) <i>Thouarsitreron</i> , Bon. tom. cit. p. 876	<i>Pt. dupetit-thouarsii</i> .
(1854) <i>Lamprotreron</i> , Bon. ibid.	<i>Pt. superba</i> .

	Type.
(1854) <i>Iotreron</i> , Bon. tom. cit. p. 878	<i>Pt. togaster</i> .
(1857) <i>Sylphitreron</i> , Verr. teste Bon. Consp. ii. p. 40 ...	<i>Pt. perlatus</i> .
(1862) <i>Megoloprepia</i> , Reich. Tauben	<i>Pt. magnificus</i> .
(1876) <i>Ædirhinus</i> , Cab. & Reich. J. f. Orn. p. 326	<i>Pt. insolitus</i> .

The *Drepanoptila holosericea*, from New Caledonia, has usually been placed in the genus *Ptilopus*; but it does not appear to me that this is its proper position. With a colouring, it is true, approaching something the style of these birds, it differs from them in form, and especially in the shape of the wing-feathers. These (see fig. 6) are very peculiar, and, in my opinion, at once remove this species from

Fig. 6.



Wing of *Drepanoptila holosericea*.

among the present group of birds into a separate genus. The drawing will show, better than any description can explain, the unusual formation of the feathers in question¹.

The members of the genus *Funingus*, beyond the feathered tarsus,

¹ In the Rev. et Mag. de Zool. 1862, p. 135, pl. 8, MM. J. Verreaux and O. Des Murs conferred another generic name upon this bird, viz., *Calyptomenenas*, and gave a drawing of both it and a portion of the wing. Neither of these, however, are correctly done, especially that of the wing, which shows only the ends of the primaries. The illustration here given more faithfully exhibits the peculiar shape of these feathers.

have but little in common with the members of *Ptilopus*, the peculiarly notched first primary and bare face easily distinguishing them.

GEOGRAPHICAL DISTRIBUTION.

Probably no group in ornithology exhibits to a greater degree the effects upon the coloration of plumage arising from the physical causes incidental to an insular life than the one here considered as composing the genus *Ptilopus*. Some of these birds that have evidently had a common origin exhibit greater or less variations from each other, according to the position of their various habitats, sometimes of sufficient importance to constitute their possessors distinct species, at others only of that trivial kind that would at best but cause them to rank merely as varieties, the lapse of time during which the individuals have dwelt in their separate localities not having been sufficiently great, or the physical causes of climate, food, and soil not powerful enough to modify essentially their appearance from the typical form. It is therefore not surprising that we find some species inhabiting one island only, others dwelling upon several, though perhaps separated by miles of sea, while again in other localities uncertain forms are observed not changed sufficiently to authorize the bestowal upon them of a separate distinctive rank, but yet differing enough to show that a departure from the type and towards a distinctive independent form has been commenced, and will continue (unless the race should become exterminated) until the variety eventually blooms into a separate species possessing characters not found elsewhere. It is not to be supposed that the continents of which the islands of the Pacific and those of the Eastern Archipelago are the sole remains, were broken up simultaneously or always suddenly throughout their length and breadth; but more probably the casualty happened at various periods and sometimes gradually. Therefore we may not be surprised at the apparently strange phenomenon that one species should inhabit various islands, between which are others containing totally distinct forms of the same genus. This may have been brought about in two probable ways. A species may have been widely dispersed over the continent; and when portions of this had disappeared beneath the waves, the fragments that remained above water at the outset were all occupied by the same species: but physical effects at intermediate points were of a different character from those at the extremes; and in course of time the birds dwelling on the intervening islands departed entirely from their types, while those most widely separated retained their original characters. Or it may, on the other hand, have been that on the breaking-up of the continent a district inhabited by a strictly local species (but one surrounded by a more widely disseminated and distinct species) had not been entirely submerged; and this, all other circumstances being equal, would explain the fact that a distinct form should intrude itself on an island lying between others inhabited by a different one, the species with the greater range having been preserved at the extremes

of its habitat, which also had become islands. In considering the peculiarities of the geographical distribution of these birds, the great physical changes that have taken place in that portion of the globe over which they are dispersed must always be borne in mind.

The members of the genus *Ptilopus* are found in only two of the zoogeographical regions of the earth, viz. the Oriental and Australian. Of these the latter contains by far the great majority of the species; and, to judge from the material at present available, the Papuan group of the Austro-Malayan Subregion is apparently the head quarters of the genus. The Polynesian Subregion also possesses many species; but they are altogether of a different style of plumage, and constitute almost a division by themselves.

I commence the review of this portion of my subject with the most easterly group of the Pacific islands (in the Polynesian Subregion of the Australian Region) in which any members of this genus are found, viz. the Marquesas. But two species are met with among these islands—the *Pt. dupetit-thouarsii*, on Christine Island, and the *Pt. mercieri*, from Nuka-hiva. Both of these are very distinct from all others known. I have described *Pt. pictiventris* as from Nuka-hiva of the Marquesas; but, for the reasons I give under the head of this species, I believe that locality to be an error, and that the bird in question is a native of the Samoan Islands only. To the south-west of the Marquesas lies the Pomatu archipelago, which is as yet hardly known in an ornithological sense. But one species of *Ptilopus* has been recorded from there, *Pt. coralensis*, found on Carlshoff Island. South of the Pomatu group lies the island of Rapa. Here has been procured probably the most important member of this genus, *Pt. huttoni*. To the west of Pomatu are the Society Islands, upon only two of which have any species of *Ptilopus* been procured, viz. *P. chrysogaster*, upon Huahaine, and *Pt. taitensis* in Otaheite. To the south-west of this last is Cook's Archipelago, where *Pt. chalcurus* has been obtained on Harvey Island. It is still doubtful if this bird is specifically distinct from *Pt. coralensis* of the Pomatu group. If the identity of those two could be established, it would be an interesting and important fact, since the two clusters of islands are not only separated by miles of ocean, but several distinct forms of *Ptilopus* are found upon the intervening archipelagos, none of which, so far as we know, are particularly related to *Pt. chalcurus*. Upon Rarotonga island has been procured *Pt. rarotongensis*; and these two species are all that have as yet been found in this group. Savage Island, lying between Cook's Archipelago and the Friendly group, contains three species—*Pt. purpuratus*, *Pt. pictiventris* and *Pt. rarotongensis*. Passing on to the westward we reach the Tonga Islands, among which five species of *Ptilopus* dwell, a number exceeded in only one of the Pacific groups, viz. the Fijis. On Tonga-Tabou all the species occur—*Pt. chrysogaster*, *Pt. apicalis*, *Pt. pictiventris*, *Pt. purpuratus*, and *Pt. perousii*. Harpai contains *Pt. perousii* and *Pt. purpuratus*; and this last has also been procured at Eua and Ninafou, the last the most northern of them all. North of the

Friendly Islands lie the Samoan or Navigators' Islands. These contain also five species, two of which are not met with in the Tonga Group. Opalu has four—*Pt. perousii*, *Pt. luteovirens*, *Pt. pictiventris*, and *Pt. fasciatus*, this last being also found on Wallis Island, while *Pt. purpuratus* is a native of Fulima, lying to the south of Wallis. We now come to the Fijis, which possess among the different islands nine species of *Ptilopus*. Only one island, however, contains more than two species, viz. Viti-Levu, which has three—*Pt. perousii*, *Pt. luteovirens*, and *Pt. pictiventris*. Schlegel suggests Viti as the probable locality also of the bird he has called *Pt. neglectus*; but this is very uncertain, and there is no evidence to support the supposition. Balaou has two species—*Pt. luteovirens* and *Pt. bonapartei*. Two species are found upon five islands which possess no others of this genus. These are *Pt. perousii* and *Pt. purpuratus*, met with at Waikia, Vanua Levu, Mango, Mokani, and Loma Loma. Bua, Lanthala and Ngamia only have *Pt. victor*. Taviuni has *Pt. victor* and *Pt. purpuratus*; while Kandavu contains *Pt. perousii* and *Pt. layardi*. The New Hebrides possess but two species—*Pt. greyi* on Erromango Island, and *Pt. corriei* on Malacolo. On Lifu, of the Loyalty group, *Pt. greyi* is found, as well as on the Isle of Pines and New Caledonia to the west, this last being also recorded by Schlegel as the habitat of *Pt. insolitus*—which, however, is probably an error. Passing now to the northward, *Pt. greyi* is again met with on Vanikoro of the Santa-Cruz archipelago; and in the Caroline archipelago, on the island of Ponapé in the Seniavin group, *Pt. fasciatus* has been procured. To the north-west, the furthest north perhaps that any species of this genus is found, lie the Marianne or Ladrone Islands. Here is met with the very distinct *Pt. roseicapillus*, the only representative of these birds in this group. To the west are the Pelew Islands, whence comes *Pt. pelewensis*; but from which particular island is not stated by its describers.

We now reach the Austro-Malayan Subregion; and the islands which come first in this review (proceeding from the east towards the west) are those contained in the Papuan group, of which New Guinea is the centre and most important. Beginning with the most eastern division of this group, we have first the Solomon Islands, upon one of which, not as yet known, the *Pt. eugenia* was obtained. To the westward of this, in the Louisiade archipelago, on the Island of Duchateau, the type of *Pt. strophium* was procured. From New Ireland, to the north-west, come *Pt. insolitus* and *Pt. puella*; while between this last-named island and New Britain lies Duke-of-York Island, the home of the rare and little-known *Pt. rivolii* and also of the *Pt. insolitus* mentioned above. From New Hanover *Pt. superbus* has been received. To the north-west of this section, on Wild and D'Entrecasteaux Islands of the Admiralty group, the beautiful *Pt. johannis* was obtained by the naturalists of the 'Challenger' Expedition. Coming now to New Guinea, the islands in the great Bay of Geelvinck claim our attention. Krudu, the most eastern of these, possesses one species, *Pt. geminus*. Next, on the large

island of Jobie, eight species of this genus dwell, viz. *Pt. superbus*, *Pt. coronulatus*, *Pt. geminus*, *Pt. aurantiifrons*, *Pt. perlatus*, *Pt. strophium*, *Pt. puella*, and *Pt. jobiensis*. The small island of Ansum, to the south of Jobie, contains also one species, *Pt. geminus*, being the only one out of those found upon its great neighbour. Meosnoum or Misnomin, to the west of Jobie, also contains one species found on that island, *Pt. strophium*. On the island of Korido, or Sook, the most northern of those in this bay, two species have been procured, *Pt. pectoralis* and *Pt. speciosus*. Mansinam, the last island in this bay from which any species of *Ptilopus* is known to come, contains one species, the *Pt. humeralis*. It will thus be seen that, so far as we are able to determine from our material, in the Bay of Geelvinck, Jobie is the central or starting-point of the members of this genus. The two small islands lying near are only detached portions of Jobie, each containing one species found on the last, but none peculiar to themselves. On the other hand the islands of Korido and Mafor only have one species in common with Jobie, viz. *Pt. superbus*, found on Korido, while on Mafor *Pt. pectoralis* and *Pt. geelvinkianus* are met with, the last-named being also a native of Meosnoum. The relationship of these islands, so far as regards this genus, are nearer to the western shores of the bay than to Jobie. Turning now to the mainland, at Andai and Dorey five species are found—*Pt. pulchellus*, *Pt. pectoralis*, *Pt. puella*, *Pt. geminus*, and *Pt. perlatus*; while on Mount Arfak *Pt. superbus*, *Pt. bellus*, *Pt. iozonus*, *Pt. aurantiifrons*, and *Pt. ornatus* have been obtained. At Amberbaki, on the north coast, five species have been procured, viz. *Pt. pulchellus*, *Pt. superbus*, *Pt. perlatus*, *Pt. pectoralis*, and *Pt. bellus*; while at Sorong *Pt. trigeminus*, *Pt. humeralis*, *Pt. coronulatus*, and *Pt. prasinorrhous* have been met with. At Triton Bay *Pt. nanus* has been obtained; and at Mount Epa, in the south of New Guinea, the small race of *Pt. magnificus*, called *puella*, is found. These are all that are as yet known to come from the mainland of New Guinea; but doubtless others of the described species, as well as those not yet discovered, remain to be obtained among the dense forests of this singular country. Passing now to the western islands of the Papuan group, the most northerly is Waigiou, which contains five species—*Pt. superbus*, *Pt. pulchellus*, *Pt. prasinorrhous*, *Pt. puella*, and *Pt. pectoralis*, this last being also found upon the near-lying small islands of Gagie and Giebeh, while *Pt. puella* is also met with on Ghémien. Batanta has four, viz. *Pt. aurantiifrons*, *Pt. superbus*, *Pt. pectoralis*, and *Pt. prasinorrhous*; while Salwatty possesses all these (excepting *Pt. pectoralis*) and also *Pt. coronulatus*, *Pt. trigeminus*, *Pt. humeralis*, *Pt. pulchellus*, *Pt. perlatus*, and *Pt. puella*. Mysol, to the south-west of Salwatty, contains seven species, viz. *Pt. prasinorrhous*, *Pt. superbus*, *Pt. aurantiifrons*, *Pt. pulchellus*, *Pt. puella*, *Pt. pectoralis*, and *Pt. nanus*. All of these save the last two are found upon Salwatty. Far to the south of this last-named island we reach the most southern ones of the group, viz. Arou, with seven species (*Pt. coronulatus*, *Pt. superbus*, *Pt. iozonus*,

Pt. wallacei, *Pt. aurantiifrons*, *Pt. zonurus*, and *Pt. perlatus*), and Yule Island, lying to the south-east of the mouth of Fly River, in the Papuan Gulf, and close to the coast, with two (*Pt. coronulatus* and *Pt. gestroi*, the last intermediate between *Pt. ornatus* and *Pt. perlatus*). The next group of the Austro-Malayan Islands that claims our attention is the Moluccas; and, commencing with the furthest north, Sanghir is the first to be considered: here is found a race of *Pt. melanocephalus* from Java, which has become possessed of sufficient characteristics to separate it from the type, and is known as *Pt. xanthorrhous*. Gilolo and its small neighbours, Ternate and Batchian, contain four species, found on each, viz. *Pt. iogaster*, *Pt. superbus*, *Pt. bernsteini*, and *Pt. monachus*. Tidore, on the west, has three—*Pt. monachus*, *Pt. iogaster*, and *Pt. prasinorrhous*; Morty two, *Pt. monachus* and *Pt. iogaster*; Obi one, *Pt. bernsteini*; Dammor and Kaisa, each one, *Pt. monachus*; and Weda and Dodingo also one, *Pt. iogaster*. Ceram contains three species—*Pt. chrysorrhous*, *Pt. superbus*, and *Pt. viridis*, this last being also found upon the small island of Monavolka, which, together with Matabello, also possesses *Pt. prasinorrhous*. Banda, to the south of Ceram, has *Pt. xanthogaster*, which is also found upon the islands of Koor and Ki, these last having in addition *Pt. prasinorrhous*. Goram, lying to the east, has two species, the one last named and *Pt. viridis*. Bouru has three species—*Pt. superbus*, *Pt. viridis*, and *Pt. prasinorrhous*; while Amboyna has also three species—*Pt. superbus*, *Pt. viridis*, and *Pt. prasinorrhous*; and Harouka, east of Amboyna, contains *Pt. viridis*. Of the Timor group, I commence with Timor, which possesses two species, *P. ewingii* and *Pt. cinctus*, this last being also found upon the small island of Wetta, to the north of Timor; while Lettie, to the north-east, possesses *Pt. lettiensis* (a modification of *Pt. cinctus*) and *Pt. xanthogaster*. Flores has three species—*Pt. ewingii*, *Pt. albocinctus*, and *Pt. melanocephalus*, this last being also found in Sambawa and Lombock. Celebes has four species, three of which are peculiar to it, viz. *Pt. melanospilus*, *Pt. temminckii*, *Pt. gularis*, and *Pt. fischeri*; while Sula contains *Pt. melanospilus* and *Pt. chrysorrhous*. Australia, the last division of this region, has six species—*Pt. regina* and *Pt. magnificus* in New South Wales, in the district between the river Hunter and Moreton Bay, *Pt. superbus* at Cape York and on the Booby Islands, *Pt. assimilis* and *Pt. magnificus* in North-east Queensland at Rockingham Bay, *Pt. assimilis* being also found together with *Pt. puella* at Cape York, and *Pt. ewingii* on the Coburg Peninsula near the coast—the distribution of the three forms of *Pt. magnificus* being decidedly against the view that they represent distinct species.

The other zoogeographical region in which these birds are found is the Oriental; and we here find them restricted to the subregion containing the Indo-Malay islands. Of these I commence with the Philippine group, in only one island of which as yet has any species been found, viz. Luzon, containing three (*Pt. occipitalis*, *Pt. jambu*, and *Pt. leclancheri*). The great island of Borneo, and also Sumatra,

have but one species, *Pt. jambu*; while Java, the last locality in which *Ptilopus* is found, contains two, *Pt. melanocephalus* and *Pt. porphyreus*.

The following key will show the chief differences existing between the birds of this genus. I recognize 71 species, and have divided them into two great groups, characterized by having the breast-feathers bifurcate or not bifurcate.

KEY TO THE SPECIES.

A. Breast-feathers bifurcate.

- a. Front and top of head purple or deep rose, margined with yellow or pale green.
 - a'. Tail with a subterminal grey or ash-coloured band.
 - a". Abdomen deep rose-colour; under tail-coverts yellow, tipped with rose; breast bright green..... 1. *Pt. greyi*, p. 523.
 - b". Abdomen and breast washed with olive; purplish red spot on the breast 2. *Pt. neglectus*, p. 524.
 - c". Abdomen and flanks green, with an indistinct spot of darker green in the middle of the former; breast ash-colour, tinged with green; back, wings, and tail green, with strong coppery red reflexions; inner secondaries with a small dark green spot on tip 3. *Pt. bonapartei*, p. 524.
 - d". Abdomen pale green, with a purplish black spot in the centre; breast uniform ashy, tinged with green; scapulars with a conspicuous dark violet spot at tip 4. *Pt. purpuratus*, p. 525.
 - b'. Tail with a terminal yellow band.
 - a". No spot at base of mandible.
 1. Centre of abdomen rufous 5. *Pt. apicalis*, p. 527.
 2. Secondaries and tail copper-colour; small dark purple spot on lower part of abdomen.
 - α. Front and crown purple 6. *Pt. coralensis*, p. 528.
 - β. Front and crown greyish purple or amethyst 7. *Pt. chalcurus*, p. 529.
 3. Middle of abdomen rufous, upper edge dark purple, scapulars tipped with lilac 8. *Pt. pictiventris*, p. 530.
 4. Feathers on upper part of breast with transverse violet spots near the tips; no spot on lower part of breast; abdomen orange; crissum yellow; under tail-coverts white at base, then yellow, with rose-violet tips 9. *Pt. pelewensis*, p. 531.
 5. Throat white or pale yellow; breast pale green, feathers tipped with light grey; abdomen orange, with a lilac-red spot in the centre 10. *Pt. regina*, p. 531.
 6. Throat light yellow; breast pale green, feathers tipped with light grey; abdomen orange, with a pale lilac band upon the upper part ... 11. *Pt. cwingii*, p. 533.

7. Abdomen and under tail-coverts bright yellow; on lower part of breast a large spot of dark purplish red 12. *Pt. rarotongensis*, p. 534.
8. Throat, cheeks, and breast yellowish green; abdomen clear green, with a purplish black spot in the centre 13. *Pt. fasciatus*, p. 535.
- b". Conspicuous deep-rose spot at base of mandible.
1. Abdomen bright uniform yellowish green, without spot 14. *Pt. mercieri*, p. 536.
2. Breast with a deep purple spot on lower part; abdomen orange; under tail-coverts bright yellow, tips orange 15. *Pt. roseicapillus*, 537.
3. Chin pale purplish red; dark purplish violet spot on breast, with the base of the feathers dark olive-green; under tail-coverts purplish violet-red, basal portion yellow; purplish violet of front and crown surrounded by green..... 16. *Pt. huttoni*, p. 538.
- b. Front and top of head greyish or purplish white, margined with yellow.
- a'. Abdomen deep rose; crissum and under tail-coverts deep yellow 17. *Pt. dupetithouarsi*, p. 539.
- b'. Abdomen and under tail-coverts orange-yellow 18. *Pt. xanthogaster*, p. 540.
- c' Abdomen and under tail-coverts bright yellow 19. *Pt. chrysogaster*, p. 541.
- d'. Underparts pale ash-green; centre of abdomen and crissum pale yellow; under tail-coverts bright yellow 20. *Pt. taitensis*, p. 541.
- c. Top of head and occiput bright purple; sides of head light green; nape and sides of neck rufous-orange; middle of abdomen and crissum white; flanks and thighs green.
- a'. Feathers of breast purple at base, broadly tipped with ashy grey, a broad bluish black band across the lower part of breast 21. *Pt. superbus*, p. 542.
- b'. Lower part of breast light purple, graduating into bluish black 22. *Pt. temmincki*, p. 544.
- d. Front, crown, band across the back, and under tail-coverts dark purplish red; feathers of breast purple at base, white at tip; beneath these an orange band 23. *Pt. perousci*, p. 545.
- c. Front pink, with posteriorly a narrow band of purple, followed by a broader one of yellow; a purple spot on fore part of abdomen; middle of abdomen and under tail-coverts yellow 24. *Pt. coronulatus*, p. 546.
- f. Front pinkish white, surrounded by a purple band succeeded by one of yellow; purple spot on abdomen, surrounded by saffron-yellow 25. *Pt. geminus*, p. 546.
- g. Front greyish white 26. *Pt. trigeminus*, p. 547.
- B. Breast-feathers not bifurcate.
- a. Middle of abdomen deep orange; vent and under tail-coverts white varied with yellow; tertials violet grey in the centre.
- a'. Shoulders greyish violet, mixed with

- green; tail green, with an apical grey band above, white beneath..... 27. *Pt. iozonus*, p. 547.
- b'* Shoulders violet-grey, bordered beneath by deep purple; tail green, with a sub-terminal grey band on lower surface only 28. *Pt. humeralis*, p. 548.
- ' Shoulders violet-grey; tail green above, beneath black, with an apical white band 29. *Pt. jobiensis*, p. 548.
- d'* Bony protuberance on forehead; shoulders and patch on back light grey; tail bright green, apical third ashy grey 30. *Pt. insolitus*, p. 549.
- b.* Bluish grey band on each side of breast; purple spot on centre of abdomen; wing-coverts, scapulars, and tertials tipped with yellow 31. *Pt. nanus*, p. 549.
- c.* Front, crown and lores, moustaches, and spot on the breast greyish blue; superciliary stripe, chin, throat, lower parts of abdomen, and under tail-coverts lemon-yellow 32. *Pt. monachus*, p. 550.
- d.* Front and crown bright carmine; sides of head and neck and breast light grey; chin and throat white; large purplish red spot on lower part of breast; abdomen and under tail-coverts orange 33. *Pt. pulchellus*, p. 551.
- c.* Head and neck light grey; occiput and back of neck black; throat yellow.
- a'* Crissum and short under tail-coverts yellow, long ones carmine 34. *Pt. melanocephalus*, p. 551.
- b'* Throat-mark narrow; crissum yellow, washed with orange 35. *Pt. melanospilus*, p. 552.
- c'* Throat-mark narrow; black bar on nape small; crissum orange-yellow 36. *Pt. chrysothorax*, p. 553.
- d'* Lower parts of abdomen and crissum rich orange 37. *Pt. xanthorhous*, p. 553.
- f.* Head and neck rose-colour, graduating into carmine on the breast, beneath which is a broad white band, followed by another of blackish green 38. *Pt. porphyreus*, p. 553.
- g.* Throat, crown, and sides of face in front scarlet, chin and throat black; middle of breast rose-colour; under tail-coverts chestnut 39. *Pt. jambu*, p. 554.
- h.* Throat white or pale grey.
- a'* Scapulars and tertials grey, margined with green.
- a''* Top of head bright carmine; mantle, neck, and breast bluish grey; lower part of breast crossed by a white band, succeeded by a broad one of deep orange; shoulders deep orange 40. *Pt. wallacei*, p. 555.
- b''* Forehead deep orange; crown and occiput yellowish green; back and upper part of breast plumbeous; underparts yellowish green..... 41. *Pt. aurantiifrons*, p. 556.
- c''* Shoulders dark purplish red; lower parts of throat dark yellow; breast dark ochre; tail dark green, with a light-yellow apical band.
1. Top of head and sides of face purplish red 42. *Pt. ornatus*, p. 556.
2. Top of head and sides of face olive-yellow 43. *Pt. gestroi*, p. 557.

- b*. Middle of scapulars and lesser wing-coverts rosy purple.
- a*". Tail uniform dark green 44. *Pt. perlatus*, p. 557.
- b*". Tail dark green, with an apical greyish white band 45. *Pt. zonurus*, p. 558.
- i*. Head, except occiput, light grey; abdomen reddish purple..... 46. *Pt. iogaster*, p. 558.
- j*. Forehead and chin greenish grey; reddish purple spot on breast 47. *Pt. pectoralis*, p. 559.
- k*. Forehead and chin grey; tips of tertials and bar across the shoulders grey.
- a*'. Lower part of throat and upper part of breast dark reddish purple; tail bronzy green, tipped with yellow 48. *Pt. viridis*, p. 560.
- b*'. Lower part of throat and upper part of breast bright reddish purple; tail yellowish green, each feather with a sub-terminal grey spot on the inner web... 49. *Pt. geelvinkianus*, p. 560.
- l*. Head white, secondaries slate-grey; centre of throat and chest crimson 50. *Pt. eugeniæ*, p. 561.
- m*. Upper parts, throat, and upper part of breast green.
- a*'. Breast crossed by a broad white band; forehead purplish red.
- a*". Rose spot on abdomen.
1. Crissum and under tail-coverts bright yellow 51. *Pt. rivolii*, p. 561.
2. Crissum and under tail-coverts green, edged with yellow 52. *Pt. prasinorrhous*, p. 562.
- b*". No rose spot on abdomen 53. *Pt. strophium*, p. 563.
- b*'. Breast crossed by a broad band, lemon-yellow above, white beneath.
- a*". Front and crown rosy red; purplish red spot on abdomen 54. *Pt. bellus*, p. 563.
- b*". Front and crown green; abdomen lilac 55. *Pt. speciosus*, p. 564.
- c*'. Band on breast, crissum, and under tail-coverts yellow; top of head and middle of abdomen lilac 56. *Pt. johannis*, p. 564.
- n*. Feathers of neck and breast lanceolate, sulphur-yellow, tinged with green; abdomen, vent, and under tail-coverts bright yellow 57. *Pt. luteovirens*, p. 565.
- o*. Head and neck olive-green; plumage green; secondaries tipped with yellow; under tail-coverts yellow, blotched with green . 58. *Pt. corriei*, p. 566.
- p*. Head and neck greenish yellow; under tail-coverts bright yellow; rest of plumage green 59. *Pt. layardi*, p. 567.
- q*. Head and throat olive-green; rest of plumage orange-carmine 60. *Pt. victor*, p. 568.
- r*. Top of head light grey
- a*'. Sides of head and upper part of breast ashy white; a dark purple band across the breast; flanks and underparts ashy green; under tail-coverts cinnamon; chin black..... 61. *Pt. leclancheri*, p. 568.
- b*'. Sides of face and occiput purplish red; centre of breast ochraceous..... 62. *Pt. occipitalis*, p. 569.
- c*'. Sides of face, breast, and flanks grey; centre of abdomen yellowish white; thighs and under tail-coverts cinnamon; chin deep chestnut 63. *Pt. gularis*, p. 570.

- d'*. Head, neck, and underparts partly grey, partly golden-ochre; under tail-coverts grey and white intermixed; sides of head bluish red; black band on back of neck 64. *Pt. fischeri*, p. 571.
- s*. Head white.
- a'*. Abdomen yellowish green, separated from breast by a black band.
- a''*. Neck and breast light blue 65. *Pt. albocinctus*, p. 571.
- b''*. Neck and breast white.
1. Tail black, with apical dark grey band 66. *Pt. cinctus*, p. 571.
2. Tail greyish black, with apical third yellowish white 67. *Pt. lettiensis*, p. 572.
- t*. Head and neck greenish grey.
- a'*. Red spot on lower part of breast; abdomen and flanks yellowish ochre 68. *Pt. bernsteini*, p. 572.
- b'*. Centre of throat and neck in front and underparts to the thighs purplish red 69. *Pt. puella*, p. 574.
- c'*. Larger race of the above 70. *Pt. assimilis*, p. 574.
- d'*. Still larger; centre of throat and underparts deep purple 71. *Pt. magnificus*, p. 575.

1. PTILOPUS GREYI.

Ptilopus greyi, Grey, List B. Brit. Mus. (1856) p. 4. sp. 8, desc. nulla—Columbæ; id. List B. Trop. Isl. (1859) p. 38; id. Proc. Zool. Soc. 1859, p. 165; J. Verr. & Des Murs. Rev. Zool. 1860, p. 435; Bon. Iconogr. Fig. (1857) pl. xx.

Ptilopus purpuratus, Bon. (nec auct.) Consp. Gen. Av. vol. ii. p. 19. sp. 1.

Hab. New Caledonia (*Germain*); Isle of Pines (*Gray*); Lifu, Loyalty Islands (*Whitmee*); Erromango, New Hebrides, Vanikoro (*Voy. Astrolabe*).

This handsome species was first named by Gray, but not described (*l. c.*). Bonaparte gave a description and very good figure of the bird in his Iconogr. Fig. pl. 20, from the specimen brought, by the naturalists attached to the expedition of the 'Astrolabe,' from Vanikoro Island. The species has a rather extensive distribution, from New Caledonia and neighbouring islands to Vanikoro on the north. Young and immature birds are greener on the breast and neck than the adults; and the first primary is not so abruptly attenuated.

Adult. Front and top of head deep rose, margined posteriorly with yellow; back of head, neck, and breast pale greyish green; throat yellowish white; flanks and sides of crissum bright green; abdomen very deep rose-colour, running into orange-yellow on crissum. Under tail-coverts rose-colour, but not so dark as on the abdomen. Upper parts bronzy green. Primaries black on inner web, dark green on the outer, and the innermost ones tipped with bronze-green; first primary abruptly attenuated, end very narrow. Secondaries shining green, edged with yellow. Tertiaries and some of the innermost secondaries with a pale lilac spot near their tips. Tail dark green, with a subterminal grey band. Bill black, with pale tip. Feet brown, possibly red in life. Total length 8 inches, wing 5, tail 3, culmen 1½.

Specimen described is the one figured by Bonaparte, Iconogr. Fig. pl. 20, ex Vanikoro.

Another specimen from New Caledonia, marked as a female, differs from the male only in having the forehead slightly tinged with rose, and the abdomen mottled with rose and bright yellow. The under tail-coverts are deep rose on their apical half, as in the specimen from Vanikoro. The secondaries are more broadly margined with yellow, and the primaries tipped with white. I am inclined to regard this example rather as an immature male than a female. Three examples are in the British Museum from Erromango Island, one of the New Hebrides, which are in all respects like the one in the Paris Museum figured by Bonaparte from New Caledonia.

2. PTILOPUS NEGLECTUS.

Ptilopus neglectus, Schleg. Mus. Pays-Bas (1873), p. 7, *Columbæ*.

Hab. Océanie! Viti? (*Schlegel*).

Allied to the *Pt. greyi*, but differs in having the lower part of the abdomen and under tail-coverts tinged with sulphur, the abdomen and breast washed with olive-green, the purplish-red spot being placed upon the *breast* and *not on the abdomen*, and in the neck and upper part of breast being tinged with light grey (*Schlegel*). Wing 5 inches, tail 2 inches 3 lines.

The locality suggested by Schlegel, as given above, "Viti," is without doubt incorrect, as there are no indications to support the idea, the relatives of this bird having been procured in quite a different group of islands.

3. PTILOPUS BONAPARTEI.

Ptilopus purpuratus, Bon. (nec auct.) Iconogr. Fig. (1857) pl. xix. fig. *a*, adult, ex Balaou (nec Vanikoro).

Ptilopus bonapartei, Gray, Hand-l. B. vol. ii. (1870) p. 225, descr. nulla, founded on pl. 19, Bon. Iconogr. Fig.

Hab. Balaou, Fiji Islands (*Hombroun and Jacquinot*).

This is the species figured by Bonaparte as *Pt. purpuratus*, fig. *a* (*l. c.*). The specimen is in the Paris collection; and the plate gives no idea of the bird; which is reddish in all lights, but in certain ones exhibits a brilliant coppery-red hue. Bonaparte committed two strange errors in reference to this bird. He stated that it came from the island of Vanikoro, and also figured as the young the *Pt. purpuratus*, Wagl., from Tonga-Tabou, a very different and distinct species. Gray (*l. c.*) bestowed the name of *Pt. bonapartei* (*l. c.*), ex Vanikoro!, on the bird represented by Bonaparte on plate 19 of his work, 'Iconographie des Pigeons.' Gray could never have seen the specimen; or else he would have corrected Bonaparte's error, and stated that it did not come from Vanikoro, but from Balaou, and also that Bonaparte had confounded two species. Gray gives no description, which also strengthens the belief that he did not know the species autoptically. It is a question whether Gray's name should be noticed at all; for to name species without seeing them, on the chance of their proving new, is not a commendable practice; and, as he did not designate which figure he bestowed the name of *bona-*

partei upon, it is of course impossible to know whether it ought to be applied to the present or to the Tonga-Tabou bird. As, however, I now have selected the Balaou species as the type of *bonapartei*, in order to avoid giving it a new name (for it is quite distinct from the *Pt. purpuratus*, Wagl.), and as the type will be in the collection of the Paris Museum for future reference, it will not be difficult hereafter to ascertain what the species really is. The type is unique.

Adult. Front and crown rosy purple, faintly margined posteriorly with yellow; throat white; occiput, neck, and breast ash-colour, tinged with green; abdomen and flanks green; an indistinct dark green spot in the middle of the former. Back and wings green, with strong coppery-red reflexions. Inner secondaries with a small dark green spot at tips, and all edged with yellow. Primaries dark coppery red, edged with white. Tail above green, with bright coppery-red reflexions, and with a subapical greyish-white band; beneath dark grey, with a broad apical white band. Crissum and under tail-coverts bright yellow. Bill greyish black, with yellow tip. Feet light red. Total length 9 inches, wing $5\frac{1}{2}$, tail $3\frac{1}{4}$, culmen $\frac{5}{8}$.

4. PTILOPUS PURPURATUS.

Columba purpurata, Shaw, Gen. Zool. vol. xi. p. 66 (1819), partim; Wagl. Syst. Av. (1827) *Columbæ*, sp. 30.

Columba porphyracea, Temm. Trans. Linn. Soc. vol. xiii. p. 130? (1822).

Columba porphyrea, Wagl. Syst. Av. (1827) sp. 31?, *Columbæ*.

Columba forsteri, Desm. Dict. Scien. Nat. vol. xl. p. 340 (1826)?; Less. Compl. Buff. tom. iii. Ois. p. 34 (1837), ex Tonga-Tabou.

Columba purpurata, Wagl. (nec Gmel.) Isis, 1829, p. 742, ex Tonga-Tabou (1829).

Columba porphyracea, Licht., Forst. Descr. Anim. p. 167 (1844); Finsch & Hartl. Fauna Centralpolyn. (1867) p. 119; Gräffe, Journ. Mus. Godeffr. tab. 7. fig. 3.

Ptilonopus porphyracus, Gray, Gen. B. (1844-49) vol. ii. p. 466; id. B. Trop. Isl. p. 38 (1839); id. List Columb. p. 3 (1856), partim.

Ptilopus purpuratus, Bon. (nec Gmel.) Iconogr. Fig. (1857) pl. xix. fig. b, juv., spec. Paris Mus. ex Tonga-Tabou (Voy. Astro-labe), nec Vanikoro.

Ptilinopus porphyraceus, Finsch & Hartl. Journ. für Ornith. 1870, p. 131; Finsch, Proc. Zool. Soc. 1877, pp. 725, 775, 783.

Ptilonopus porphyraceus, Reich. Taub. p. 95; Layard, Proc. Zool. Soc. 1876, p. 502.

Ptilonopus purpuratus, Reich. (nec auct.) Taub. p. 94?

Columba kurukuru, variété, Temm. & Knip, Fig. vol. i. pl. 35?

Ptilopus fasciatus, Layard (nec Peale), Ibis, 1876, p. 392.

Hab. Tonga-Tabou, Waikai, Mango, Mokani, Loma-Loma, Tavuni, Fiji Islands, Futuna, Friendly Islands (*Layard*); Ninafou Island, most northern of Tonga group (*Finsch*); Hapai (*Gräffe*); Eua, Friendly Islands (*Hübner*); Savage Island (*Whitmee*); Vavao, Friendly Islands.

It is apparently a difficult matter for authors to decide upon the

correct name for this Fruit-Pigeon ; and, as will be seen by the list of synonyms given above, the species has been presented with a very fair number of appellations. In order to explain why I consider that this bird, of all those given in this paper, should alone bear the name of *purpuratus*, it will be necessary to begin at the beginning. Latham, in his 'General Synopsis of Birds,' vol. ii. p. 626. sp. 15 (1783), describes a Dove, which he says came from Otaheite, as the "Purple-crowned Pigeon," the chief characteristics of which were:—"Forehead to the middle of the crown purple; head, neck, and underparts of body pale green, inclining to ash-colour; vent and under tail-coverts yellow. Tail greenish black, with green edges, and when spread a greyish bar appears near the end, the colour only occupying the inner webs of each feather." To this description Gmelin gave the name of *Columba purpurata*. Now there is no Pigeon known belonging to the genus *Ptilopus* that will answer to the above description of Latham. No such bird is found upon the island of Otaheite, whence, according to Latham, this curiously compounded specimen came; for it carries the *head* of the bird from Tonga-Tabou and the *body* of the species found in Otaheite, distinguished afterwards by Lesson as *taitensis*. Latham possessed specimens from both these localities, and remarked upon their differences, but did not deem them distinct species; and it is very evident that when he wrote his description he took his characters from both forms. The bird from Otaheite does not possess a purple forehead or crown, these parts being ash-colour with but a faint tinge of lilac; therefore it could never have been designated as the "Purple-crowned Pigeon." Nor does the Tonga-Tabou bird have the *underparts of the body* pale green inclining to ash-colour (which is a characteristic of the Otaheite species), but has the flanks and abdomen grass-green, with a conspicuous purplish-black spot in the centre of the latter. Therefore the name *Col. purpurata*, Gmel., having been founded upon a bird that did not exist, taken from a description comprising portions of two distinct species, cannot be accepted, and should be rejected from the nomenclature of the genus.

The next author after Gmelin who mentioned this species was Shaw (*l. c.*) (1819). He, however, also confounded two species, and his name of *purpurata* must be passed over. Temminck follows in 1822 (*l. c.*) with *Columba porphyracea*; and this name, attributed to Forster, has been used by various writers when referring to this bird, especially from the island of Tonga-Tabou. Now the *C. porphyracea* of Temminck was bestowed upon the bird figured by Madame Knip in their great work on the Pigeons, at plate 35, and there considered as a variety of the *Pt. ewingii*, and called *Columba purpurata*. Temminck states (Trans. Linn. Soc. 1822, p. 130) that his specimen came from *New Holland*! The figure resembles no species from that country, nor indeed from any other; and it can only be through an examination of the type that a correct knowledge of the species intended can be ascertained. I have therefore placed Temminck's name, as well as *porphyrea*, Wagl., founded upon Temminck's bird, whatever it may have been, among the synonyms of

the present species with a doubt¹. Desmarest also published a name (*l. c.*) for the bird depicted on Temminck's plate, viz. *forsteri*. This, for the same reason which has placed Temminck's name on one side, will also have to go among the list of doubtful synonyms. We now come to Wagler, 'Isis,' 1829, who first diagnosed as distinct both species, from Otaheite and Tonga-Tabou respectively, and gave names to each, and properly portrayed their distinctive characters. To the Tonga bird with the purple crown he applied the term *purpurata*, which name will take precedence; and the Otaheite species he called *oopa*. Unfortunately he did not appear to be cognizant of the name *taitensis* previously given to this species by Lesson, Voy. Coq. tom. i. text, p. 297 (1826); and therefore *oopa* will of course become a synonym of Lesson's term.

Mr. Layard speaks of this species under the name of *porphyraceus*, Forst., as not uncommon in the Friendly Islands. In its habits it resembles the other species of this genus, and is called by the natives "Kullu kullu." The female, when in full breeding-dress, resembles the male, but is not so brightly coloured on the abdomen, the male at this season having the black abdominal patch shading away into brilliant purple.

Adult. Front and top of head, extending in a curved line behind the eyes, rich purple, edged with light yellow. Rest of head, neck, upper part of back, throat, and breast pale ashy green. Flanks and abdomen grass-green, with a dark purple spot in the centre of abdomen. Crissum and under tail-coverts bright yellow, tinged with orange on the tips of the coverts. Back and upper tail-coverts dark yellowish green. Wings the same colour, with the inner secondaries and some of the scapulars deep bluish green near their tips. Primaries black on their inner webs, green on their outer, and, together with the secondaries, margined with yellow; first primary abruptly attenuated and very narrow at the end. Rectrices bright green on their outer webs, brownish black on their inner, with a terminal grey or ash-coloured band, this margined with yellow. Under surface smoke-colour, terminal portion white. Bill black, tip flesh-colour. Feet brownish. Total length $8\frac{3}{4}$ inches; wing $5\frac{1}{4}$; tail $3\frac{3}{4}$; bill, culmen $\frac{5}{8}$.

Young. Resembles the adult, except that the top of the head is ashy like the breast, with only a tinge of purple on the forehead. The back of the neck is pale green, instead of ash-colour; and the plumage of the upper part, tail, and wings is bronzy.

5. PTILOPUS APICALIS.

Lamprotreron apicalis, Bon. Compt. Rend. vol. xxxix. p. 877 (1854).

Ptilinopus apicalis, Bon. Consp. Gen. Av. vol. ii. (1857) p. 23; Finsch & Hartl. Centralpolyn. (1867) p. 121.

Ptilonopus apicalis, Reich. Tauben, p. 97.

Hab. Samoa, Vavao (*Bonaparte*).

This species, described by Bonaparte (*l. c.*), while resembling in

¹ See further remarks upon this plate 35 in the article on *Pt. coralensis*.

general appearance the preceding one, differs from all others in the colour of the spot upon the abdomen. In the type this is mixed with rufous and yellow, the latter colour perhaps predominating; but in a second specimen, also in the Paris collection, the spot is more rufous, and extends over a greater space. I regard this latter as a more adult individual. It unfortunately bears no precise locality, but has merely marked upon the stand, "donné par la Société des Missions Catholique de l'Océanie en 1849." The type was brought by Hombron and Jacquinot from the Samoan Islands in their Voyage au Pôle Sud. The exact island is not given on the specimens by these travellers; but Bonaparte has stated Vavao to be the habitat. I am not aware how he ascertained this island to be the one in which the specimen described by him was procured.

Adult. Front and crown rosy purple, faintly margined with yellow; throat yellowish white; occiput and back of neck pale green; sides of neck and breast greenish grey; flanks and abdomen pale green, with a rufous spot tinged with yellow in the centre of the latter; crissum and under tail-coverts bright yellow, inclining to a deep orange hue at the tips. Upper part and wings bronzy green. Secondaries margined on outer webs with pale yellow. Tail bronzy green, with an apical light-yellow band. Bill green? Feet dark red? Total length $7\frac{1}{2}$ inches; wing $5\frac{1}{4}$, tail $3\frac{1}{2}$, culmen $\frac{5}{8}$. (Type.)

6. PTILOPUS CORALENSIS.

Ptilopus coralensis, Peale, U.S. Expl. Exped. (1848) p. 190, pl. 51; Cass. U.S. Expl. Exped. 2nd ed. (1858) p. 272, pl. 32; Schleg. Mus. Pays-Bas, 1873, p. 14, *Columbæ*.

Columba purpurata, Temm. & Knip, Pig. vol. i. pl. 35?

Ptilopus viridissima, Bon. Consp. Gen. Av. vol. ii. p. 20 (1857).

Kurutreron coralensis, Bon. Consp. Av. vol. ii. p. 26. sp. 3 (1857); Reich. Taub. p. 93; id. Novit. Suppl. p. 203, t. iii. f. 33.

Ptilinopus coralensis, Cass. Wilkes Expl. Exped. text, p. 272, atl. pl. 32 (1858).

Ptilonopus coralensis, Gray, List B. Trop. Isl. p. 37 (1859).

Ptilonopus viridissimus, Gray, List B. Trop. Isl. p. 38 (1859), partim; Reich. Tauben, p. 95, pl. 236 b. fig. 3367.

Ptilinopus viridissimus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 134.

Hab. Island of Carlshoff, Paumotu group (Peale).

The type of Bonaparte's *Ptilopus viridissimus* is in the Paris Museum. The example, which was brought home by M. Maugé, the surgeon attached to the expedition commanded by Captain Baudin, is marked as from Timor. This locality is evidently erroneous, as no species belonging to this particular group of the genus *Ptilopus* is found in that island, but all are, on the contrary, apparently confined to the islands of the South Sea, from some one of which it is most probable the specimen described by Bonaparte was brought. It is in a bad condition, the primaries and tail being worn away to a considerable degree, as though the bird had been in captivity at

some period of its existence. It may possibly have been purchased by Maugé at Timor. In the coppery-red hue of the wings, as well as the tail, it answers well to the description given by Peale (*l. c.*) of his *P. coralensis*; and I have therefore assigned it to that species. The back of the type is not “*viridissimum immaculatum*,” as described by Bonaparte, but has very conspicuous violet spots on the scapulars.

I have given among the synonyms of this species the *Columba purpurata*, var., figured by Madame Knip on plate 35 of the work on Pigeons. Temminck states that there are two specimens in the Paris Museum, brought by Capt. Baudin, which resemble the type of his plate 35. I find that the type of Bonaparte’s *Pt. viridissimus* is marked as follows:—“*Ptilopus viridissimus*, Bp. ex Temm. tab. 35, nec 34.” This unquestionably refers to the work of Temminck and Knip; but whether it is also intended to indicate that the example was the original of Madame Knip’s plate I am unable to ascertain. I deem it very probable, however, that it is the original from which the drawing was made. In that case this bird would bear the name of *porphyraceus*, Temm. Trans. Linn. Soc. 1822, p. 130, which antedates *coralensis*, Peale.

Mr. Peale states that this Dove attracted his attention by its plaintive call, resembling *hoot-hoot-hoot*, uttered in rapid succession. Although not wild, it was very difficult to see them, as their plumage accorded so well with the leaves. Specimens were subsequently obtained on the low coral islets of the Paumotu group, but nowhere else. They always kept in the most wooded and secluded places.

Male. “Vertex having a very pale rubiaceous spot, which does not reach to the base of the bill; bill yellow; irides red; head, neck, and breast ashy, the feathers having a very pale greenish-yellow band near their tips, those on the breast bifurcate; back and rump green, inclining to olive; vent, wings, and tail, when viewed in a positive light, bright copper-colour, barred with golden green; underparts of the wing and tail cinereous; quill-shafts brown; tail-shafts white beneath and black on the upper surface; tail even, the inner web having a dark bar near the tip; tertiary feathers edged with yellow; primaries and secondaries having a very narrow margin of white; feathers on the leg cinereous. Total length 9 inches; tail $3\frac{1}{10}$, extent of wings 17, bill $\frac{1}{2}$, tarsus 1.”—*Peale (l. c.)*.

7. PTILOPUS CHALCURUS.

Ptilonopus chalcurus, Gray, List Birds Trop. Isl. Brit. Mus. (1859) p. 37.

Ptilinopus chalcurus, Finsch & Hartl. Faun. Centralpolyn. (1867), p. 131.

Hab. Harvey Islands, Cook’s Archipelago (*Gray*).

The type of this species (?) is in the British Museum, where I have had an opportunity of examining it. The colour of the forehead is amethyst, a lighter hue than in *Pt. viridissimus*, Bon.; but in their coppery tints the two birds greatly resemble each other. Gray separated this Harvey-Island bird from *Pt. coralensis*, Peale, on account of the light-coloured front and crown. Without the

type of Peale's species to compare it with, I cannot say if the difference mentioned is sufficient to separate the present form as distinct, and for the present leave it under the designation given to it by its describer.

Forehead amethyst. Crown, occiput and nape pale green. Throat yellowish; sides of neck and breast greyish ash; abdomen pale green. Back and wings bronzy-green. Primaries and secondaries with a coppery-red hue in certain lights. Tail coppery red, with a greenish shade; but in the majority of lights the feathers are bright copper-colour. Crissum and under tail-coverts pale yellow. Bill, legs, and feet yellowish in the skin. Wing $5\frac{1}{2}$, tail 4in. (Type.)

8. *PTILOPUS PICTIVENTRIS*. (Plate XXXIII.)

Ptilonopus fasciatus, Whitmee (nec Peale), Proc. Zool. Soc. 1873, p. 152 (spec. exam.)

Ptilonopus apicalis, Lay. (nec Bon.), Proc. Zool. Soc. 1876, p. 495.

Ptilopus pictiventris, Elliot, Ann. & Mag. Nat. Hist. ser. 5, vol. i. p. 349 (1878).

Hab. Nukahiva, Marquesas Islands (?) (type Paris Museum); Samoa (*Whitmee*); Savage Islands (*Brenchley*); Navigators' and Friendly Islands (*Layard*).

This species was sent from Samoa by the Rev. S. J. Whitmee, and marked by him *Pt. fasciatus*. I have examined his specimens now in the British Museum, from one of which the figure (Plate XXIII.) is taken; and they agree exactly with my type in the Paris Museum. Mr. Whitmee states (*l. c.*) that this bird is kept generally in captivity by the natives of the Samoan Islands, and they train it to act as a decoy for the wild bird. I described this species from a specimen in the Paris Museum, stated to have been brought by Hombron and Jacquinet from Nukahiva of the Marquesas. I am inclined to think this locality may be erroneous, as I find on the bottom of the stand that it is first stated to have come from "Upolu," Samoan group. This was erased and Nukahiva substituted. It seems to me, in view of the Rev. Mr. Whitmee's examples, that Upolu is probably the correct locality of the type. Mr. Layard, in the 'Proceedings' of this Society, 1876, p. 495, has erroneously referred this bird to the *Pt. apicalis*, Bon. This latter species, the type of which is before me, has a rufous spot mixed with yellow in the centre of the abdomen, without any black line about it. The secondaries are also uniform bronzy green without any lilac spots near their tips; and the under tail-coverts are bright yellow inclining to an orange hue at their tips. The present species and *Pt. apicalis* are readily distinguishable from each other, the purplish-black line above the rufous on the abdomen of the present bird being at all times sufficient to separate it. Mr. Layard states that he found this species abundant, feeding on wild berries, and having a pleasing rolling "coo." The females were not so brightly coloured as the males; and the young have the whole of the underparts scaly with yellow edges to their green feathers. They exhibit no trace of the bifurcation in the breast-feathers, as in the adults; nor is the

first primary so greatly attenuated. Front and crown rosy purple, with a very faintly indicated yellow margin, almost obsolete. Occiput greenish grey. Throat whitish; neck, upper part of mantle, and breast ashy green. Flanks light green. Centre of abdomen rufous, bounded above by a deep-purple line. Crissum and under tail-coverts bright yellow, the latter orange towards their tips. Back and upper tail-coverts bright green. Scapulars tipped with lilac. Tail bright green, with a broad apical yellow band. Bill greenish with a yellow tip. Feet brown in the skin. Total length $8\frac{1}{2}$ inches, wing $5\frac{1}{4}$, tail 3, culmen $\frac{9}{16}$.

9. PTILOPUS PELEWENSIS.

Ptilinopus pelewensis, Hartl. & Finsch, Proc. Zool. Soc. 1868, p. 7, 1872, p. 101; Gräffe, Journ. Mus. Godeffr. 1873, pt. 1, pl. 7. fig. 5; Finsch, Vög. Palau-Gruppe, Journ. Mus. Godeff. 1875, Heft viii. p. 24.

Hab. Pelew Islands.

This species, described by Messrs. Hartlaub and Finsch (*l. c.*) belongs to the second group into which I have divided the green Fruit-Pigeons of the South-Sea Islands, viz. the one with the yellow apical band on the tail. It differs apparently from its relative in the violet spot on the breast-feathers, and in the colouring of the under tail-coverts, and also, as Dr. Finsch writes me, in the large orange vent-spot. It is evidently a very distinct species. In their first description the above-mentioned authors state that the under tail-coverts are white at base, then yellow, with the tips rose-violet. In the Society's 'Proceedings' for 1872, p. 101, they describe these coverts as bright purplish red, with narrow bright orange edgings. From this there would seem to be considerable variation in the hues of these feathers. I have not seen an example of this species.

Adult. Front and crown rose-violet, margined with yellow; rest of head and neck pale greenish yellow, feathers of upper part of breast crossed transversely with violet spots, tips greenish yellow. Middle of abdomen deep orange. Crissum yellow. Under tail-coverts white at base, then yellow, with the tips rose-violet. Upper parts light green. Primaries black, tipped and margined on the outer web with light green. Secondaries bright green edged with yellow. Middle rectrices green; lateral ones black on inner webs, green on outer, all with an apical yellow band. Bill lead-colour, feet flesh-colour. Length $9\frac{1}{2}$ "', wing $8'' 2'''$, tail $2\frac{1}{2}$ "', tarsus $10'''$, bill $6'''$ (*Hartl. and Finsch*).

10. PTILOPUS REGINA.

Columba purpurata, prem. var., Temm. Fig. et Gall. tom. i. p. 282 (1813) (?).

Columba purpurata, var. *regina*, Swains. Zool. Journ. vol. i. (1825) p. 473.

Columba purpurata, Jard. and Selby, Illust. Ornith. vol. ii. pl. 70 (nec auct.).

Ptilinopus swainsoni, Gould, Proc. Zool. Soc. 1842, p. 18; id.

Birds Austr. vol. v. pl. 55; id. Hand-b. B. Austr. vol. ii. p. 106; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 125; Gräffe, Journ. Mus. Godeff. 1873, pt. 1, pl. 7. fig. 6; Ramsay, Proc. Zool. Soc. 1876, p. 114.

Ptilonopus swainsoni, Gray, Gen. B. (1844) vol. ii. p. 466. sp. 6; id. List B. Brit. Mus. (1856) p. 2. sp. 1; Reich. Tauben, p. 94, pl. 235. figs. 1309-10.

Kurukuru swainsonii, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 256.

Ptilopus swainsonii, Schleg. Mus. Pays-Bas, 1873, p. 4, *Columba*.

Hab. Australia, river Clarence, between the Hunter and Moreton Bay (*Gould*).

Temminck, in his 'Pigeons et Gallinacées,' (*l. c.*), describes a "première variété" of his *Columba purpurata* (= *ewingii*, *Gould*). This has been referred, by Messrs. Finsch and Hartlaub in their work on Central-Polynesian birds, to *Pt. fasciatus*, Peale. I do not think this is correct; and although it may be impossible to prove what really this "variety" of Temminck's is, yet it seems to me that his description points more towards the present species. In the first place Temminck makes no mention of a purplish-black spot upon the abdomen, which *Pt. fasciatus* (Peale) possesses; and he describes the belly as exhibiting "plusieurs nuances de jaune et d'orange," which certainly are not to be found on Peale's bird, which has this part grass-green with a purplish black spot in the centre. As the *Columba purpurata*, Temm., is known to be the *Pt. ewingii*, *Gould*, and did not come from Tahiti, it is probable that he had with it the *Pt. regina*, also from Australia, and looked upon them as varieties of the same species. As this cannot, however, be definitely ascertained, I have placed his name among the synonyms, with a question. Temminck states that there are two specimens in the Paris Museum, brought by Capt. Baudin, which are like the variety described by him. I have examined all the examples brought by Baudin's expedition; and they belong only to the *Pt. ewingii* and *Pt. viridissimus*, Bon. (= *coralensis*, Peale). This species has been generally known as the *Ptilopus swainsoni*, *Gould*; but it was called *regina* by Swainson seventeen years before Mr. *Gould*'s name was published. In fact it is the type of Swainson's genus *Ptilonopus* (*Ptilopus*); and *Gould*'s name must become a synonym.

Male. Forehead and top of head crimson, margined narrowly with yellow. Occiput and back of neck greyish green. Throat white, sometimes tinged with yellow. Breast pale green, each feather tipped with light grey. Flanks dull green. Abdomen deep orange, with a spot of deep lilac-red in the centre. Crissum and under tail-coverts orange-yellow. Upper parts bright green. Primaries slaty grey on inner webs, green on the outer, edged with yellow. The first abruptly and greatly attenuated. Secondaries bluish green, becoming deep blue near their tips, and broadly margined with yellow. Tail deep green, with a broad terminal rich yellow band. Irides reddish orange. Bill greenish black, horn-colour at the tip. Feet olive-brown. Total length $9\frac{1}{4}$ inches, wing $5\frac{1}{2}$, tail $3\frac{1}{2}$, culmen $\frac{1}{2}$.

Immature. Front tinged with rose-colour; loreal space and a line over the anterior half of the eye light yellow. Head, neck, cheeks, back, and breast green, the feathers of the latter tipped with light yellow. Throat yellowish white. Abdomen and under tail-coverts light yellow; the lilac-red spot absent. Rest of plumage as in the adult.

Specimens described are those figured by Bonaparte, Iconogr. Fig. pl. 21.

11. PTILOPUS EWINGII.

Columba purpurata, Temm. Fig. et Gall. tom. i. p. 280 (1813); Less. Traité Ornith. (1831), p. 472 (nec auct.).

Columba purpurata, Desmar. Dict. Sc. Nat. vol. xl. (1826) p. 339; Knip & Prév. Fig. vol. i. pl. 34 (nec auct.).

Le Kurukuru, Less. Compl. Buff. Ois. tom. iii. p. 32 (1837).

Ptilinopus purpuratus, Selby, Nat. Libr. vol. v. pt. 3, p. 103 (1835) (not from Otaheite); Swains. Class. Birds, vol. ii. p. 347 (nec auct.).

Ptilinopus ewingii, Gould, Proc. Zool. Soc. 1842, p. 19; id. B. Austr. vol. v. pl. 56.

Ptilonopus purpuratus, Gray, List B. Brit. Mus. (1844) p. 2, *Gallinæ*.

Ptilonopus ewingii, Gray, List B. Brit. Mus. (1844) p. 2, (1856) p. 3. sp. 2; id. Gen. B. vol. ii. (1844) p. 466; Reich. Tauben, p. 94, pl. 235. figs. 1307-8.

Kurukuru roseicapillus, Des Murs & Prév. (nec Less.), Voy. Vénus, Ois. p. 262 (1855), partim.

Ptilinopus flavicollis, Gray, List B. Brit. Mus. (1856) p. 3. sp. 3.

Ptilonopus flavipectus, Reich. Tauben, p. 94, pl. 235. fig. 1305 (ex pl. 35, Knip, Fig.), ex Timor.

Ptilonopus flavicollis, Reich. Taub. p. 95; Gray, List B. Brit. Mus. (1856) p. 3. sp. 3; Wall. Ibis, 1865, p. 380.

Ptilopus flavicollis, Bon. Consp. Gen. Av. vol. ii. p. 20. sp. 4; id. Compt. Rend. (1855) tom. xl. p. 216. sp. 40; id. Iconogr. Fig. (1857) pl. 25.

Ptilopus ewingii, Bon. Consp. Av. vol. ii. p. 20 (1857); id. Iconogr. Fig. (1857), pl. 24. fig. 1; Schleg. Mus. Pays-B. 1873, p. 5.

Ptilonopus flavicollis, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 125.

Hab. Coburg peninsula, northern coast of Australia (*Gould*); Timor, Flores (*Semmelink*).

The representation of this species given by Madame Knip on plate 34 of her work is so badly executed that it is impossible to recognize what is intended; for it certainly resembles no species that was ever seen. Therefore Bonaparte was perfectly justified in giving another figure in his Iconogr. Fig. pl. 25, from which a very good idea of this species is obtained. It is very safe to say that, unless the originals of some of Madame Knip's plates had been preserved in the Paris Museum to show what the species really were, they would always have remained a stumbling-block to ornitho-

logists. I do not find, after a careful comparison of specimens from the two localities, that the birds from Timor and Australia show any characters that should separate them as distinct species. Desmarest, in the 'Dictionnaire des Sciences,' gives a species of *Ptilopus* as *Columba purpurata*. This has been referred to the *Pt. fasciatus* of Peale. As, however, the description mentions yellow and orange colours on the belly, and, moreover, this bird is referred to plate 34 of Temminck and Knip's 'Pigeons,' which represents *Pt. ewingii*, I have placed Desmarest's name among the synonyms given above.

Adult male. Forehead and crown rose-colour, margined with yellow. Sides of head greyish. Throat light yellow. Breast pale green, feathers tipped with yellow. Abdomen orange, with a pale lilac band crossing the upper part. Flanks green. Crissum and under tail-coverts orange-yellow. Back of neck and upper parts bright green. Wings bluish green. Primaries brownish black on inner webs, dark green on outer, margined with yellow, the first abruptly and greatly attenuated. Secondaries bluish green; base of inner webs brownish black, margined with light yellow. Tail bright green, with a broad terminal yellowish-white bar. Bill black, with yellow tip. Feet brownish. Total length 9 in., wing 5, tail $3\frac{1}{2}$, culmen $\frac{1}{2}$. (Specimen figured by Bonaparte.)

12. PTILOPUS RAROTONGENSIS.

Ptilinopus rarotongensis, Hartl. & Finsch, Proc. Zool. Soc. 1871, p. 30; Gräffe, Journ. Mus. Godeff. 1873, pl. 7. fig. 1.

Hab. Cook's Islands (*Finsch & Hartlaub*); Savage Island (*Whitmee, Brenchley*).

A specimen in the British Museum from Savage Island, one of the Friendly group, is apparently of this species, and answers quite well to the description given by Finsch and Hartlaub. The spot on the lower portion of the breast is rosy red in the centre, surrounded by very dark purple. Abdomen and under tail-coverts are yellow, the latter strongly tinged with orange towards the ends.

Adult. Front and vertex purplish violet-red, surrounded by a narrow indistinct line of yellow; occiput, sides of head, neck, crop, and upper part of breast delicate grey, the feathers of the latter bifurcate and with a pale yellow cross band; chin and middle of throat white, washed with pale yellow; breast and remainder of underparts yellow, purer on the back and under tail-coverts, paler on the anal region; the sides washed with pale greyish green, the same as the feathered tarsus; on the middle of the lower portion of the breast a large spot of dark purplish red; back and upper parts vivid grass-green; primaries and their coverts on the outer web and end brilliant dark green, with a very narrow but distinct white margin, the inner web black; secondaries also dark green, but with a somewhat broader yellow margin along the outer web; coverts of the secondaries dark green, narrowly margined externally and at the end with yellow; larger shoulder-coverts brilliant dark green, broadly margined at the end with grass-green; wing beneath ashy grey; under wing-coverts

delicate grey like the neck; tail dark green with a broad greyish-white end; the feathers, except the two middle ones, are on the inner web dark grey, crossed above the white end by a blackish cross band; the white end is margined narrowly with pale yellow; tail beneath dark grey, at the end broadly white; bill plumbeous, tipped with pale horn-colour; feet reddish brown, nails dark; irides yellow; bill brownish yellow; legs purple-red.

"*Young*. Vertex and hind neck green like the back; front and forehead covered with a pale violet-purple patch; sides of head and neck grey, washed with green, the crop and upper portion of breast with greenish yellow; the underparts are of a less brilliant yellow; the sides darker greyish green; the red pectoral patch is indicated only by some dirty purplish feathers; the pale yellow margins at the ends of the coverts of the secondaries are broader and form a distinct cross line; the white end portion of the tail-feathers is washed at the outer web and apex with green; bill and feet brown; total length 8 inches, wing 5, tail 3.1."—*Finsch and Hartl. (l. c.)*.

13. PTILOPUS FASCIATUS.

Ptilinopus fasciatus, Peale, U.S. Expl. Exped. Ornith. (1848) p. 193, pl.; Gray, List B. Brit. Mus. (1856) p. 4; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 115; Gräffe, Journ. Mus. Godeff. Heft i. (1872) p. 45, Taf. 7. fig. 2.

Ptilinope de Clémentine, Hombr. & Jacq. Voy. Pôle Sud (1841), pl. xxix. fig. 3.

Ptilinopus clementinæ, Bon. Compt. Rend. tom. xl. (1855) p. 216. sp. 48; id. Consp. Gen. Av. vol. ii. p. 22. sp. 9; id. Iconogr. Fig. pl. xxii. fig. 1 (1857); Reich. Taub. p. 96, tab. 240. fig. 2588; id. Suppl. p. 203, pl. iv. figs. 34, 35; Gray, B. Trop. Isl. p. 38; Finsch, Journ. Mus. Godeff. Heft xii. p. 37 (1876).

Columba viridissima, Temm. Pl. Col., text of *C. diademata*.

Ptilinopus! clementinæ, Jacq. & Puch. Voy. Pôle Sud, vol. iii. text (1853), p. 117, Atl. pl. xxix. fig. 3.

Kurukuru clementinæ, Des Murs & Prév. Voy. Vénus, Ois. p. 269 (1855).

Lamprotreron porphyracea, Bon. Consp. Gen. Av. vol. ii. p. 21.

Ptilopus clementinæ, Bon. Iconog. Fig. (1857) pl. xxii. fig. 1.

Ptilonopus fasciatus, Gray, List B. Trop. Isl. (1859) p. 37 (partim).

Ptilonopus clementinæ, Gray, List B. Trop. Isl. (1859) p. 38.

Ptilopus porphyraceus, Schleg. Mus. Pays-B. 1873, p. 8, *Columbæ*.

Ptilopus fasciatus, Schleg. Mus. Pays-B. 1873, p. 6, *Columbæ*.

Ptilonopus ponapensis, Finsch, Proc. Zool. Soc. 1877, p. 779.

Native name *Manu-tagi* (*Whitmee*).

Hab. Samoa (*Peale, Hombron and Jacquinet*); Ponapé Island (*Kubary*).

This is the species first described by Peale (*l. c.*) from Samoa, and afterwards by Hombron and Jacquinet as *clementinæ*. It is a well-marked bird, differing from all its allies in the yellowish hue of its throat, cheeks, and breast. The abdomen is pure green, with

a purplish-black spot in the centre. Several examples are before me, including the type of *Pt. clementinæ*; and the species is readily recognizable from all the others of this especial section of the genus *Ptilopus*. *Pt. apicalis*, Bon., sometimes referred to this species, is quite distinct. I place with a doubt, among the synonyms given above, the *Ptilinopus fasciatus* figured in the Journal of the Museum Godeffroy (*l. c.*); for the colouring of the figure is so defective that it is impossible to arrive at any satisfactory conclusion as to what species is meant. The purplish-black mark on the abdomen is apparently omitted. If the specimen does not possess this, it cannot be the *Pt. fasciatus*, and is probably *Pt. apicalis*, Bon. An examination of the bird itself could alone decide the matter.

Dr. Finsch, in a late number of these 'Proceedings' (1877, p. 779), described a *Ptilopus* from the island of Ponapé from specimens sent to the Museum Godeffroy by Mr. Kubary, as distinct under the name of *Pt. ponapensis*. Not being able to make out by the description wherein this bird differed from the *Pt. fasciatus*, Peale, I wrote to Dr. Finsch asking if it was not possible to have the type sent to me. On his making the request to the Directors of the Museum Godeffroy, they most kindly forwarded me three specimens, among which was the type of the description published in this Journal. I compared it with the examples in the Paris Museum; and, as I supposed it would be, the species is the same as *Pt. fasciatus*, Peale, being identical with those birds in the Paris Museum called *clementinæ* by Hombron and Jacquinot, and procured by them in the Voyage au Pôle Sud, and which do not differ specifically from the *Pt. fasciatus*, Peale. The *Pt. ponapensis* will therefore have to become a synonym of the present species.

Adult. Top of head and forehead bright purple, margined with pale yellow. Back and sides of neck, cheeks, upper part of back, throat, and breast pale yellowish green inclining to ash colour. Flanks and abdomen grass-green, with a purplish-black spot in the centre of the abdomen. Back and upper tail-coverts bronzy green. Primaries and secondaries black on inner webs; outer bright green, edged with yellow on the secondaries; first primary abruptly and greatly attenuated. Some of the innermost secondaries and tertials have a pale violet mark near their tips. Tail bright green, with the terminal fourth bright yellow. Crissum and under tail-coverts orange-yellow. Bill black, tip yellowish. Feet brown. Total length $8\frac{3}{4}$ inches, wing $5\frac{1}{2}$, tail $3\frac{3}{8}$, culmen $\frac{5}{8}$. (From Hombr. & Jacq. specimen in Paris Museum.)

14. PTILOPUS MERCIERI.

Kurukuru mercieri, Des Murs & Prév. Voy. Vénus, Ornith. p. 266 (1855).

Ptilopus mercieri, Bon. Compt. Rend. tom. xl. (1855) p. 216; id. Iconog. Fig. pl. xxii. fig. 2 (1857); id. Consp. Gen. Av. vol. ii. (1857) p. 22. sp. 8.

Ptilinopus mercieri, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 128; Finsch, Proc. Zool. Soc. 1877, p. 410.

Ptilonopus mercieri, Gray, List B. Trop. Isl. (1859) p. 36 ; Reich. Tauben, p. 96.

Hab. Nuka-hiva, Marquesas Islands. (Type.)

A very rare and well-marked species ; but one or two examples besides the type in the Paris Museum are, I believe, all that are known in European collections. It resembles in its coloration the last species, but is readily recognized by the red spot on the head at the base of the mandible.

Adult. Entire upper part of head and occiput and a conspicuous spot at base of the mandible deep rosy purple. Nape, mantle, sides of neck, throat, and breast pale yellowish green, with a tinge of ash upon cheeks and nape. Abdomen and flanks bright greenish yellow ; crissum and under tail-coverts bright yellow. Back and upper tail-coverts bright green, with a yellowish tinge upon the latter. Wings same colour as the back ; primaries black, shaded with very dark green upon the outer webs, the first abruptly and greatly attenuated ; secondaries black on the inner webs, dark green on the outer, and margined with yellow ; the innermost ones with a conspicuous blue-black spot near the tips, and margined broadly with yellow. Rectrices smoke-colour at base, the outer webs barred with pale green in the centre, this colour sometimes extending slightly onto the inner web ; and all the apical third very light yellow. Bill black with light tip. Feet brown. Total length 9 inches, wing $5\frac{1}{2}$, tail $3\frac{3}{8}$, culmen $\frac{1}{2}$. (Description taken from type in Paris Museum.)

15. PTILOPUS ROSEICAPILLUS.

Columba roseicapilla, Less. Trait. Ornith. p. 472. sp. 44 (nec syn.) (1831).

Le Kurukuru des Mariannes, Less. Compl. Buff. tom. iii. Ois. p. 33 (1837).

Ptilonopus purpureicinctus, Gray, Proc. Zool. Soc. 1853, p. 48, pl. lv ; id. List B. Brit. Mus. (1856) p. 4. sp. 5 (partim) ; id. Ann. & Mag. Nat. Hist. 2nd ser. vol. xv. (1855) p. 159 ; id. List B. Trop. Isl. (1859) p. 37.

Kurukuru roseicapilla, Des Murs & Prév. Zool. Voy. Vénus, Ois. p. 259 (1855).

Ptilopus roseicapillus, Bon. Compt. Rend. tom. xl. (1855) p. 216. sp. 46 ; id. Iconog. Pig. (1857) pl. xxii. ; id. Consp. Gen. Av. vol. ii. p. 21. sp. 7.

Ptilonopus roseicapillus, Gray, List B. Trop. Isl. p. 37 ; Reich. Taub. p. 96.

Ptilinopus roseicapillus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 127.

Hab. Ladrone Islands or Marianne Islands.

This is a very distinct species, differing in certain particulars from all others known. Besides Lesson's type there are several examples in the collection of the Paris Museum. It is a rare species, not many examples having been brought to Europe.

Adult. Front, crown, and spot at base of lower mandible rich purple, margined on the posterior part with yellow. Back and sides of neck greenish grey. Throat white. Upper part of breast greyish green, the feathers tipped with pearly white. Lower part of breast crossed by a green band, with a large spot of deep purple in the centre; abdomen orange, with the centre yellowish green; under tail-coverts bright yellow, becoming rich orange towards their tips. Back and upper tail-coverts bronzy green. Wings like the back; primaries black on inner webs, green on the outer, edged with yellow, the first one abruptly and greatly attenuated; secondaries bluish green margined with lemon-yellow. Rectrices pale green on outer webs, smoke-colour on their inner, with a broad terminal band of yellowish white. Bill black, tip yellowish. Total length $8\frac{3}{4}$ inches, wing $5\frac{1}{4}$, tail $3\frac{1}{4}$, culmen $\frac{1}{2}$. (Specimen figured by Bonaparte *l. c.* in Paris Museum. Lesson's type of this species is also before me; but not being in so good a condition as Bonaparte's specimen, I have preferred not to take my description from it.)

16. PTILOPUS HUTTONI.

Ptilinopus huttoni, Finsch, Proc. Zool. Soc. 1874, p. 92.

Hab. Island of Rapa or Opara, South Sea.

I do not know this bird autoptically. It is evidently a very fine and distinct species, differing in many ways from all others of this genus. It is quite large, has the first primary attenuated, and also two thirds of the basal portion of the tarsus feathered. As I have shown, however, in the discussion of the genera in the earlier part of this paper, these two characters are not of any especial importance in defining the generic position of the members of the group now under consideration. The following description is taken from that given by Dr. Finsch of the type.

Adult. Front and crown and spot at base of mandible purplish violet-red; chin red, but paler than the crown. Red of crown margined narrowly and indistinctly with green. Occiput, neck, throat, and crop ashy grey tinged with green; feathers on the crop bifurcate, and dull olive-green in the centre. A pale yellowish longitudinal patch below the chin. A large dark purplish-violet patch on the breast; base of feathers dark olive-green. Sides of breast and flanks dark olive-green. Anal region and back of thighs dirty yellow. Under tail-coverts purplish violet-red like the crown, basal portions yellowish. Upper parts dark olive grass-green. Quills dark green, margined narrowly with yellow, with apical portions having coppery reflections. Shoulder-coverts with a triangular spot of dull lilac. Tail-feathers dark green; apical margin yellowish white, with coppery reflections in certain lights. Bill horny grey, tip yellowish; feet pale, apparently yellow; eye pink. Total length 12.20 inches, wing 6.70, tail 4.90; bill above .75, at gape 1.15; tarsus 1.20; middle toe .95, nail .35.

17. PTILOPUS DUPETIT-THOUARSI.

Ptilinope de dupetit-thouars, Hombr. & Jacq. Voy. Pôle Sud, pl. 29. f. 1.

Columba dupetithouarsii, Neboux, Rev. Zool. 1840, p. 289; id. Voy. Favor. pl. 7.

Columba kurukuru purpuro-leucocephalus, Hombr. & Jacq. Ann. Sc. Nat. xvi. p. 316 (1841).

Ptilinopus emiliæ, Less. Echo du Monde Sav. (1844) p. 873.

Ptilonopus leucocephalus, Gray, List B. Brit. Mus. p. 2 (1844), *Gallinæ*.

Ptilonopus dupetit-thouarsi, Gray, Gen. B. vol. iii. App. p. 23 (1844-49); id. List B. Brit. Mus. (1856) p. 3, *Columbæ*; id. B. Trop. Isl. p. 36 (1859).

Ptilinopus dupetit-thouarsi, Jacq. & Puch. Voy. Pôle Sud, vol. iii. (1858), text, p. 114, atl. pl. 29. fig. 1.

Trygon dupetit-thouarsi, Reich. Syst. Av. p. xxvi.

Thouarsitron leucocephala, Bon. Compt. Rend. tom. xxxix. (1854) p. 276, and tom. xl. (1855) p. 216; id. Iconogr. Fig. (1857) pl. 17; id. Cons. Av. p. 16 (1857).

Columba dupetit-thouarsi, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 241.

Thouarsitron dupetit-thouarsii, Reich. Tauben, p. 93, pl. 240. fig. 2587.

Ptilinopus dupetit-thouarsi, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 129; Finsch, Proc. Zool. Soc. 1877, p. 410.

Ptilopus dupetit-thouarsii, Schleg. Mus. Pays-B. 1873, p. 15, *Columbæ*.

Hab. Christine Island, Marquesas.

A very handsome species, not likely to be confounded with any other of this group. It has, I believe, only been obtained on Christine Island of the Marquesas. The first primary is especially noticeable for the great length of its attenuation.

Adult. Top of head greyish white, margined faintly with light yellow. Throat and spot in front of the eye light yellow. Neck and upper part of back greyish green. Feathers of the breast pale green tipped with grey. Flanks pale green. Abdomen deep rose-colour; crissum and under tail-coverts bright yellow. Back and upper tail-coverts bronzy green. Wings like the back; primaries black, with a dark green shade on their outer webs, and the innermost ones bronzy green at their tips, the first one abruptly and greatly attenuated. Secondaries—outer ones dark green on their outer webs, dark brown on inner with bronze-green tips, innermost ones deep blue near their tips, and all broadly margined with light yellow. Rectrices dark green (sometimes strongly tinged with bronze), with a broad apical yellowish-white band. Bill black, tipped with yellow. Feet red. Total length $9\frac{5}{8}$ inches, wing 6, tail $3\frac{3}{4}$, culmen $\frac{3}{8}$. (Type of the species from Christine Island.)

18. *PTILOPUS XANTHOGASTER.*

Columba purpurata, Temm. (nec auct.) Pl. Col. livr. 43 (1824), vide text to pl. 254, livr. 95 (1835).

Columba xanthogaster, Wagl. Syst. Av. (1827) sp. 29, *Columba*.

Columba diademata, Temm. text to Pl. Col. 254, livr. 95 (1835).

Ptilinopus purpuratus, Steph. (nec auct.) Cont. Shaw's Gen. Zool. vol. xiv. p. 277. sp. 1.

Ptilinopus flavigaster, Swains. Class. B. vol. ii. p. 347.

Le Kurukuru à ventre jaune, Less. Compl. Buff. tom. iii. Ois. p. 36 (1837).

Ptilonopus xanthogaster, Gray, Gen. B. (1844-49) vol. ii. p. 446; id. List B. Brit. Mus. (1856) p. 5; id. List B. Trop. Isl. p. 36 (1859).

Kurukuru xanthogaster, Des Murs and Prév. Voy. Vénus (1855), Zool. p. 238.

Thouarsitreron diademata, Bon. Compt. Rend. tom. xxxix. (1854) p. 876, tom. xl. (1855) p. 216; id. Iconog. Fig. pl. 18 (1857); id. Consp. Av. vol. ii. p. 16 (1857); Reich. Tauben, p. 93, figs. 1326, 1327.

Ptilonopus diadematus, Wall. Ibis, 1865, p. 380.

Ptilinopus diadematus, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 124.

Ptilopus diadematus, Schleg. Mus. Pays-B. 1873, p. 11, *Columba*.

Ptilopus xanthogaster, Salvad. Ann. Mus. Civ. Genov. 1876, vol. ix. p. 199.

Hab. Banda (*Reinwardt, Hoedt*); Koor or Kanaloor, Little Ké, Grand Ké (*Von Rosenberg*); Lettie, east of Timor (*Hoedt*).

This species was first called by Temminck *Columba purpurata*, Lath., in the 43rd livraison of the 'Planches Coloriées,' he supposing that it was a female of Latham's bird. Afterwards he ascertained, from an examination of the specimens obtained by Quoy and Gaimard during the voyage of the 'Uranie,' that the bird figured by him represented a distinct species; and he therefore, in the 95th livraison, issued a new sheet of text calling the bird *diademata*, and requested that the previous page should be replaced by this one. However, between the dates of these two livraisons (1824-1835), Wagler had in 1827, in his 'Systema Avium,' described the species as *xanthogaster*, which name will of course take precedence over Temminck's later one of *diademata*.

Adult. Head, neck, and upper part of the breast greyish white. An orange-yellow line passes over the eye and encircles the occiput. Throat bright yellow. Lower part of breast, abdomen, and under tail-coverts orange-yellow; a large pale grey patch on upper part of abdomen. Upper parts dark green. Centre of tertiaries, scapulars, and innermost secondaries deep blue, bordered with yellow. Primaries bordered with white, the first one abruptly and greatly attenuated. Tail dark green, with an apical band of lighter green. Bill green,

tip yellow; feet dark red. Total length 9 inches, wing $5\frac{1}{4}$, tail $3\frac{3}{8}$, culmen $\frac{1}{2}$.

19. PTILOPUS CHRYSOGASTER.

Ptilonopus chrysogaster, Gray, Proc. Zool. Soc. 1853, p. 48; id. Ann. & Mag. Nat. Hist. 2nd ser. vol. xv. (1855) p. 158; id. List B. Brit. Mus. (1856) p. 5. sp. 10, *Columba*; id. List B. Trop. Isl. p. 36 (1859); Sclat. Proc. Zool. Soc. 1864, p. 9.

Kurutreron chrysogaster, Bon. Compt. Rend. (1854) tom. xxxix. p. 876, (1855) tom. xl. p. 217; id. Iconogr. Fig. (1857) pl. 29. fig. 2; id. Consp. Gen. Av. vol. ii. p. 26. sp. 2 (1857).

Kurutreron chrysoastra, Reich. Taub. p. 92, tab. 245 b. figs. 3525, 3526.

Ptilinopus chrysogaster, Finsch & Hartl. Faun. Centralpolyn. (1867) p. 128; Graeffe, Journ. Mus. Godeff. 1873, Taf. 7. fig. 4.

Hab. Tonga-Tabou, Huaheine, Society Islands (*Wodehouse*).

Although distinct, this species is a close ally of the *Pt. vanthogaster*. It can, however, be readily recognized by its bright yellow abdomen and under tail-coverts and light-purple crown, those of its relative being orange and greyish white respectively. It is one of the two species known to inhabit the Society Islands.

Adult. Front and crown light-purple, margined posteriorly with dark yellow. Rest of head, neck, mantle, breast, and flanks greenish grey. Throat pale yellow. Abdomen and under tail-coverts bright yellow. Back and wings bronzy grass-green. Primaries black, the outer webs margined with dark green, the first abruptly and greatly attenuated for one third its length; secondaries bluish green, margined with pale yellow. Tail dark bronze-green, with a broad terminal band of yellowish white edged with a bright yellow. Bill black, tip yellow. Feet brown. Total length $9\frac{1}{2}$ inches, wing $5\frac{3}{4}$, tail 4, culmen $\frac{3}{8}$.

20. PTILOPUS TAITENSIS.

Columba kurukuru, var. *taitensis*, Less. Voy. Coq. tom. i. text, p. 297 (1826).

Columba oopa, Wagl. Isis, 1829, p. 742.

Columba taitensis, Less. Trait. Ornith. (1831) p. 472.

Le Kurukuru d'Otaïti, Less. Compl. Buff. tom. iii. Ois. p. 35 (1837).

Colombe de Taiti, Neboux, Rev. Zool. 1840, p. 289.

Ptilonopus taitensis, Gray, Gen. B. vol. ii. p. 466 (1844-49).

Ptilinopus furcatus, Peale, U.S. Expl. Exped. Birds, p. 191 (1848).

Kurukuru purpuratus, Des Murs & Prév. (nec auct.) Voy. Vénus, Zool. p. 222 (1855). Spec. Paris Mus.

Kurukuru dupetit-thouarsi, Des Murs & Prév. Voy. Vénus, Zool. pl. vii. (1855).

Kurukuru nebouxii, Des Murs & Prév. Voy. Vénus, Zool. p. 253 atl. pl. vii.

Kurukuru taitensis, Des Murs & Prév. Voy. Vénus, Zool. (1855) p. 251.

Ptilonopus purpuratus, Gray, List B. Brit. Mus. (1856) p. 4 (partim); id. List B. Trop. Isl. (1859) p. 35 (partim); Finsch, Proc. Zool. Soc. 1877, p. 741.

Kurutreron oopa, Bon. Compt. Rend. (1854) tom. xxxix. p. 878; id. Iconogr. Fig. (1857) (text); id. Consp. Av. vol. ii. p. 26; Reich. Taub. p. 92, pl. 245 b. figs. 3527-28.

Ptilonopus purpuratus, Cass. U.S. Expl. Exped. (1858) Ornith. pl. xxx. p. 269; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 122; Finsch, Proc. Zool. Soc. 1877, p. 741.

Ptilonopus purpuratus, Schleg. Mus. Pays-B. 1873, p. 15, *Columbæ*. Hab. Otaheiti.

Peale says this species utters a *coo-coo-coo* slowly and at regular intervals. It is not as sprightly as the Coral-Island Dove, and delights to sit on some dead branch in the shady recesses of the woods. In my article on *Pt. purpuratus* I have given my reasons for considering that this species should not bear that name. The fact that Latham states that the bird he describes came from Otaheite, which is the chief reason why his name of *purpuratus* was assigned to this species, loses entirely its value and force when it is seen that no bird of the genus *Ptilonopus* inhabits Otaheite that answers to his description. Having specimens from both the Society Islands and Tonga in his possession, and having confused them in his description, he probably did not particularly regard his specimen or compare it with his description when he stated it to have come from Otaheite. By no stretch of the imagination can the present species be deemed to have a "purple crown." It is *ashy grey with a lilac tinge*, but in no way does it approach any shade of purple. A series of specimens now before me from the Paris-Museum collection clearly substantiates this.

Adult. Top of head ash-grey with a tinge of lilac. Underparts light ash-green, darkest on the abdomen. Back of neck cinereous, washed with green. Upper parts bright green. Wings bright green; first primary gradually narrowed to tip; the inner webs of secondaries and primaries black, outer webs bright green, those of the secondaries edged with yellow. Centre of abdomen and crissum pale yellow, becoming bright yellow on the under tail-coverts. The tail has the rectrices bright green on the outer webs, black on the inner, and a subterminal interrupted greyish bar, extending only over the inner webs. Feet violet; eyes orange; bill green at base, tip yellow. Feet brown. Total length 9 inches, wing $5\frac{3}{4}$, tail $3\frac{5}{8}$, culmen $\frac{1}{2}$.

21. PTILOPUS SUPERBUS.

Columba superba, Temm. Fig. & Gall. tom. i. p. 277 (1813); Shaw, Gen. Zool. vol. xi. pt. 1, p. 64 (1819); Desm. Dict. Sc. Nat. vol. xl. (1826) p. 337; Temm. & Knip, vol. i. pl. 33.

Columba cyanovirens, Less. Voy. Coq. pl. xlii. fig. 1 (1824); Desm. Dict. Sc. Nat. vol. xl. (1826) p. 343; Less. Trait. Ornith. (1831) p. 471; Knip & Prév. Fig. vol. ii. pl. 8, ♀.

Columba superba, Wagl. Syst. Av. (1827) sp. 32, *Columba*.

La Verte, Less. Compl. Buff. tom. iii. Ois. p. 29 (1837).

La Poukiopou, Less. Compl. Buff. tom. iii. Ois. (1837).

Ptilinopus leucogaster, Swains. Class. B. vol. ii. p. 347.

Ptilinopus superbus, Steph. Gen. Zool. vol. xiv. p. 279. sp. 6 ; Gould, B. Austr. vol. v. pl. lvii.

Ptilonopus superbus, Gray, Gen. B. (1844-49) vol. ii. p. 467 ; id. List B. Brit. Mus. (1856) p. 7 ; id. Proc. Zool. Soc. 1858, p. 184 ; id. List B. Trop. Isl. (1859) p. 39 ; id. List Mamm. and B. New Guin. (1859) p. 46 ; Wall. Ibis, 1865, p. 379 ; Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 786.

Ptilonopus cyanovirens, Gray, Gen. B. (1844-49) vol. ii. p. 467 ; id. List B. Brit. Mus. (1856) p. 8. sp. 23 ; id. Cat. Mamm. and B. New Guin. (1859) p. 47.

Kurukuru superbus, Des Murs & Prév. Voy. Vénus, p. 231 (1855).

Lamprotreron superba, Bon. Consp. Gen. Av. (1857) vol. ii. p. 18 ; Reich. Tauben, p. 97, pl. 236 b. fig. 3366, ♀, pl. 236. figs. 1316-17, ♂ juv. ; Ibis (1866), p. 333 ; Ramsay, Proc. Zool. Soc. 1876, p. 114.

Cyanotreron cyanovirens, Bon. Compt. Rend. (1854) tom. xxxix. p. 878 ; id. Consp. Av. vol. ii. p. 23 ; Reich. Tauben, p. 98, pl. 238. fig. 1324.

Ptilonopus (Lamprotreron) superbus, Gray, Proc. Zool. Soc. 1860, p. 360.

Ptilopus superbus, Schleg. Mus. Pays-B. 1873, p. 30, *Columbæ* ; Salvad. Ann. Mus. Civ. Genov. (1877) vol. x. p. 158.

Lamprotreron porphyrostictus, Gould, Ann. & Mag. Nat. Hist. (1874) vol. xiii. p. 137, ♀ ?

Hab. Amboyna, Ceram, Batchian, Gilolo, Waigiou, Mysol, Aru, New Guinea (*Wallace*) ; Mount Arfak (*Brujn.*) ; Halmahera, Ternate, Batanta, Jobie (*Bernstein, Von Rosenberg*) ; Bouru, Salwatty (*Hoedt*) ; Amberbaki, Mafor (*Raffray*) ; New Hanover (*Cabanis*) ; Booby Islands (*Gould*) ; Cape York, Australia (*Cockerell*).

As will be seen from the list given above, this species has received many names. The two sexes have been described as distinct species, and have been assigned to different genera! It has a wide distribution, having been procured as far to the eastward as New Hanover, reaching Gilolo on the north, and Cape York, Australia, on the south. In fact it is found generally throughout the Papuan group of islands and along the northern part of New Guinea. As it has been obtained at Mount Arfak and Amberbaki, and also on Salwatty on the west coast, it is probable that it will be ascertained to inhabit the entire northern portion of New Guinea. According to Mr. Ramsay, this bird is tolerably abundant in the scrub-lands of the Herbert River and coast-range. The note, which is a rolling guttural "coo," may be heard half a mile off. The young resemble somewhat those of *Pt. swainsoni (regina)*, but do not show the bifurcate breast-feathers before the end of the second year ; but the green bands on the flanks are conspicuous even in the nestling. The

Lamprotreron porphyrostictus of Gould seems to be only a female of this species, having "a purplish-blue spot at back of head."

Adult male. Upper part of head bright purple. Ear-coverts and sides of face light green. Chin and throat ashy white. Nape and sides of neck above shoulders rufous-orange. Breast has the feathers light purple at the base, broadly tipped with ashy grey, this latter hue giving the predominant colour to the breast. A broad bluish-black band crosses the lower part of the breast. Middle of abdomen and crissum white. Flanks and thighs green, the former crossed by a white band above the thighs. Upper parts bright green. Shoulders and a spot on the scapulars, wing-coverts, and secondaries deep purple. Primaries brownish black, the first abruptly attenuated. Secondaries bright green, edged with light yellow. Tail has the rectrices blackish on the inner webs, bright green on the outer, and all except the central pair with a white apical band. Under tail-coverts white, tinged with yellow, with broad central green stripes. Bill olive-green, tip yellowish. Feet pink; claws pale. Iris yellow.

Total length $9\frac{1}{2}$ inches, wing $5\frac{1}{2}$, tail 4, culmen $\frac{5}{8}$.

Specimen described from Ternate. Amboyna examples seem to be bright pale orange on the nape and sides of neck.

Female. Uniform green above. A spot of deep greenish blue on the occiput. Throat greyish white; breast greyish green. Middle of abdomen white.

Young. Uniform yellowish green, tinged with grey upon the breast.

22. PTILOPUS TEMMINCKI.

Columba superba, Knip & Prév. Fig. tab. 42, ♀, ex Celebes (1838).

Kurukuru temminckii, Des Murs & Prév. Voy. Vénus, p. 234 (1855).

Ptilonopus formosus, Gray, Proc. Zool. Soc. 1860, p. 360; Wall. Ibis, 1865, p. 379; Wald. Trans. Zool. Soc. vol. viii. (1872) p. 82.

Ptilopus superbus, Schleg. Mus. Pays-B. 1873, p. 32, *Columbæ*, ex Celebes.

Megaloprepia formosa, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 199.

Hab. Celebes.

This form, from the island of Celebes, possesses quite sufficient difference in coloration to entitle it to be considered distinct from *Pt. superbus*. The nape and sides of the neck are a much brighter orange; and the lower part of the breast is pale purple, graduating insensibly into the bluish-black band that crosses the body above the abdomen. An immature bird of this species from Celebes was figured by Knip & Prévost (*l. c.*) as the female of *Pt. superbus*; but afterwards, convinced that it represented a distinct species, they called it *temminckii* in the Voyage of the Vénus (*l. c.*), which name antedates the *formosus* of Gray. The figure originally published by these authors does not represent well the differences existing between this species and *Pt. superbus*, on account of the specimen not having yet assumed its perfect livery; but the locality, Celebes, proves

that their bird cannot belong to the older known form. Gray did not well indicate the distinctive characters of this species in the 'Proceedings' of this Society when he conferred a name upon it (*l. c.*); but it was properly and completely described by Wallace afterwards in 'The Ibis' (*l. c.*). It can readily be distinguished from its ally by the purple breast, the general plumage of the two species being the same, as are also the dimensions.

The female resembles that of *Pt. superbus*, with rather a deeper coloration.

23. Ptilopus perousei.

Ptilopus perousei, Peale, U.S. Expl. Exped. (1848) p. 195, pl. 54; Cassin, *ibid.* (1858) 2nd ed. p. 274, pl. 33; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 110; *id.* Proc. Zool. Soc. 1869, p. 548; Finsch, Journ. für Ornith. 1872, p. 44; Schleg. Mus. Pays-Bas 1873, p. 10, *Columbæ*.

Ptilinope de Marie, Hombr. & Jacq. Voy. Pôle Sud, pl. 29. fig. 2.

Columba kurukuru superba, Hombr. & Jacq. Ann. Scien. Nat. (1841) tom. xvi. p. 316.

Ptilinopus mariæ, Jacq. & Puch. Voy. Pôle Sud (1853), tom. iii. p. 115.

Kurukuru samoensis, Des Murs & Prév. Voy. Vénus, Zool. p. 247. Type examined.

Ptilopus mariæ, Bon. Compt. Rend. (1854) tom. xxxix. p. 877; *id.* Iconog. Fig. (1857) pl. 26, ad. et juv.; *id.* Consp. Av. vol. ii. p. 22. sp. 10.

Ptilonopus mariæ, Gray, List Columb. (1856) p. 4; Reich. Tauben, p. 96, pl. 240. fig. 2586; *id.* List B. Trop. Isl. p. 37 (1859).

Ptilinopus cæsarinus, Hartl. Journ. für Ornith. 1864, p. 413, juv.

Ptilinopus perousei, Cass. Expl. Exped. (1858) p. 274, pl. 33; Reich. Tauben, Supp. p. 203, nov. taf. 38-40; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 110, t. xi. fig. 1; Gräffe, Journ. für Ornith. 1870, pp. 122 & 408; Finsch, Journ. für Ornith. 1872, p. 44.

Ptilinopus mariæ, Finsch & Hartl. Journ. für Ornith. 1870, p. 131.

Ptilonopus perousei, Whitmee, Ibis, 1875, p. 441.

Hab. Ovalau (*Filhol*); Upolu, Hapai (*Gräffe*); Samoan Islands, Viti-Levu (*Gräffe*); Wakaia, Mokani, Vanua Levu, Loma Loma, Kandavu, Mango (*Layard*); Fiji Islands; Tonga or Friendly Islands.

This species was first described by Peale (*l. c.*) under the name here adopted, and afterwards by Hombron and Jacquinot (*l. c.*) as "Ptilinope de Marie," still later latinized by Jacquinot and Pucheran (*l. c.*) as *Ptilinopus mariæ*. Peale's appellation, however, has undoubted priority. Mr. Peale found it in the mountain-gorges of the Feejee Islands, but not abundant. The native name, *Manu-ma*, means shame or modest bird. It is one of the most beautiful and curiously marked members of this genus. The young are so differently coloured from the adult that they might easily be mistaken for a different species.

Adult. Front and crown, and a broad band across the back, dark purplish red. Head, neck all around, and throat white with a wash of yellow. Feathers of the breast, split at their ends, have their basal half rose-red, apical portion yellowish white; beneath these feathers is a reddish-orange band. Abdomen, flanks, and crissum yellowish white. Under tail-coverts dark purplish red. Back and upper tail-coverts pale greenish yellow. Wings pale grey, feathers margined with greenish yellow. Primaries and secondaries dark bronzy green; first primary abruptly attenuated. Tail greyish white. Bill black, with the tip yellow. Feet black.

Total length $8\frac{5}{8}$ inches, wing $5\frac{1}{4}$, tail $3\frac{1}{4}$, culmen $\frac{3}{8}$.

Immature. Front and crown deep rosy purple. Cheeks grey. Upper parts shining golden green. Throat white. Breast green, feathers tipped with white. Abdomen and crissum yellowish white. Under tail-coverts bright yellow. Wings shining golden green; primaries and secondaries margined with yellow. Tail golden green, very bronzy on the edges and tips of the feathers. Bill and feet as in the adult. (Four specimens before me, all of which lack the purple bar on the breast shown in the figures of Bonaparte and Hartlaub and Finsch.)

24. PTILOPUS CORONULATUS.

Ptilonopus coronulatus, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 138; id. List Mamm. & Birds, New Guinea (1859), p. 45; Wall. Ibis, 1865, p. 378; Schleg. Mus. Pays-Bas 1873, p. 9, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 833.

Ptilonopus coronulatus, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Aru Islands (*Wallace, Rosenberg*); Salwatty and Sorong, (*Bernstein*); Jobie (*Rosenberg*); Yule Island (*D'Albertis*).

This species and the two next mentioned form a small section of this genus, related closely to each other in the distribution of the hues of their plumage. Like so many others of the genus, they are conspicuous for their brightly-coloured crowns and abdomens.

Male. Front and crown pink, bordered posteriorly by a narrow line of purple, succeeded by a broader one of bright yellow. A purple spot on the upper part of the abdomen; middle of abdomen, crissum, and under tail-coverts bright yellow. Entire rest of plumage bronzy green. Secondaries and primaries margined with yellow. First primary abruptly attenuated at tip. Bill greenish yellow. Feet red. Iris orange.

Total length $7\frac{1}{2}$ inches, wing $4\frac{3}{4}$, tail $2\frac{3}{4}$, culmen $\frac{3}{8}$.

Female like the male.

25. PTILOPUS GEMINUS.

Ptilonopus geminus, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 786.

Ptilonopus senex, Brügg. Abhandl. natur. Ver. Brem. 1876, p. 82.

Ptilopus geminus, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Jobie (*Von Rosenberg, Bruijn*); Krudu (*Beccari*); New Guinea, near Dorey (*Bruijn*); Ansum (*Salvadori*).

This is a species apparently entitled to be considered distinct from the *Pt. coronulatus*. It differs by having the front and crown pinkish white, and the upper part of the abdomen around the violet spot saffron-yellow. The cheeks are also a dark greenish grey. First primary abruptly attenuated at tip. Size the same as *Pt. coronulatus*. Prof. Schlegel, in Mus. Pays-Bas, was the first to point out the differences existing between these two birds, but did not deem them of specific importance; and Dr. Salvadori bestowed the name here adopted.

26. PTILOPUS TRIGEMINUS.

Ptilonopus trigeminus, Salvad. Ann. Mus. Civ. Gen. vol. vii. (1875) p. 787.

Ptilonopus marginalis, Brügg. Abhandl. natur. Ver. Brem. 1876, p. 82.

Ptilopus trigeminus, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Salwatty (*Von Rosenberg*); New Guinea, near Sorong (*Bernstein*).

The claims of this form to be considered distinct from the last are based upon very slight grounds; and it may well be doubted if it should be separated from *Pt. geminus*. The only difference is in the slightly paler crown. At best it seems to be but a local race of the preceding species.

27. PTILOPUS IOZONUS.

Ptilonopus iozonus, Gray, Proc. Zool. Soc. 1858, p. 186; id. List Mamm. & Birds New Guin. (1859) p. 46; Wall. Ibis, 1865, p. 378.

Ptilopus iozonus, Schleg. Mus. Pays-B. 1873, p. 17, *Columbæ*; id. Nederl. Tijdsch. Dierk. tom. iv. p. 25 (1873); Meyer, Rowl. Ornith. Misc. pt. ix. p. 342.

Ptilonopus ionozonus, Salvad. Ann. Mus. Civ. Gen. vol. vii. (1875) p. 834.

Ptilopus ionozonus, Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876) p. 198.

Hab. Aru (*Wallace, Von Rosenberg*); New Guinea (*D'Albertis*).

We have here, in this species and its two relatives, another small section of this genus. One of their chief differences is the arrangement of the colours on the margin of the wing, and another the manner in which the terminal band on the tail is exhibited. Although closely allied, the species seem to be quite distinct, their geographical distribution also giving strength to this view.

Male. Yellowish green. Bend of wing greyish violet, mixed with green. Middle of the abdomen deep orange. Vent and under tail-

coverts white, varied with yellow. Greater wing-coverts and tertials bordered with yellow, the latter grey in the middle of each feather. Quills shining deep emerald-green, first one gradually narrowed to the tip. Under surface of wings slate-colour. Tail green, with a broad band of grey at the tip, which is white beneath, especially on the inner webs.

Length 8" 3''' ; wings 4" 9''' (*Gray, l. c.*).

Female with a patch on the abdomen of an orange-yellow.

28. PTILOPUS HUMERALIS.

Ptilonopus humeralis, Wall. Proc. Zool. Soc. 1862, p. 166.

Ptilopus humeralis, Meyer, Proc. Zool. Soc. 1862, pl. 21 ; Schleg. Mus. Pays-B. (1873) p. 16, *Columbæ* ; id. Nederl. Tijdsch. Dierk. tom. iv. p. 24 (1873) ; Meyer, Rowl. Ornith. Misc. p. 342, pt. ix. ; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Salwatty and adjacent coasts of New Guinea (*Wallace*) ; Sorong (*Bernstein*) ; Salwatty and Mansinam (*Meyer*).

This bird is easily distinguished from its immediate allies by the deep-purple band on the shoulder. It apparently ranges across the northern part of New Guinea, having been procured, as will be observed, from Mansinam, on the mainland, in the Bay of Geelvink, to Sorong, on the west coast, and also on Salwatty, opposite Sorong.

Adult male. General plumage bright green. Middle of abdomen rich orange. Crissum and under tail-coverts bright yellow. Shoulders violet-grey, bounded beneath by deep purple. Wing-coverts violet-grey, margined with green. Secondaries margined with yellow. Primaries dark green, the first sharply narrowed towards the tip. Tail bright green above, dark grey beneath, with an apical whitish band. Bill greenish, tipped with yellow ; base above red and swollen. Feet purplish red.

Total length $8\frac{3}{4}$ inches, wing $4\frac{7}{8}$, tail $2\frac{1}{2}$, culmen $\frac{5}{8}$.

29. PTILOPUS JOBIENSIS.

Ptilopus humeralis jobiensis, Schleg. Mus. Pays-B. 1873, p. 16, *Columbæ* ; Rowl. Ornith. Misc. pt. ix. pp. 340, 348, pl. ; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198.

Hab. Island of Jobie.

This species, a close relative of *Pt. humeralis*, has as yet only been found upon the island of Jobie, in the great Bay of Geelvink, New Guinea. It differs chiefly from the species just named in the coloration of the shoulders of the wing, which are violet-grey, without any purple ; and the tail is uniform green above, without the apical grey band.

Adult. General plumage yellowish green. Abdomen rich orange. Crissum and under tail-coverts white, the latter tipped with yellow. Shoulders violet-grey. Wing-coverts violet in the centre, surrounded by greenish blue, and margined with green. Primaries and secondaries dark green, the latter edged with yellow ; first primary nar-

rowed at tip. Tail bronzy green above, beneath black, with an apical greyish-white band. Bill black, tip yellow. Feet red.

Total length $7\frac{1}{4}$ inches, wing $4\frac{3}{4}$, tail $2\frac{1}{4}$, culmen $\frac{5}{8}$.

30. PTILOPUS INSOLITUS.

Ptilopus insolitus, Schleg. Nederl. Tijdsch. (1861) vol. i. p. 61, pl. 3. fig. 3.

Ptilopus humeralis jobiensis (monstr.?), Schleg. Mus. Pays-B. 1873, p. 16, *Columbæ*.

Edirhinus globifer, Cab. & Reich. Sitzungsab. Gesellsch. nat. Freunde Berlin 1876, p. 73; id. Journ. für Ornith. 1876, p. 326.

Edirhinus insolitus, Sclat. Proc. Zool. Soc. 1877, p. 110; Salvad. Proc. Zool. Soc. 1877, p. 196.

Hab. New Ireland (*Huesker*); Duke-of-York Island (*Brown*).

This strange and attractive species was first described by Schlegel (*l. c.*). He afterwards, on account of the protuberance on the forehead, imagined it was only a monstrosity of the *Pt. jobiensis*. This, however, is not the fact, as the species is very distinct. The locality given by Schlegel (New Caledonia) is probably an error, as the bird has lately been received from both New Ireland and Duke-of-York Island. Cabanis and Reichenow have made a new genus for the reception of this bird, "*Edirhinus*," on account of the swelling of the forehead. I have not adopted this term; for the division does not seem to me to be necessary. The same peculiarity exists in species of *Carpophaga*, viz. *C. tumida* and *C. rubricera* and others; and if it is a sufficient cause to separate *Pt. insolitus* from the members of the genus *Ptilopus*, the species above mentioned should also be generically divided from *Carpophaga*, a proceeding which is hardly likely to meet with favour. Nothing is known about the habits and economy of the present species. In the arrangement of the group it naturally comes next to the *Pt. jobiensis*.

Adult. Head, neck, back, breast, and flanks bright bronzy green. Throat green, slightly tinged with grey. Abdomen deep orange. Shoulders and a patch on each side of the back at the edge of the mantle light grey. Wings green; secondaries margined with bright yellow on their outer webs; inner secondaries light grey, margined with green. Tail bright green, with the apical third ashy grey. Crissum and under tail-coverts bright yellow. Bill greenish at base, yellowish at tip. Forehead and base of culmen covered by a bony protuberance large and rounded in form, very conspicuous, and of a red colour. Tarsi and feet red.

Total length $9\frac{1}{4}$ inches, wing 5, tail 3, bill at gape $\frac{3}{4}$.

31. PTILOPUS NANUS.

Columba Naina, Temm. Plan. Col. no. 565; Knip & Prév. Fig. vol. ii. pl. 59.

La Naine, Less. Compl. Buff. tom. iii. Ois. p. 30 (1837).

Ptilonopus naina, Gray, Gen. B. vol. iii. p. 467 (1844-49).

Iotreron nana, Bon. Consp. Gen. Av. vol. ii. p. 25 (1857).

Ionotreron nana, Reich. Taub. p. 100, Taf. 239. fig. 1330.

Ptilonopus nanus, Gray, List Mamm. & B. New Guinea (1859), p. 46; Wall. Ibis 1865, p. 381.

Ptilopus nanus, Schleg. Mus. Pays-B. (1873) p. 21, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 196.

Hab. Triton Bay, New Guinea (*Müller*); Mysol (*Hoedt*).

This is the smallest species of this genus, and one of the most attractive. It is very rare in collections, but few specimens having been procured since it was first described by Temminck (*l. c.*). It is conspicuous among its relatives from having all the wing-coverts tipped with yellow, and from the blue-grey bands on each side of the breast.

Male. General plumage bronzy green. Large band of bluish grey on each side of the breast. A purple spot on the centre of the abdomen. Wing-coverts, scapulars, and tertials tipped with yellow, a greenish-blue shade behind the yellow on the last two. Feathers of the legs whitish. First primary narrowed at tip.

Wing 2 inches 11 lines, tail 1 inch 6 lines.

Female. Green, without abdominal spot.

32. PTILOPUS MONACHUS.

Columba monacha, Temm. Pl. Col. 253; Desm. Dict. Sc. Nat. tom. xl. p. 314 (1826); Knip & Prév. Fig. pl. 53; Wagl. Syst. Av. (1827) sp. 35.

Ptilinopus monachus, Steph. Shaw, Gen. Zool. vol. xiv. (1826) p. 277. sp. 2; Swains. Class. B. vol. ii. p. 347 (1837).

La Monache, Less. Compl. Buff. tom. iii. Ois. p. 29 (1837).

Ptilonopus monachus, Gray, Gen. B. vol. ii. p. 466. sp. 8 (1844-49); Wall. Ibis, 1865, p. 378; Salvad. Ann. Mus. Civ. Genov. vol. vii. p. 786 (1875).

Cyanotreron monacha, Bon. Consp. Gen. Av. vol. ii. p. 24 (1857); Reich. Taub. p. 98, Taf. 236. figs. 1314, 1315.

Ptilonopus (Cyanotreron) monachus, Gray, Proc. Zool. Soc. 1860, p. 359.

Ptilopus monachus, Schleg. Mus. Pays-B. (1873) p. 12, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 198.

Hab. Batchian, Kaisa, Ternate, Gilolo, Morty (*Wallace*); Motir, Dammar (*Bernstein*); Tidore (*Raffray*).

A series of this bird from different localities brought by M. Raffray is now before me. I notice that those from Ternate differ from Gilolo specimens, as well as those from Tidore &c., in being of larger size, and also in having the blue spot of greater extent and situated upon the *abdomen*, and not on the *breast*, as in those from Gilolo. The type of *Pt. monachus* was erroneously stated to have come from Celebes. A specimen in the Paris collection was obtained in exchange from M. Temminck, and the locality given as Celebes. This agrees precisely with Ternate examples, and has the blue patch upon the abdomen. Temminck's figure in the 'Planches Coloriées' exhibits this large abdominal patch very clearly. The Gilolo birds may require separation.

Adult male. Front, crown, lores, moustache, and a spot on the breast greyish blue. Superciliary stripe, chin, and throat, lower part of abdomen, and under tail-coverts lemon-yellow. Rest of plumage of body bright green. Primaries and secondaries black on inner, green on outer webs, edged with white or pale green; first primary abruptly attenuated at tip. Tail bright green, with a sub-terminal bar of darker green. Bill greenish, tip lighter; iris dark; feet red.

Total length 7 inches, wing 4, tail $2\frac{1}{2}$, culmen $\frac{3}{8}$.

Female differs in having the front and top of head greenish blue, the throat only slightly tinged with yellow, no spot on the breast, rest of plumage like the male but all the colours much duller.

33. PTILOPUS PULCHELLUS.

Columba pulchella, Temm. Pl. Col. 564; Knip & Prév. Fig. vol. ii. t. 14.

La Mignonne, Less. Compl. Buff. tom. iii. Ois. (1837).

Ptilonopus pulchellus, Gray, Gen. B. vol. ii. (1844) p. 466. sp. 7; id. Cat. Mamm. Birds New Guin. (1859) p. 44; Reich. Tauben, p. 96, pl. 236. fig. 1311; Wall. Ibis, 1865, p. 378; Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) pp. 786, 833.

Ptilopus pulchellus, Bon. Consp. Gen. Av. vol. ii. p. 22 (1857); Schleg. Mus. Pays-B. 1873, p. 2, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 198, & vol. x. (1877) p. 158.

Hab. New Guinea, Salwatty, Waigiou (*Bernstein*); Mysol (*Wallace*); Amberbaki, Andai (*Ruffray*); Monte Epa, New Guinea (*D'Albertis*).

A very brightly coloured and charming little species. From the localities in which it has been procured, we should judge its range was the northern part of New Guinea, with some of the islands lying off the west coast. Its synonymy is very simple, the species never having received a second name.

Male. Front and crown bright carmine. Sides of head and neck, together with the breast, light grey. Chin, throat, and lores white. A large spot or bar of purplish red on the lower part of the breast. Flanks green. Abdomen orange, shading into deep yellow upon the lower parts and crissum. Under tail-coverts orange. Entire upper parts and back of neck bright green. Wings green; primaries and secondaries black on inner webs, green on outer, those of the secondaries edged with yellow; first primary abruptly attenuated at tip. Tail bright green. Bill yellow, tip greenish yellow. Feet dull carmine. Iris orange, paler within. Eyelids yellow.

Total length 8 inches, wing $4\frac{1}{4}$, tail $3\frac{1}{8}$, culmen $\frac{7}{16}$.

There is no difference between the sexes in plumage.

34. PTILOPUS MELANOCEPHALUS.

Columba melanocephala, Gmel. Syst. Nat. tom. i. p. 781 (1788); Temm. Fig. & Gall. tom. i. (1813) p. 263; Horsf. Trans. Linn. Soc. 1821, vol. xiii. p. 182; Wagl. Syst. Av. (1827) *Columba*,

sp. 33; Temm. Pl. Col. 214; Knip & Temm. Pig. vol. i. pl. 30; Less. Trait. Ornith. (1831) p. 471.

Tourterelle de Batavia, Buff. Plan. Eulum. 214.

Columba melanocephala, Shaw, Gen. Zool. vol. xi. pt. 1 (1819).

Ptilinopus melanocephalus, Steph. Shaw, Gen. Zool. vol. xiv. p. 279. sp. 7; Wall. Ibis, 1865, p. 381.

Le Turgis, Less. Compl. Buff. tom. iii. Ois. p. 26 (1837).

Ptilonopus melanocephalus, Gray, List B. Brit. Mus. (1844) p. 1, (1856) p. 6. sp. 15; id. Gen. B. vol. ii. p. 467 (1844-49).

Ionotreron melanocephala, Reich. Taub. p. 100, Taf. 237. figs. 1318, 1319.

Iotreron melanocephala, Bon. Consp. Gen. Av. vol. ii. p. 24. sp. 2 (1859).

Ptilopus melanocephalus, Schleg. Nederl. Tijdsch. Dierk. vol. iii. p. 207; id. Mus. Pays-B. 1873, p. 28, *Columbæ*.

Ptilopus melanauchen, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 670 (ex Flores).

Iotreron melanocephala, id. ibid. p. 671.

Hab. Java (*Diard, Temminck*); Sumbawa, Flores (*Forstein, Rosenberg*); Sulabessie (*Hoedt*); Lombock (*Wallace*).

Count Salvadori has called the birds from Flores (*l. c.*) *Ptilopus melanauchen*; but I really cannot see that this island form differs sufficiently from typical *Pt. melanocephalus*, ex Java, to require separation as a distinct species. It would seem that *four* races of this style of *Ptilopus* are quite sufficient to indicate the varieties that exist. This species is one of the longest-known in the genus; and while the typical style is confined to Java and the Timor group of islands, representative forms, constituting races if not distinct species, are met with on other islands of the Malay archipelago.

Male. Top and sides of head and neck, and lower part of throat light grey; occiput and back of neck black; chin and throat yellow; crissum and short under tail-coverts rich yellow, long ones carmine; entire rest of plumage bright green; primaries black on inner web, green on outer; first primary slightly scalloped and narrowed at tip; bill yellow, greenish horny at the tip; feet pink-red; orbits bare, green.

Total length $9\frac{3}{8}$ inches, wing $4\frac{1}{2}$, tail 3, culmen $\frac{1}{2}$. (Java.)

Female. Entirely green, with the exception of the longest feathers of the under tail-coverts, which are carmine, like those of the male.

35. PTILOPUS MELANOSPILUS.

Ptilopus melanocephalus, Schleg. Mus. Pays-B. 1873, p. 29, ex Celebes.

Iotreron melanospila, Salvad. Ann. Mus. Civ. Genov. vol. vii. (1875) p. 670.

Ptilinopus melanocephalus celebensis, Brügg. Brem. Abhandl. (1876) p. 80.

Hab. Celebes.

The various forms of *Pt. melanocephalus* were pointed out by

Prof. Schlegel (*l. c.*), and names afterwards given to them by M. Salvadori. The principal difference between examples from Celebes and Java appears to be that the former have a much narrower throat-mark, which is lemon-yellow washed with orange.

36. PTILOPUS CHRYSORRHOUS.

Ptilopus melanocephalus, Wall. Proc. Zool. Soc. 1862, p. 344; Schleg. Mus. Pays-B. 1873, p. 29, ex Sula.

Iotreron chrysorrhoea, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 671.

Ptilinopus sulaensis, Brügg. Abhandl. natur. Ver. Brem. 1876.

Hab. Sula, Ceram (*Bernstein*).

This form has the throat-mark as in specimens from Celebes. The black band on the occiput is smaller, and the abdomen orange-yellow. The characters it offers to support its claim to a distinct rank are not very striking; and it may be questioned if it should be really separated from *Pt. melanocephalus*.

37. PTILOPUS XANTHORRHOUS.

Ptilopus melanocephalus, Schleg. Mus. Pays-B. 1873, p. 29, ex Sanghir.

Iotreron xanthorrhoea, Salvad. Mus. Civ. Gen. vol. vii. (1875) p. 670.

Ptilinopus nuchalis, Brügg. Brem. Abhandl. 1876, p. 80.

Hab. Island of Sanghir.

This well-marked race of *Pt. melanocephalus* differs, both in size and colour of plumage, so much that, more than any of the other styles, it deserves a separate name. The colour of the throat is of a deeper yellow; and both abdomen and crissum are orange; and this colour runs up nearly to the breast instead of being confined to the short under tail-coverts and crissum. It is much larger than any of the other races.

Male. Head and neck pearly white. Occiput and back of neck jet-black. Throat orange-yellow. Abdomen and crissum bright orange; long feathers of the under tail-coverts rich carmine. Entire rest of plumage bright yellowish green. Primaries and secondaries margined on their outer webs, near the tips, with lemon-yellow. First primary gradually narrowed towards tip. Bill black, tipped with yellow. Feet very dark red.

Total length 10 inches, wing $5\frac{1}{2}$, tail $3\frac{3}{4}$, culmen $\frac{3}{4}$.

Female. Entirely green. Feathers of the abdomen tipped with yellow. Some feathers of the under tail-coverts tipped with yellow, others with carmine. Bill black. Feet dark red.

38. PTILOPUS PORPHYREUS.

Columba porphyrea, Temm. Pl. Col. 106 (1824); Knip & Prév. Fig. vol. ii. pl. iv.; Less. Trait. Ornith. (1831) p. 472.

Ptilinopus porphyreus, Swains. Zool. Journ. vol. i. p. 474 (1824-25); Steph. Shaw, Gen. Zool. vol. xiv. (1826) p. 277. sp. 3.

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- Columba roseicollis*, Wagl. Syst. Av. (1827), *Columba*, sp. 30.
Ia Porphyre, Less. Compl. Buff. tom. iii. Ois. (1837).
Ptilonopus erythrocephalus, Swains. Class. B. vol. ii. p. 347 (1839).
Ptilonopus roseicollis, Gray, Gen. B. vol. ii. p. 467 (1844-49);
 id. List B. Brit. Mus. (1844) p. 1, (1856) p. 8.
Ptilopus porphyrea, Reich. Taub. p. 97, pl. 237. figs. 1322-23.
Ptilonopus porphyreus, Wall. Ibis, 1865, p. 380.
Ptilopus porphyreus, Schleg. Mus. Pays-B. 1873, p. 33, *Columbæ*.
Hab. Java (*Wallace, Diard*).

This is a rather large and brightly plumaged species, with a long square tail, approaching somewhat in form *Pt. cinctus*, *Pt. bernsteini*, &c. The first primary is abruptly attenuated at the tip. It is apparently restricted to Java, all the specimens that I have seen having come from that island. There is considerable difference in the colour of the plumage of the adult and young, the latter almost entirely wanting the rose or carmine on the head and breast which makes the adult so conspicuous. There does not appear to be any difference in the plumage of the sexes.

Adult. Head rose-colour, graduating into carmine upon the neck and breast. Beneath the red colour on the breast is a rather broad white band, below which is another of blackish green. Abdomen and flanks clear grey. Thighs and crissum bright green, feathers tipped with bright yellow. Under tail-coverts greenish on the inner webs, white on the outer, with the margins light yellow. Entire upper parts dark yellowish green, lightest on the rump. Primaries black, the first abruptly attenuated at tip. Tail dark green, with a broad dull grey apical band. Bill black, with pale tip. Feet red.

Total length 11 inches, wing $5\frac{3}{4}$, tail $4\frac{1}{4}$, culmen $\frac{5}{8}$.

Young. Have a generally green plumage, with the feathers margined with yellow, and the breast mottled with purplish red.

39. PTILOPUS JAMBU.

Columba jambu, Gmel. Syst. Nat. (1788) vol. i. p. 784; Raffl. Trans. Linn. Soc. (1822) vol. xiii. p. 212; Wagl. Syst. Av. (1827) sp. 28, *Columba*.

Columba jambos, Lath. Ind. Ornith. (1790) vol. i. p. 598. sp. 18; Less. Trait. Ornith. (1831) p. 472.

Columba jamboo, Temm. Fig. et Gall. (1813) p. 257; Temm. & Knip, Fig. vol. i. pl. 27 ♀, 28 ♂; Shaw, Gen. Zool. vol. xi. pt. 1 (1819), p. 49.

Le Jambou, Less. Compl. Buff. tom. iii. Ois. p. 27 (1837).

Ptilonopus jambu, Gray, List B. Brit. Mus. (1844) p. 2, (1856) p. 7. sp. 18; id. Gen. B. vol. ii. p. 467 (1844); Selat. Proc. Zool. Soc. 1863, p. 221; Wall. Ibis, 1865, p. 378.

Ramphiculus jambu, Bon. Consp. Gen. Av. vol. ii. p. 17 (1857); Moore, Proc. Zool. Soc. 1859, p. 465; Reich. Taub. p. 99, pl. 239. figs. 1334-35 ♂, pl. 244. figs. 3488-89 ♀.

Ptilopus jambu, Schleg. Mus. Pays-B. 1873, p. 36, *Columbæ*.

Native name *Punei-chitrah* in Borneo (*Motley*).

Hab. Malacca (*Wallace*); Sumatra (*Müller*); Borneo (*Motley*);

Luzon, Philippines (*Crockewit*) ; Busan and Bintulu, Borneo (*Everett*).

This bird, although very plentiful at Banjermassing, is, according to Mr. Motley, rare in other parts of Borneo. It feeds on fruits, particularly of the different species of *Ficus*. Quite different in its style of coloration, it cannot be confounded with any other species of *Ptilopus*. Of late hundreds of specimens have been sent to Europe to be cut up to decorate ladies' bonnets. I saw only lately a box, at least three feet square, full of these birds, which were condemned to be torn to pieces in order to supply the demand this unfortunate fashion has created.

Adult male. Front, crown, and sides of face in front scarlet, the top of head in some lights having an amethyst shade. Upper part of throat and chin black. Sides of neck, from just below the eye, lower part of throat, and entire underparts pure white, washed with rose-colour on the centre of the breast. Under tail-coverts deep chestnut. Entire upper parts and wings dark green. Primaries black, tinged with green on the outer webs, and edged with rufous, the first abruptly attenuated at tip. Tail dark green, with a dusky grey apical band. Bill bright yellow. Iris sienna-orange. Feet dark red.

Total length $10\frac{1}{4}$ inches, wing $5\frac{3}{4}$, tail 4, culmen $\frac{3}{4}$.

Female. Top of head greyish purple, sides of face in front deep rose, centre of throat and chin black. Upper parts and breast bronzy green, rest of underparts white. Under tail-coverts chestnut. Tail green, with a pale rufous apical band.

Young. Plumage almost uniformly green. Chin pale red. Middle of abdomen white. Under tail-coverts chestnut.

40. PTILOPUS WALLACEI.

Ptilonopus wallacei, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 136 ; id. List Mamm. & B. New Guin. p. 45 (1859) ; Wall. Ibis, 1865, p. 380.

Ptilopus wallacei, Schlegel, Mus. Pays-B. 1873, p. 18, *Columbae* ; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197.

Hab. Aru Islands (*Wallace*) ; Kei Island (*Von Rosenberg*).

This beautiful bird, one of the most lovely species of this lovely group, was procured by Mr. Wallace on the Aru Islands, and described by Gray (*l. c.*). It is still very rare in collections ; and for the examples from which my description was taken I am indebted to the Marquis Doria, who sent them to me from the Museum of Genoa. I have also examined the type in the British Museum.

Adult male. Top of head and occiput carmine. Chin, throat, and sides of head pure white. Nape, neck, and breast pure grey. A band of white across lower part of breast, succeeded by a broad one of deep orange. Abdomen and under tail-coverts light yellow, the latter striped with green. Upper part of back grey, bordered with orange ; scapulars and lesser wing-coverts grey, margined with green. Shoulders orange. Secondaries bright green, margined with lemon-yellow. Quills deep green, the first one narrowed gradually

to the tip. Back and rump yellowish green. Tail coppery green, apical half of lateral feathers greenish white. Bill yellow. Feet red. Iris orange-red.

Total length 10 inches, wing 6, tail $3\frac{1}{2}$, culmen $\frac{3}{4}$.

41. PTILOPUS AURANTIIFRONS.

Ptilonopus aurantiifrons, Gray, Proc. Zool. Soc. 1858, p. 185, pl. 137; id. List Mamm. & B. New Guin. (1859) p. 45; Wall. Ibis, 1865, p. 380.

Ptilopus aurantiicollis, Schleg. Mus. Pays-B. 1873, p. 18, *Columbæ*.

Ptilopus aurantiifrons, var. *novæ-guineæ*, Meyer, Sitz. Ak. Wiss. 1874, p. 508.

Ptilopus aurantiifrons, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 197.

Hab. Aru Islands, Mysol (*Wallace*); Salwatty (*Von Rosenberg*); Batanta (*Laglaize*); New Guinea (*Wallace, D'Albertis*); Jobie (*Meyer, Beccari*).

This is a very beautiful and very distinct species. Dr. Meyer (*l. c.*) has proposed to separate the bird from the mainland of New Guinea, procured at Passim, from that of Jobie, on account of some slight variation in the hues of the plumage, such as the deeper orange of the forehead and the orange tint of the back of the head and breast, with also metallic reflections of the top of the head. I do not deem these slight differences of sufficient importance to give New-Guinea specimens a distinct specific rank. Examples from Batanta before me seem to be intermediate between those of Jobie and Passim, with more orange tints than in individuals from Jobie, and less than in those of Passim.

Adult. Forehead deep orange, rest of top and sides of head yellowish green. Throat pure white. Neck all around and upper part of breast leaden grey. Underparts yellowish green. Mantle and scapulars with some of the lesser wing-coverts grey, margined with green, some of the feathers of the mantle margined with orange. Rest of wing-coverts and secondaries yellowish green, margined with lemon-yellow. Primaries dark green, the first narrowed gradually to the tip. Back and upper tail-coverts yellowish green. Tail bronzy green, with a subterminal interrupted grey band; this band does not extend entirely across the outer web of each rectrix. Under surface smoky grey, with a light-grey apical band. Bill yellow; base swollen, red. Feet red. Iris orange.

Total length $9\frac{1}{2}$ inches, wing $5\frac{1}{4}$, tail $2\frac{3}{4}$, culmen $\frac{3}{4}$.

42. PTILOPUS ORNATUS.

Ptilopus ornatus, Schleg. Nederl. Tijdsch. 1871, vol. iv. p. 52; id. Mus. Pays-B. 1873 p. 18, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, et (1877) vol. x. p. 158.

Hab. New Guinea, Mount Arfak (*Rosenberg, Laglaize*).

This species seems to be entirely confined to the mainland of New

Guinea. At all events I have not seen a specimen from any of the islands. To state that it was a beautiful bird would be only equivalent to saying that it belongs to the genus *Ptilopus*. It is still quite a rare species in collections.

Adult. Top and back of head, sides of face, and back of neck purplish red. Chin and throat pale grey. Upper part of breast dark ochre, becoming a clearer yellow on the lower part of throat. Underparts bright green; feathers of abdomen edged with yellow; centre of abdomen pale yellow. Under tail-coverts lemon-yellow, streaked with dark green. Upper parts bright green, darkest on the mantle. A band of dark purplish red upon the shoulders. Wing-coverts light grey, margined with green. Primaries black, tinged with dark green on outer webs, the first narrowed gradually to tip. Secondaries bright green, edged with lemon-yellow. Tail bright green, with a broad light yellow apical band. Bill yellow, dark brownish towards the base in the skin. Feet red. Iris lemon-yellow, bordered with orange.

Total length $9\frac{3}{4}$ inches, wing 6, tail $3\frac{1}{4}$, culmen $\frac{5}{8}$.

43. PTILOPUS GESTROI. (Plate XXXIV.)

Ptilinopus gestroi, D'Alb. & Salvad. Ann. Mus. Civ. Gen. vol. vii. p. 834 (1875).

Ptilopus gestroi, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 197.

Hab. Yule Island (*D'Albertis*).

This very beautiful species is singularly intermediate between the *Pt. ornatus* and *Pt. perlatus*, possessing as it does the head and neck of the latter with the body and tail of the former. I have only seen one specimen, kindly sent to me by my friend Count Th. Salvadori, a male, collected by Signor D'Albertis in Yule Island. In size it is larger than *Pt. ornatus* and more like *Pt. perlatus*. It is the representative of its near allies in the district it inhabits. As yet Yule Island is the only locality in which it has been obtained.

Adult male. Top and sides of head and upper part of back of neck olive-yellow. Chin, throat, and a broad line going round the lower part of neck light lead-colour, nearly white on throat. Lower part of throat ochraceous yellow. Upper part of breast greenish ochre, changing in certain lights to purplish. Lower parts of breast; abdomen, and flanks bright green. Under tail-coverts yellowish white, striped with bright green. Upper parts bright green. Wings with a rich dark purple band near the shoulders; the coverts pale grey, margined with green. Secondaries green, edged with lemon-yellow. Primaries dark green, the first narrowed gradually at the tip. Tail bright green, with a broad pale yellow apical band edged with green. Bill olive-yellow. Iris yellow. Feet carmine. Total length 10 inches, wing 6, tail $3\frac{1}{4}$, culmen $\frac{5}{8}$.

44. PTILOPUS PERLATUS.

Columba perlata, Temm. Pl. Col. 559, livr. 94; Knip & Prév. Fig. vol. ii. pl. xxi.

La Perlée, Less. Compl. Buff. tom. iii. Ois. p. 31 (1837).

Ptilonopus perlatus, Gray, Gen. B. vol. ii. p. 466 (1844); id. Proc. Zool. Soc. 1858, p. 185; id. Cat. Mann. & B. New Guin. (1859) p. 47; Wall. Ibis, 1865, p. 380.

Megaloprepia perlata, Bon. Compt. Rend. (1854) tom. xxxix. p. 1097.

Sylphitronon perlatus, Bon. Consp. Gen. Av. vol. ii. p. 40.

Ptilopus perlatus, Schleg. Mus. Pays-B. 1873, p. 17, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, (1877) vol. x. p. 157.

Hab. Aru Islands (*Wallace*); New Guinea (*Bernstein*); Salwatty, Jobie (*Von Rosenberg*); Amberbaki (*Laglaize*); Dorey (*Raffray*).

Like the last, this is rather a large species. It was placed by Reichenbach in his genus *Megaloprepia*; but I cannot see that it possesses any characters to separate it generically from the members of the genus *Ptilopus*.

Male. Chin and upper part of throat pure white. Moustache, sides, lower part of throat, and a narrow band separating the neck from the mantle pale grey. Top and sides of head and back of neck greenish yellow. Breast and a line beneath the grey band on the neck rufous. Lower part of breast, abdomen, and flanks yellowish green. Crissum and under tail-coverts pale yellow; the latter striped with dark green. Upper parts and wings bright green, with the centre of scapulars and smaller wing-coverts rosy purple. First primary slightly narrowed at tip. Secondaries edged with light yellow. Tail dark green above, beneath dark smoke-grey, with an apical greyish-white band. Bill yellow; feet red; iris orange-yellow. Total length $9\frac{3}{4}$ inches, wing $6\frac{3}{4}$, tail $3\frac{3}{4}$, culmen $\frac{3}{4}$. No difference in the sexes.

Immature. Top of head green; lores and cheeks greenish yellow. Throat greyish white. Sides and back of neck grey; breast dark ochre. Rest of plumage like the male. (Spec. ex Dorey, New Guinea, Voy. Astrolabe.)

45. *PTILOPUS ZONURUS*.

Ptilopus zonurus, Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876-77) p. 197.

Hab. Aru Islands (*Wallace*, *Von Rosenberg*).

Like *Pt. perlatus*, save that the tail has an apical greyish-white band above and below. Barely distinguishable from *Pt. perlatus*.

46. *PTILOPUS IOGASTER*.

Columba hyogastra, Temm. Pl. Col. pl. 252, livr. 43; Desm. Dict. Sc. Nat. tom. xl. pl. 344 (1826); Knip & Prév. Fig. vol. ii. pl. 54.

Columba iogastra, Wagl. Syst. Av. (1827) sp. 34, *Columbæ*.

L'Hyogastre, Less. Compl. Buff. tom. iii. Ois. p. 30 (1837).

Ptilinopus hypogaster, Swains. Class. B. vol. ii. p. 347 (1837).

Ptilonopus hyogaster, Gray, Gen. B. vol. ii. p. 466 (1844); Wall. Ibis 1865, p. 381.

Iotreron hyogaster, Bon. Consp. Gen. Av. vol. ii. p. 25. sp. 4 (1857).

Ionotreron ionogaster, Reich. Taub. p. 100, pl. 239. figs. 1332-33.

Ptilonopus (Iotreron) iogaster, Gray, Proc. Zool. Soc. 1860, p. 359.

Ptilopus iogaster, Schleg. Mus. Pays-B. 1873, p. 20, *Columbæ*.

Ptilopus ionogaster, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 196.

Hab. Tidore (*Bruijn*); Batchian, Gilolo (*Wallace*); Weda, Dodingo, Ternate, Morotai (*Bernstein*).

This is a well-marked species, its grey head and purple abdomen making it very conspicuous among the other species of the genus.

Adult. Head, except occiput, clear grey. General plumage of body, neck, and occiput bronzy green. Abdomen almost entirely covered by a spot of deep reddish purple. Crissum and under tail-coverts rich lemon-yellow. Wings green. Some of the scapulars and greater wing-coverts violet-grey, margined with green. Primaries emerald-green, first narrowing gradually. Secondaries yellowish green, edged with lemon-yellow. Tail bronzy green, with an interrupted subterminal grey bar, this not reaching the edge of the outer web of the rectrices. Beneath smoke-grey, apical band white. Bill bluish white, tip yellow; feet lilac-purple. Total length 9 inches, wing $5\frac{1}{4}$, tail 3, culmen $\frac{5}{8}$.

47. PTILOPUS PECTORALIS.

Columba pectoralis, Wagl. Isis, 1829, p. 759.

Columba virens, Less. Voy. Coq., descr. ♀; id. Trait. Ornith. (1831) p. 471.

Columba cyanovirens, Less. Voy. Coq. pl. 42. fig. 2, ♀.

Omeotreron pectoralis, Bon. Consp. Gen. Av. vol. ii. p. 27.

Ptilonopus rosepectus, Gray, Proc. Zool. Soc. 1861, p. 432; Reich. Tauben, p. 191; Wall. Ibis, 1865, p. 381.

Ptilonopus virens, Wall. Ibis, 1865, p. 382.

Ptilopus pectoralis, Schleg. Mus. Pays-B. 1873, p. 23, *Columbæ*; Meyer, Rowl. Ornith. Misc. pt. xiii. p. 114 (1878).

Ptilonopus pectoralis, Salvad. Ann. Mus. Civ. Genov. (1875) vol. vii. p. 785.

Hab. Rubi, Passim, Andai, New Guinea (*Meyer*); Mysol (*Hoedt*); Gagie, Guébeh, Waigiou (*Bernstein*); Mafoor, Sook (*Von Rosenberg*); Batanta (*Laglaize*); Amberbaki (*Raffray*).

Examples from Batanta are of larger size, but otherwise do not seem to differ from those procured in New Guinea and other localities. The species has a rather wide distribution among the Papuan Islands.

Male. Forehead and chin greenish grey. A small reddish-purple spot upon the breast. Middle of abdomen and under tail-coverts light yellow; the latter striped with dark green. Rest of plumage of body yellowish green. A few of the scapulars with grey tips. Primaries dark green on outer webs, and bronzy green at tips; first

equal for its entire length. Secondaries yellowish green, edged with pale yellow. Tail bright yellowish green, with a grey spot at tip of feathers on inner webs. Underneath smoky black, with apical grey band. Bill yellow, base red; feet red; iris orange. Total length $8\frac{1}{4}$ inches, wing $4\frac{3}{4}$, tail $2\frac{3}{4}$, culmen $\frac{5}{8}$.

Female. Like the male, but without the spot on the breast.

48. *PTILOPUS VIRIDIS*.

Columba viridis, Linn. (nec Scop.) Syst. Nat. vol. i. p. 283. sp. 23 (1766); Gmel. Syst. Nat. (1788) p. 780. sp. 23; Shaw, Gen. Zool. vol. xi. pt. 1, p. 65 (1819); Knip & Prév. Fig. vol. ii. pl. xvii.

Tourterelle à gorge pourprée d'Amboine, Buff. Pl. Enl. no. 142.

Ptilinopus viridis, Steph. Shaw, Gen. Zool. vol. xiv. p. 299. sp. 5 (1826).

Ionotreron viridis, Reich. Taub. p. 99, pl. 237. figs. 1320–21.

Iotreron viridis, Bon. Iconogr. Fig. (1857) pl. 28, juv. ♀?; id. Consp. Gen. Av. vol. ii. p. 24. sp. 1.

Ptilonopus viridis, Gray, Gen. B. vol. ii. p. 467 (1844–49); id. List B. Brit. Mus. (1856) p. 6; id. List Mamm. & B. New Guin. (1859) p. 45; id. Proc. Zool. Soc. 1863, p. 34; Wall. Ibis, 1865, p. 381.

Ptilopus viridis, Schleg. Mus. Pays-B. 1873, p. 22, *Columba*; Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876) p. 195.

Hab. Bouru, Amboyna, Ceram, Goram (*Wallace*); Harouka, Monavolka (*Rosenberg*).

This is the oldest-described member of the genus *Ptilopus*, and the only one known to Linnæus. It is entirely an insular species, confined to the islands west of New Guinea, upon which land I have found no record of its ever having been procured. It is represented in the east (Bay of Geelvink) by the next species.

Male. Forehead and upper part of throat light grey. Lower part of neck, and upper part of breast very deep reddish purple. Rest of underparts yellowish green. Crissum and under tail-coverts light yellow; the latter with broad dark green stripes on the inner webs of the feathers. Upper parts, occiput, and back of neck bronzy green. A grey band near the shoulder, and tertials also grey, edged with green. Primaries dark green; first about equal in width for the entire length; secondaries bronzy green, margined with lemon-yellow. Tail bronzy green and tipped with yellow, lightest on the edges. Bill yellow, base red; orbits yellow; feet pink-red; iris with inner ring yellow, outer red. Total length 8 inches, wing $4\frac{1}{4}$, tail 3, culmen $\frac{1}{2}$.

49. *PTILOPUS GEELVINKIANUS*.

Ptilopus viridis geelvinkianus, Schleg. Nederl. Tijdsch. vol. iv. (1871) p. 23; id. Mus. Pays-B. 1873, p. 23.

Ptilopus musschenbræckii, Rowl. Ornith. Misc. pt. xiii. pl. 95, p. 114; Salvad. Ann. Mus. Civ. Gen. vol. ix. (1876) p. 195.

Hab. Islands of Mafor and Meosnour (*von Rosenberg, Raffray*); Mysore (*Meyer*).

This bird, separated from the *Pt. viridis* by Schlegel, is apparently entitled to be considered a distinct species. With a large series of examples before me, mainly brought by M. Raffray, the difference of the colour on the breast is very perceptible, being very much brighter and purer than the deep purple of *Pt. viridis*. In other respects the two species closely resemble each other. The term *musschenbrœckii*, being only a MS. name of von Rosenberg's, without any description of the bird given, must become a synonym.

Adult. Forehead and chin dark grey; sides of face grey, washed with green. Breast and lower part of throat bright reddish purple, much lighter than the similar spot in *Pt. viridis*. General plumage yellowish green, slightly bronzed in certain lights. Centre of abdomen and under tail-coverts pale yellow; the latter striped with dark green. Across the wing, near the shoulders, a broad band of pale grey. Some of the innermost secondaries with a spot of light grey near their tips; first primary not narrowed. Tail yellowish green, each feather with a subterminal grey spot on the inner web. Bill yellow, base red. Iris red; feet red. Total length 8 inches, wing $4\frac{1}{2}$, tail 3, culmen $\frac{5}{8}$. Sexes alike.

50. PTILOPUS EUGENIÆ.

Iotreron eugeniæ, Gould, Proc. Zool. Soc. 1856, p. 137; Gray, List B. Brit. Mus. (1856) p. 6; Bon. Iconogr. Fig. (1857), text.

Ptilonopus eugeniæ, Gray, List B. Trop. Isl. (1859) p. 39; Wall. Ibis, 1865, p. 381; Sclat. Proc. Zool. Soc. 1869, p. 124.

Ptilopus eugeniæ, Salvad. Ann. Mus. Civ. Genov. vol. ix. (1876) p. 195.

Hab. Solomon Islands.

The type specimen, which I have examined, of this apparently distinct species, is in a mutilated condition, and wants entirely the tail. The species is very close to the two preceding, but differs in the white head. The type in the British Museum is unique.

Top of head, cheeks, and upper part of throat white. Centre of lower throat and breast rich deep crimson. Back of neck and upper parts yellowish green. Across the shoulders a band of grey, and the tertiaries tipped with the same. Secondaries bright green, edged on the outer webs with yellow. Under surface greyish green. Tail wanting. Bill apparently greenish at base, yellow at tip. Wing $4\frac{3}{4}$ inches, culmen $\frac{1}{2}$. (Type.)

51. PTILOPUS RIVOLII.

Columba rivoli, Knip & Prév. Fig. vol. ii. pl. 57; Des Murs, Iconogr. Ornith. pl. 4 (1845).

Iotreron rivolii, Bon. Consp. Av. vol. ii. p. 25 (1857).

Ionotreron rivolii, Reich. Taub. p. 100, Taf. 235. fig. 1306.

Ptilonopus rivoli, Wall. Ibis, 1865, p. 381.

Ptilonopus solomonensis, Gray, Ann. Mag. Nat. Hist. vol. v. (1870) p. 328.

Ptilopus rivolii, Sclat. Proc. Zool. Soc. 1877, p. 109.

Hab. Duke-of-York Island (*Brown*), Wanga, San Christoval (*Brenchley*).

The type of the *Ptilopus rivolii* was originally in the collection of the Prince d'Essling, which was purchased by Dr. Wilson, and now forms part of the Museum of the Academy of Natural Sciences at Philadelphia. In the catalogue of Prince d'Essling's collection made at the time of its sale, the specimen of *Pt. rivolii* is entered on page 30 as having "Inde" for the habitat. The exact locality of this handsome species was unknown until Mr. George Brown, C.M.Z.S., obtained it in Duke-of-York Island, lying off the north-east coast of New Guinea. I am inclined to believe that the *Pt. solomonensis*, Gray, is based on a young bird of this species.

Male. Forehead purplish red; breast crossed by a broad white band, a large rose-red spot on the abdomen; lower part of abdomen, crissum, and under tail-coverts bright yellow. Rest of plumage bright green, with some small round bluish-black spots on the scapulars. In its dimensions this species agrees with the following one.

Female. General plumage bright green.

52. PTILOPUS PRASINORRHOUS.

Ptilonopus prasinorrhous, Gray, Proc. Zool. Soc. 1858, p. 185; id. List B. & Mamm. New Guin. 1859, p. 46; Wall. Proc. Zool. Soc. 1863, p. 34, ex Bouru.

Ptilopus rivoli, Schleg. (nec Prév.) Nederl. Tijdsch. tom. iv. p. 21 (1873); id. Mus. Pays-B. 1873, p. 24, *Columbæ*; Salvad. Ann. Mus. Civ. Gen. vol. ix. 1876, p. 196, ex Bouru.

Ptilopus prasinorrhous, Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 196, (1877) vol. x. p. 157.

Hab. Ké Islands, Koor, Tegoor, Matabello, Monavolka, Pulo-Pandang, Goram, Salwatty (*Von Rosenberg*); Bouru, Waigiou (*Wallace*); Amboina, Mysol (*Hoedt*); Koffiao (*Beccari*); Batanta (*Bruijn*); Sorong (*D'Albertis*).

This species appears to be very variable in its coloration from different localities; and it is a question if examples might not be procured leading completely from the typical style of this bird into that of the *Pt. rivolii*. It is mainly distinguished from this last by having the vent and under tail-coverts green, slightly margined with yellow, instead of these parts being bright yellow as in *Pt. rivolii*. In the collection at Leyden are specimens from the same locality (island of Bouru), with the under tail-coverts green and yellow respectively, which would seem to show that this character is an indefinite and unsatisfactory one. I do not consider that the specific distinctness of this bird from the *Pt. rivolii* has as yet been established. A larger series than I have had at my command, from all the localities known, will be necessary before the question can be determined. If the two are distinct, it would be a curious fact that, in the case of such closely allied species, *Pt. rivolii* should be restricted to the Duke-of-York Island, while the present is scattered over a dozen islands and also found upon the mainland of New Guinea.

Resembling in its coloration *Pt. rivoli*, but differs chiefly in the vent and under tail-coverts being green, slightly margined with yellow; the reddish-purple patch of the abdomen sometimes reaches the white pectoral band. First primary slightly narrowed at tip. Bill yellow; feet red.

53. Ptilopus STROPHIUM.

Ptilinopus strophium, Gould, Jard. Contr. Ornith. 1850, p. 102, pl. 105 (note).

Ptilonopus strophium, Gray, List B. Brit. Mus. (1856) p. 6 (partim); id. List Mamm. & B. New Guin. (1859) p. 46; Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 196.

Ionotreron rivoli, Reich. Taub. p. 100, pl. 236 b. fig. 3364.

Ptilopus miqueli, Schleg. Ned. Tijdsch. (1873) vol. iv. p. 22; id. Mus. Pays-B. 1873, p. 26, *Columbæ*; Rowl. Ornith. Misc. part xii. p. 60, pl. 88 (1878); Salvad. Ann. Mus. Civ. Gen. vol. ix. p. 196 (1876).

Ptilopus miqueli, Meyer, Sitzungs. d. k. Akad. d. Wiss. vol. lxx. p. 128 (1874).

Ptilinopus miqueli, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 786.

Hab. Duchâteau Isles (*MacGillivray*, type of *Pt. strophium*, Gould); Jobie, Meosnoum (*Von Rosenberg, Meyer*).

Mr. Gould's type of his *Pt. strophium* is in the British Museum, and is undoubtedly the same bird as was afterwards described as *Pt. miqueli* by Prof. Schlegel. The type is faded upon the forehead and is more of a rosy hue than purple-red; but it is plainly evident, I think, that the original colour has faded away. Another specimen in the Museum collection, without any locality, has the forehead purplish red. The name *miqueli* will have to give way to the older one of *strophium*.

Male. Front and top of head purplish red. A broad pure white band across the breast, beneath which is a stripe of bluish green. Centre of abdomen and under tail-coverts bright yellow. Entire rest of plumage bright yellowish green, with some small round bluish-black spots on the scapulars near the tips. Primaries greenish black, first narrowed to the tip. Tail same colour as the back. Bill greenish, tip yellowish; feet red; iris orange. Total length $10\frac{1}{4}$ inches, wing $4\frac{1}{2}$, tail $2\frac{3}{4}$, culmen $\frac{3}{8}$. (Ex type.)

Female. Plumage almost entirely green.

54. Ptilopus BELLUS.

Ptilonopus bellus, Selat. Proc. Zool. Soc. 1873, p. 696, pl. 57; Salvad. Ann. Mus. Civ. Genov. (1875) vol. vii. p. 786.

Ptilopus bellus, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197, and (1877) vol. x. p. 157.

Hab. Atam, New Guinea (*D'Albertis*); Mount Arfak (*Laglaize*); Amberbaki (*Raffray*).

This very fine and distinct species is one of the largest of the

section of the genus to which it belongs. Originally described by Mr. Sclater from specimens obtained by D'Albertis on Mount Arfak, it has since been found in other parts of the northern coast of New Guinea. Beside its much greater size, it can always be distinguished from *Pt. speciosus*, its nearest ally, by the rosy-red forehead and crown, together with the purplish-red spot on the abdomen.

Male. Front and crown deep rosy red. Occiput dark bluish green. Breast covered by a broad, halfmoon-shaped band, pure white on the lower parts and sides, lemon-yellow on the upper part. Abdomen has the middle portion covered by a purplish-red patch. Entire rest of plumage yellowish green, with small round bluish-black spots on the scapulars, and the feathers of the crissum and under tail-coverts edged with yellow. Primaries greenish black, first not narrowed. Tail yellowish green, with a pale apical band of the same colour. Bill yellow; feet dark red; iris yellow. Total length $9\frac{1}{4}$ inches, wings $5\frac{3}{4}$, tail $3\frac{3}{4}$, culmen $\frac{5}{8}$.

55. PTILOPUS SPECIOSUS.

Ptilopus speciosus, Schleg. Nederl. Tijdsch. vol. iv. (1871) p. 23; id. Mus. Pays-B. 1873, p. 27, *Columbæ*; Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 197.

Hab. Sook, Mafor (*Von Rosenberg, Raffray*); Misori (*Raffray*).

This very peculiarly-coloured and striking species is apparently confined to the islands in the great Bay of Geelvink, New Guinea. It was first described by Schlegel from specimens sent by Von Rosenberg, and is very rare in collections. Lately a large series has been received at the Paris Museum, obtained by M. Raffray in the localities given above. There does not appear to be any variation among individuals from the different habitats.

Male. General plumage yellowish green, darkest on the head and neck. A broad bright-yellow band bordered on the lower side with white crosses the breast. Abdomen beautiful lilac; lower part of abdomen and under tail-coverts bright lemon-yellow. A purple spot in front of the eyes. Primaries grey on their outer webs and tips; first not narrowed especially towards tip. Tail yellowish green. Bill black, tip yellow; feet dark red. Total length 7 inches, wing $4\frac{5}{8}$, tail $2\frac{5}{8}$, culmen $\frac{5}{8}$.

Female. Green, with the feathers of the abdomen margined yellow, and under tail-coverts yellow. Primaries have outer webs and tips grey.

56. PTILOPUS JOHANNIS.

Ptilopus johannis, Sclat. Proc. Zool. Soc. 1877, p. 556.

Hab. Wild and D'Entrecasteaux Islands, of the Admiralty group ('Challenger' Expedition).

This very distinct species was obtained by the 'Challenger' Expedition, and derives its name from Mr. John Murray, one of the naturalists. By the kindness of Mr. Sclater I have been enabled to examine the types. With its nearest relationship perhaps to

Pt. speciosus, it differs conspicuously from all the members of this particular section of the genus *Ptilopus* in having the band which crosses the breast all yellow—and in this respect differs from all the others, as it is the only one so marked, the others having this band white, or yellow and white. It is a very beautiful species.

Male. General plumage green, with small dark blue spots on the scapulars. A broad band across the chest, which, together with the lower part of abdomen, crissum, and under tail-coverts, is light yellow. Top of head and middle of abdomen lilac. Primaries leaden grey, with the tips light grey, nearly white. Bill black, feet dark red. Total length $7\frac{1}{2}$ inches, wing $4\frac{5}{8}$, tail $2\frac{1}{2}$.

Female. Nearly uniform green; middle of belly and crissum yellow.

57. *PTILOPUS LUTEOVIRENS*.

Colombe jaune, Hombr. & Jacq. Voy. Pôle Sud, pl. 12. f. 2.

Columba luteovirens, Hombr. & Jacq. Ann. Sc. 2^e sér. vol. xvi. (1841) p. 315.

Colombe de Felicie, Hombr. & Jacq. Voy. Pôle Sud, pl. 12. f. 1, juv.

Columba felicie, Hombr. & Jacq. Ann. Sc. 2^e sér. vol. xv. (1841) p. 316, juv.

Columba flava, Gray, Gen. B. vol. ii. p. 470 (1844–49).

Calœnas luteovirens, Hartl. Wieg. Arch. 1852, p. 134.

Ptilinopus! luteovirens, Jacq. & Puch. Voy. Pôle Sud, vol. iii. p. 112 (text) (1853).

Ptilinopus! feliciæ, Jacq. & Puch. Voy. Pôle Sud, (1853), text, juv.

Ptilonopus luteovirens, Gray, List B. Trop. Isl. (1859) p. 38.

Chrysœnas luteovirens, juv. *feliciæ*, Reich. Taub. Suppl. p. 203, Taf. nov. no. iii. fig. 32.

Chrysœnas luteovirens, Reich. Taub. p. 90, t. 245. fig. 5594, t. 263. figs. 1469–70.

Chrysœna luteovirens, Bon. Compt. Rend. (1854) tom. xxxix. p. 879; id. Consp. Av. vol. ii. p. 28; id. Iconogr. Fig. (1857) pl. 31; Finsch & Hartl. Faun. Centralpolyn. (1867) p. 134, Taf. ii. fig. 4, juv.; Layard, Proc. Zool. Soc. 1875, p. 436; Finsch, Proc. Zool. Soc. 1875, p. 557; Finsch, Journ. Mus. Godeff. Heft xii. (1876) p. 10.

Omotreron feliciæ, Bon. Consp. Gen. Av. vol. ii. p. 27 (1857), juv.

Hab. Fiji Islands, Balaou (*Hombr. & Jacq.*, type); Ovalau (*Layard*); Viti Levou (*Godeffroy*).

This species, according to Layard, dwells in the forest-covered parts of the island of Ovalau and the Rewa. It breeds in October, November, and December. On account of the colour of their plumage it is difficult to see them in the trees; but their presence is betrayed by their voice, which sounds something like a bark. It feeds on berries, and is fond of the seeds of araliaceous trees and creepers of the genus *Melastoma*.

This species is the type of Bonaparte's genus *Chrysœna*, the chief

character being the lanceolate shape of the feathers of the body. This, however, would seem to indicate more a specific than a generic value, as the *Pt. victor*, with which the present bird is generically identical, does not possess this form of feather. As is shown in my remarks on genera, in the beginning of this paper, neither of these two species exhibits any characters that, in my opinion, would separate them from the genus *Ptilopus*, those relied upon by authors for establishing a distinct generic rank not being at all peculiar to, or possessed solely by, these birds.

Male. Head greenish yellow. Throat and irregular collar on lower part of neck lemon-yellow. Feathers of breast and back lanceolate sulphur-yellow, tinged with green. Abdomen, vent, and under tail-coverts bright yellow. Primaries dark greenish yellow, first not narrowed especially; secondaries pale green, both edged with lemon-yellow. Tail pale green, graduating into light yellow at the tip. Bill black, tip yellow. Feet black. Total length 8 inches, wing $4\frac{3}{4}$, tail $2\frac{1}{2}$, culmen $\frac{5}{8}$. (Ex type, Paris Museum.)

Young male. Head and throat pale green. General plumage bright green, with yellow lanceolate feathers appearing upon the breast and back. Abdomen mixed with yellow and green. Under tail-coverts saffron-yellow. Primaries and secondaries brownish green, broadly margined with yellow. Some feathers of the rump and upper tail-coverts tipped and margined with yellow. Tail bright green. Bill black, tip yellow. Feet black.

Female. General plumage bright green, verging to yellow on the throat and abdomen. Primaries and secondaries margined with light yellow. Under tail-coverts pale yellow. Tail bright green, lightest at the tip. Bill black, tip yellow. Feet black.

58. *PTILOPUS CORRIEI*.

Ptilinopus corriei, Ramsay, Proc. Linn. Soc. New South Wales, 1876, p. 133, vol. i.

Hab. Malacolo Island, New Hebrides.

In the above-named publication Mr. Ramsay describes a specimen of *Ptilopus* as representing a distinct species. It is evidently immature, and, judging from the description, belongs to the group comprising *Pt. victor*, *luteovirens*, and *layardi*; and it is not impossible that it may be one of these species from a new locality, although the dimensions given are larger than those of any examples of the above-named species that I have seen. The type had been in spirits, and, as stated by Mr. Ramsay, was somewhat discoloured on the sides of the neck and interscapular region. The texture of the feathers resembled that of *Chrysœnas viridis*, Layard (*Pt. layardi* of this paper). Only a single specimen was procured by Dr. A. Corrie, at Malacolo Island, during the cruise of H.M.S. 'Pearl,' in August 1875. More specimens will be required before its specific rank can be satisfactorily determined.

The following is Mr. Ramsay's description:—

Male. "The whole of head, chin, and throat olive-green, becoming bright green on the neck and occiput; the whole of the remainder

of the upper and under surface bright deep green; the wing-quills deep golden green, mesially shaded with black; the inner webs of the primaries black towards the middle and basal portion of the feather. The three inner secondaries and their corresponding coverts of the larger series only have an oblique oblong blotch of bright golden yellow at their tips, which on the secondaries is confined to the outer web only, the smaller wing-coverts at the bend of the wing adjacent to the scapulars having a roundish, crescentic or cordate spot of white (?) near the tips of the feathers; some show a green shaft-line and a margin of green round the tip of the feather; under wing-coverts green; the outer series ashy; under surface of the wings ashy brown; under surface of the tail ashy brown, becoming lighter towards the base, and crossed conspicuously near the tip with a band of light ashy grey; upper surface green, the grey band not so conspicuous; the inner portion of the legs and lower part of the abdomen yellowish (much faded); under tail-coverts yellow, blotched with oblong marks of green on inner webs; the thighs, outer feathered portion of the legs, and the flanks bright green, like the rest of the body; tail of 14 feathers, square, even; of the wings, the third, fourth, and fifth feathers are nearly equal and longest; bill, legs, and feet bluish lead-colour; tarsi not feathered to the toes, lower portion scaled in front. Total length 9.5 inches, wing 6.3, tail 3; bill from forehead 0.8, from gape 1; tarsus .95."

59. PTILOPUS LAYARDI.

Chrysænas viridis, Layard, Proc. Zool. Soc. 1875, pp. 151, 437; Finsch, Proc. Zool. Soc. 1877, p. 736.

Native name *Sokulu* (Layard).

Hab. Kandavu, Fiji Islands.

This apparently very distinct Pigeon was described by Layard (*l. c.*) from specimens obtained by himself at Kandavu. He at first identified it, as he tells us, with *P. luteovirens*, but afterwards, having obtained it in the full breeding-dress, saw that his first impression was an erroneous one, and then conferred upon the species the name of *viridis*. Several specimens of this pretty Dove are in the collection of the 'Challenger' Expedition, which, through the kindness of my friend Dr. Sclater, I have had the opportunity of examining. They are all in the adult dress, with greenish-yellow head, and entirely green body relieved only by the yellow of the under tail-coverts. The feathers of the back are slightly inclined to the lanceolate form of those of *P. luteovirens*; but the two species cannot well be confounded together. As I do not consider that the birds included in the term *Chrysænas* possess any characters that should properly separate them generically from *Ptilopus*, it will be impossible to retain the name of *viridis* given to this species by Mr. Layard, as there is already, unfortunately, a species of this group so named, described originally by Linnæus. I have therefore substituted the name *layardi*, in justice to my friend, who has, in his researches among the birds of the Fiji Islands, exhibited the same energy and

love for natural history which has always characterized him in other parts of the world in which his lot has been temporarily cast.

Male. Head and neck greenish yellow; under tail-coverts bright yellow. Thighs and lower part of abdomen grey. Rest of plumage of body and wings dark green, with a golden gloss upon back and chest. Primaries are edged with yellow on outer webs, and, together with the secondaries, have nearly all the inner webs golden yellow; the first primary is narrowed gradually towards the tip. Bill blue-black, tip livid; legs dark crimson; iris yellowish. Length $7\frac{3}{4}$ inches, wing $4\frac{1}{2}$, tail $2\frac{1}{2}$, culmen $\frac{5}{8}$ (skin).

Female. Like the male, but less brilliant generally.

60. PTILOPUS VICTOR.

Chrysæna victor, Gould, Proc. Zool. Soc. 1871, p. 642; Layard, Proc. Zool. Soc. 1875, p. 437; Finsch, Proc. Zool. Soc. 1875, p. 557; Rowl. Ornith. Misc. pt. v. pl.; Finsch, Journ. Mus. Godeff. Heft xii. (1876) p. 10; Lay. Ibis, 1876, p. 151; Finsch, Proc. Zool. Soc. 1877, p. 736.

Native name *Buli ndamu* (Layard).

Hab. Fiji Islands, Bua (*Filhol*); Vanua Levu, Taviuni, Ngami, Lanthala (*Layard*).

Layard says that this Dove is the glory of the forest of Taviuni, and is also found in Lanthala and Rambli Islands, also on Vanua Levu, about Bua, Ndreketti, &c. The young males would be mistaken for females, but that the vent is more orange. They breed about December or November, making a rude platform of small twigs for a nest about ten feet from the ground, and lay two eggs, axis 1" 4"', diam. 1", pure white in hue. The species feeds on many sorts of small and large berries and fruits.

Male. Head and throat dull olive-green. Entire rest of plumage bright orange-carmine. Under surface of wings bright yellow. Primaries greenish yellow, edged with orange; first not narrowed. Tail, which is very short and almost hidden by the upper-coverts, brownish orange, graduating into pure orange at the tip. Bill and feet black. Total length 7 inches, wing $4\frac{1}{4}$, tail $2\frac{1}{2}$, culmen $\frac{1}{2}$.

Female. Head yellowish green, lightest upon the throat. Entire plumage of body rich green; inner webs of primaries and secondaries broadly margined with orange; outer webs edged with the same colour. Under tail-coverts orange, with the centre of the feathers green. Bill black, tip yellow; feet black.

61. PTILOPUS LECLANCHERI.

Trerolama leclancheri, Bon. Compt. Rend. (1855) tom. xli. p. 247; id. Iconog. Fig. (1857) pl. 16.

Carpophaga leclancheri, Gray, List B. Brit. Mus. (1856) p. 21. sp. 19.

Leucotreron gironieri, J. Verr. & Des Murs, Ibis, 1862, p. 342, pl. 12, ♀; Wald. Trans. Zool. Soc. vol. ix. p. 213 (1875).

Ptilopus geversi, Schleg. Ibis, 1863, p. 120.

Ptilopus hugonianus, Schleg. Nederl. Tijdsch. 1863, p. 60, pl. 3.

fig. 2, juv. ex Luevu; Wall. Ibis, 1865, p. 378; Schleg. Mus. Pays-B. 1873, p. 36.

Ptilopus leclancheri, Salvad. Ann. Mus. Civ. Genov. (1876) vol. ix. p. 199.

Hab. Philippines, Luzon, and Guimaras (*Meyer*).

This species was first described by Bonaparte (*l. c.*) as *Trerolama leclancheri*. The type is a female, and resembles in a great degree the specimen described by Lord Walden (*l. c.*) from Guimaras, brought by Meyer, and called, in Lord Walden's memoir on Philippine birds, *Leucotreron gironieri*. The type was brought to Paris by M. Leclancher, who was attached as surgeon to the expedition of the 'Favourite;' but no locality whatever was given to the specimen; so that of New Guinea, furnished by Bonaparte (*l. c.*), is erroneous. Messrs. J. Verreaux and Des Murs redescribed the species in 'The Ibis' (*l. c.*) as *Leucotreron gironieri*, their specimen being also a female or possibly a young male, bearing, however, a very close resemblance to Bonaparte's type. Schlegel (*l. c.*) also described a young bird of the same species as *Ptilopus hugonianus*. All these names must become synonyms of that given by Bonaparte.

Male. Head, neck, and upper part of the breast ashy white, washed on the nape with pale green; chin and throat black. A broad dark purple band crosses the breast just below the white. Flanks and underparts ashy green. Under tail-coverts cinnamon. Upper parts bright green. Wings green; primaries and secondaries black on inner webs, dark green on the outer, all edged with yellowish white. Tail bright green, with a terminal light-yellow band. Bill yellowish; feet red. Total length $9\frac{1}{2}$ inches, wing 6, tail 4, culmen $\frac{3}{4}$.

Female. Head and breast ashy white, nape pale green. Throat and chin black. A purplish band on the breast, which does not extend across. Rest of underparts and flanks tawny ashy green. Under tail-coverts chestnut. Upper parts and tail as in the male described above. (From type of *Tr. leclancheri*, Paris Museum.)

62. PTILOPUS OCCIPITALIS.

Ptilonopus occipitalis, Gray, Gen. B. vol. ii. p. 467, pl. 118 (1844); id. List B. Brit. Mus. Gall. p. 1 (1844), (1856) p. 7. no. 17; Wall. Ibis 1865, p. 378; Mart. Journ. für Ornith. 1866, p. 22. no. 124.

Ramphiculus occipitalis, Bon. Compt. Rend. tom. xxxix. p. 878 (1854); id. Iconogr. Fig. pl. 14 (1857); id. Consp. Av. vol. ii. p. 17; Wald. Trans. Zool. Soc. vol. ix. (1875) p. 214.

Omotreron batilda, Bon. Compt. Rend. tom. xxxix. p. 878 (1854); id. Consp. Av. vol. ii. p. 27; Wall. Ibis, 1865, p. 382; Von Mart. Journ. für Ornith. 1866, p. 22. no. 125 (juv.).

Ionotreron occipitalis, Reich. Taub. p. 101, pl. 239. fig. 1331.

Columba occipitalis, Schleg. Handl. vol. i. p. 411 (1857).

Lamprotreron porphyria, Bon. (nec Temm.), Iconogr. Fig. (1857) pl. xv. (juv.), from type of *O. batilda*.

Ptilopus occipitalis, Schleg. Mus. Pays-B. 1873, p. 35, *Columbæ*.

Hab. Luzon, Philippines (*Meyer*).

Bonaparte described a young bird of this species, in the 'Comptes Rendus' (*l. c.*), as *Omotreron batilda*; and afterwards, in his 'Iconographie des Pigeons,' he figured this specimen as the young of *Ptilopus porphyreus*! The type of *O. batilda* is in the collection of the Paris Museum, and proves to be simply a young bird of *P. occipitalis*. It is larger than any specimen of *porphyreus*, of which there is a series before me, even exceeding the adults in its measurements, and presents quite a different coloration. The type was brought from the Philippines in 1839 by M. Barrot, but no particular island is indicated.

Adult. Top and front of head light leaden grey; sides of face below the eyes and entire back of head purplish red. Throat yellowish white; sides of neck and breast grey, like the top of head. Entire centre of breast, from the lower part of the throat to the abdomen, ochraceous; flanks bright green; a large purplish-red spot in the middle of the abdomen. Crissum grey mingled with white. Upper parts bronzy green, darkest upon the rump and upper tail-coverts. Wings bright green; primaries and secondaries black on their inner webs, green on their outer and edged with light yellow. Tail bright green, with an apical greyish band; under coverts white, with a broad green stripe on their inner webs. Bill red, with light tip; feet red. Total length $11\frac{3}{4}$ inches, wing $6\frac{1}{8}$, tail $4\frac{1}{2}$, culmen $\frac{5}{8}$. (Specimen figured by Bonaparte, Icon. Fig. pl. 14.)

Young. Top of head, back of neck, and entire upper parts bronzy green. Throat yellowish white. Sides of head yellowish white, interspersed with green. Underparts greyish green, bronze upon the breast. Crissum and under tail-coverts whitish, the latter striped with green. Wings like the back, the secondaries and primaries edged on outer web with yellowish white. Tail bright green, with a greyish-white apical band, which is observed only on the inner webs. Total length 11 inches, wing 6, tail 4, culmen $\frac{5}{8}$. (Type of *batilda*, Bon.)

63. PTILOPUS GULARIS.

Columba gularis, Quoy & Gaim. Voy. Astrol. Zool. vol. i. p. 247, pl. xxix. (1830).

La Mentonnière, Less. Comp. Buff. tom. iii. Ois. (1837).

Columba gularis, Knip & Prév. Fig. pl. xi.

Laryngogramma gularis, Reich. Tauben, p. 102, pl. 233. fig. 1297; id. suppl. p. 203, nov. Taf. iv. fig. 44.

Leucotreron gularis, Bon. Consp. Av. vol. ii. p. 15 (1857); Wald. Trans. Zool. Soc. vol. viii. (1872) p. 83; Salvad. Ann. Mus. Civ. Gen. (1875) vol. ix. p. 670.

Ptilonopus gularis, Wall. Ibis, 1865, p. 377.

Ptilopus gularis, Schleg. Mus. Pays-B. (1873) p. 57, *Columbæ*.

Hab. Celebes.—Menado (*Wallace*); Tondano (*Forsten*); Gorontalo, Wawou, Bone, Modelido (*Von Rosenberg*).

Peculiarly a Celebes species, the present bird has fortunately never received another name beside the one originally bestowed on it by Quoy and Gaimard (*l. c.*). In its long tail it differs from the majority of the species of *Ptilopus*, and approaches the birds placed by Reichenbach in "*Megaloprepia*;" but the first primary is abruptly attenuated.

Adult. Top and sides of head grey, graduating into light green upon the occiput and hind neck. Chin and centre of throat very deep chestnut; rest of throat, neck on sides, and underparts lavender-colour, with a large spot in the centre of the abdomen yellowish white washed with rufous. Thighs and under tail-coverts rich dark cinnamon. Upper parts, wing, and tail bright green, the rectrices indistinctly tipped with yellowish green. Primaries and secondaries black on inner webs, green on outer, and edged with light yellow. Bill yellow; iris orange-brown; eyelids and orbits bare, blue; feet red. Total length $13\frac{1}{4}$ inches, wing $6\frac{5}{8}$, tail $5\frac{7}{8}$, culmen $\frac{3}{4}$. (Type in Paris Museum.)

64. PTILOPUS FISCHERI.

Ptilinopus fischeri, Brügg. Brem. Abhandl. (1876) p. 82, Taf. iv.

Hab. Celebes.

I only know this handsome species by the description and figure published by Dr. Brüggemann (*l. c.*). It is apparently very distinct from all the known forms, and cannot be compared with any of them. The red patch on the side of the head is a very peculiar character.

It may be briefly described as follows:—

"Back green. Head, neck, and breast partly grey, partly golden ochre. Under tail-coverts grey and white intermixed. Sides of head in the male bluish red; back of neck with a black band. Total length 400 millims., wing 168, tail 147, bill 17, tarsus 21." (*Brügg. l. c.*)

65. PTILOPUS ALBOCINCTUS.

Ptilinopus albocinctus, Wall. Proc. Zool. Soc. 1863, p. 496, pl. xxxix.; id. Ibis, 1865, p. 377.

Ptilopus cinctus florensis, Schleg. Nederl. Tijdsch. vol. iv. p. 20 (1873).

Hab. Flores (*Wallace*).

This species, which seems distinct from *Pt. cinctus*, was first described by Wallace (*l. c.*). It differs from its ally in having the neck and breast light blue, and the first primary less attenuated. The bill, according to Wallace, is greenish at the base, yellow at tip; feet bright red. I have examined the type in the British Museum. In size and all other characters, save those pointed out, it is like *Pt. cinctus*.

66. PTILOPUS CINCTUS.

Columba cincta, Temm. Fig. & Gall. vol. i. p. 243 (1813); Knip & Prév. Fig. vol. ii. pl. xxiii.; Shaw, Gen. Zool. vol. xi. p. 50 (1819); Wagl. Syst. Av. (1827) sp. 19, *Columba*.

Leucotreron cincta, Bon. Compt. Rend. (1854) tom. xxxix. p. 876; id. Consp. Av. vol. ii. p. 15; Reich. Tauben, p. 103, pl. 238. fig. 1328.

Ptilonopus cinctus, Gray, Gen. B. vol. ii. p. 467 (1844); id. List B. Brit. Mus. (1844) p. 2, (1856) p. 8. sp. 22; Wall. Ibis, 1865, p. 377.

Ptilonopus cinctus, Schleg. Nederl. Tijdsch. tom. iv. p. 19 (1873); id. Mus. Pays-B. 1873, p. 34.

Hab. Timor (*Wallace, Müller*); Wetter (*Hoedt*).

This bird is about the same size as the *Pt. gularis*, but has a long and square tail, the feathers of which are very broad. It belongs to the large members of this genus, and should, from its size, be included in the genus *Megaloprepia*, if that were really a valid division; but then it has an abruptly attenuated primary, which although not a generic character, as I have shown, still, according to Reichenbach, prevents its entrance into his genus (?).

Adult. Head, neck, throat, and entire breast white; rest of underparts yellowish green, separated from the white breast by a black band. Entire upper parts, wings, and tail black; the rectrices with a broad apical dark grey band. Under tail-coverts dark grey on the inner webs, white on the outer, margined broadly with bright yellow. Bill ochre-yellow, greenish at base; feet red; iris red. Sexes alike. Total length $12\frac{1}{4}$ inches, wing $6\frac{1}{2}$, tail $5\frac{1}{2}$, culmen $\frac{5}{8}$.

67. PTILOPUS LETTIENSIS.

Ptilonopus cinctus lettiensis, Schleg. Mus. Pays-B. 1873, p. 35, *Columbæ*; id. Nederl. Tijdsch. Dierk. tom. iv. p. 20 (1873).

Hab. Lettie, east of Timor (*Hoedt*).

This bird is apparently entitled to be considered distinct from the *Pt. cinctus*. I am indebted to my friend Count H. Turati for the loan of a very fine specimen, exhibiting very clearly the differences existing between it and *Pt. cinctus*. The principal one is the coloration of the tail, which for one third of its length from the tip is yellowish white, instead of having merely a dark grey apical band as in *Pt. cinctus*. Another difference between the birds is that the last-named species has the first primary abruptly attenuated, while that of the present is gradually narrowed to the tip, which is sharply pointed. The tails of both are long and square, as in *Pt. bernsteini*.

Adult. Head, mantle, throat, neck, and breast ivory white; beneath the white of the breast is a broad blue-black band. Lower part of abdomen and crissum greenish yellow. Under tail-coverts brownish in the centre; rest white, margined with yellow. Back and wings black; first primary gradually attenuated to the tip, which is pointed. Rump greenish grey. Tail greyish black for two thirds of its basal half, rest yellowish white. Bill green, tip ochre; feet dark red. Total length $11\frac{3}{4}$ inches, wing $6\frac{1}{4}$, tail $4\frac{5}{8}$, culmen $\frac{5}{8}$.

68. PTILOPUS BERNSTEINI.

Carpophaga formosa, Gray, Proc. Zool. Soc. 1860, p. 360 (nec *P. formosus*, Gray, ex Celebes).

Ptilopus bernsteini, Schleg. Nederl. Tijdsch. 1863, p. 59, pl. iii. fig. 1.

Ptilonopus ochrogaster, Bernst. Journ. für Ornith. 1864, p. 408.

Ptilopus ochrogaster, Bernst. Nederl. Tijdsch. 1865, p. 324.

Carpophaga bernsteini, Wall. Ibis, 1865, p. 388.

Megaloprepia bernsteini, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 788.

Hab. Halmahera, Ternate, Batchian, Obi (*Bernstein*); Gilolo (*Wallace*).

This and the next three species have been placed by some authors in Reichenbach's genus *Megaloprepia*. It seems very evident that at least some of the species which he placed in his genus were not known to Reichenbach autoptically, or else when desiring to separate certain members of the genus *Ptilopus* generically from the others he would probably not have selected *Pt. perlatus*, with its short tail and narrow rectrices, as one of those especially fitted to go with the present and the succeeding ones. I fail to see any characters whatever that should cause this bird and *Pt. magnificus*, with its two races, to be separated generically from *Ptilopus*. The gradation from *Pt. leclancheri*, through *Pt. gularis*, *cinctus*, *albocinctus*, *bernsteini*, *puellus*, and *assimilis*, is complete between the moderate-sized, comparatively short-tailed species of *Ptilopus* and the large *Pt. magnificus*, which brings the genus into *Carpophaga*. In his diagnosis of *Megaloprepia*, Reichenbach gives no character that may not equally apply to *Ptilopus*; and it seems to me to be a division highly artificial, and in no way necessary.

This species was first described by Gray (*l. c.*); but as he had already bestowed the name *formosus* upon another species of *Ptilopus*, his appellation cannot stand; and even for those authors who place this bird in *Megaloprepia*, to avoid confusion, it is better to continue the name bestowed by Schlegel.

Male. Head and neck greenish grey; breast, back, wings, and tail bright green. In the middle of the lower part of the breast a large spot of rich deep red. Abdomen and flanks yellowish ochre; under tail-coverts brownish yellow-ochre. Bill black, tip yellowish; feet black. Total length $11\frac{1}{4}$ inches, wing $5\frac{3}{4}$, tail $5\frac{1}{2}$, culmen $\frac{5}{8}$.

Female. Like the male, but wants the red spot on the breast, and has the neck light green.

It may be seriously questioned if the three following races should be continued as distinct species. They only differ in size; and this is very variable even among those examples acknowledged as representing *one of the species*. The localities of the forms also seem to have no recognizable bounds; and while the island form *puella* is the smallest, yet at Cape York it meets its large relative *magnificus*, which here, according to Mr. Ramsay, is *very variable in size*, and which, if the bird is distinct, ought not to be found at all in this part of the continent, which should be reserved for *assimilis*. I have no doubt that in a large series of examples from various localities the small *puella* would graduate directly up to *magnificus*,

and leave no characters by which the forms could be distinguished apart. The specimens of the smallest race, called *Pt. puella*, which are found in the island of Jobie and also at Mount Epa in the south of New Guinea, have the under surface of the tail lighter in colour than those from other localities, being blackish-grey instead of blackish-brown. This, however, cannot be considered of any specific importance, the geographical distribution alone forbidding the idea that they could be designated as a fourth race; for the *Pt. puella* is known to dwell between the Jobie and Mount-Epa birds as well as to the south of the latter, which fact is alone sufficient to preclude the supposition that two species, or even races, are indicated by the slight difference observable. For convenience I have kept the synonymy of the three races distinct; but they really should only be regarded as representing but one species.

69. PTILOPUS PUELLA.

Colomba amarante, Less. Voy. Coq. (text), 1826, p. 711.

Colomba puella, Less. Bull. Sc. Nat. (1827) p. 400; id. Trait. Ornith. (1831) p. 469; Knip & Prév. Pig. vol. ii. pl. i.

Carpophaga puella, Gray, List B. Brit. Mus. (1856) p. 21. sp. 18; Wall. Ibis, 1865, p. 388.

Megaloprepia puella, Bon. Consp. Gen. Av. vol. ii. p. 40; Reich. Taub. p. 102; id. Suppl. p. 203, nov. Taf. iv. fig. 41; Ramsay, Proc. Zool. Soc. 1876, p. 118.

Ptilopus puellus, Schleg. Mus. P.-Bas, 1873, p. 38, *Columbæ*.

Megaloprepia puella, Salvad. Ann. Mus. Civ. Gen. (1875) vol. vii. p. 788, vol. iv. p. 199, (1877) vol. x. p. 158.

Mapouha of the Papuans (*Less.*).

Hab. Cape York, Australia (*Ramsay*); Mysol, Salwatty, Waijiou, Ghémien, New Guinea (*Bernstein, Hoedt*); Jobie (*Von Rosenberg*); Dorey (*Lesson*); New Ireland (*Lesson*).

The type of this species is in the Paris Museum. There are two specimens, one from Dorey, New Guinea, and the other from New Ireland, both of which were procured during the voyage of the 'Coquille.'

Adult. Front and chin greyish white; head and neck greenish grey; centre of throat and neck in front, and underparts to the thighs, rich purplish red; lower part of abdomen and crissum rich yellow. Under tail-coverts greenish grey. Wings, back, and tail bright grass-green. Upon the outer web of the wing-coverts are some pale yellow spots forming a line along the wing. Bill yellow, red at base; iris orange-red; feet yellow-green; claws dusky. Total length $13\frac{3}{8}$ inches, wing 6, tail $6\frac{3}{4}$, culmen $\frac{3}{4}$. Sexes alike.

70. PTILOPUS ASSIMILIS.

Carpophaga assimilis, Gould, Proc. Zool. Soc. 1850, p. 201.

Megaloprepia assimilis, Bon. Compt. Rend. tom. xxxix. p. 1077; Reich. Taub. p. 102; id. Suppl. p. 203, nov. Taf. iv. figs. 42, 43;

Ramsay, Proc. Zool. Soc. 1876, p. 115; Salvad. Ann. Mus. Civ. Gen. (1876) vol. ix. p. 199.

Ptilopus assimilis, Schleg. Mus. Pays-B. 1873, p. 38, *Columbæ*.

Hab. Cape York, Rockingham Bay, Australia (*Ramsay*).

This is a race of *Pt. magnificus*, representing it in the northern part of Australia, and differing mainly in being smaller in size. Whether this is sufficient to constitute a species, I do not propose at present to discuss, but merely to remark that, as in many groups of birds it has been very properly rejected as a specific character, it would seem that, in the present instance, this bird and *Pt. magnificus* might with advantage be retained under one specific name.

Pt. assimilis was procured by Mr. Ramsay, together with *Pt. magnificus* itself, at Rockingham Bay, North-east Queensland. Except in its smaller size, he found that it presented no differences whatever from *Pt. magnificus*. He regards it as a connecting link between the large form and the smallest (*Pt. puella*), of which form he had received a fine pair collected at Cape York, Australia, by Mr. J. A. Thorpe, this being the first instance known to me in which *Pt. puella* has been obtained in Australia.

Head and throat grey; centre of throat and underparts to middle of abdomen rich purple. Under wing-coverts, thighs, and under tail-coverts rich yellow. Back and rump yellowish green. Wing and tail bright grass-green; wing-coverts with a conspicuous oblong spot at the tip. Total length 14 inches, wing 7, tail 6, culmen 3.

The specimen described was obtained at Cape York by the 'Challenger' Expedition.

71. PTILOPUS MAGNIFICUS.

Columba magnifica, Temm. Pl. Col. 163; id. Trans. Linn. Soc. vol. xiii. p. 125 (1822); Wagl. Syst. Av. sp. 26 (1827), *Columba*; Knip & Prév. Fig. vol. ii. pl. 25; Gould, B. Austr. vol. v. pl. lviii. (1848); Ramsay, Proc. Zool. Soc. 1876, p. 115.

Carpophaga magnifica, Selby, Nat. Libr. Ornith. vol. v. p. 119.

Megaloprepia magnifica, Reich. Tauben, p. 101, pl. 283. figs. 1299, 1300.

Ptilopus magnificus, Schleg. Mus. Pays-B. 1873, p. 38, *Columbæ*.

Hab. South Australia, river Hunter to Moreton Bay (*Gould*); Rockingham Bay, North-east Queensland (*Ramsay*).

Mr. Ramsay states in this journal (*l. c.*) that he found this species abundant at Rockingham Bay in North-east Queensland, and *very variable in size*.

Adult. Forehead and chin light grey; head and neck greenish grey, becoming light green on sides of breast; centre of throat and neck in front, breast, and abdomen deep purple. Lower part of abdomen orange-yellow. Under tail-coverts yellowish green. Wings, back, and tail bright green; wing-coverts with large pale yellow spots, forming a bar across the wing. Bill red at base, tip yellow. Total length 19 inches, wing 9, tail 7, culmen $\frac{7}{8}$.

May 21, 1878.

F. D. Godman, Esq., F.Z.S., in the Chair.

The following papers were read :—

1. Description of a new Genus of Snakes of the Family *Calamariidæ*, from Southern India. By Lieutenant-Colonel R. H. BEDDOME, C.M.Z.S.

[Received April 29, 1878.]

XYLOPHIS, n. gen.

Body cylindrical, slender; head short, not distinct from neck, gradually narrowed forwards and pointed; eye very small, with round pupil; tail about one seventh of the total length; maxillary teeth very numerous, equal; the two palatine rows very conspicuous, and the teeth slightly longer behind; upper labials four, the first very minute, the second and third enter the orbit, fourth in contact with a large temporal; rostral very small; an elongate loreal gradually narrowed behind replaces anteorcular and occupies all the space from rostral to eye; nasals simple, very small; frontals only one pair, large, a very small superciliary shield and a similar postocular. Scales smooth, without apical groove, in fifteen rows; anal single; subcaudals broad, bifid, or a few occasionally entire.

XYLOPHIS INDICUS, n. sp.

General colour of a uniform brown like an earthworm, but beautifully iridescent; length $9\frac{1}{2}$ inches, of which the tail is $1\frac{2}{3}$ inch: vertical, pointed behind, rounded in front; occipitals elongate; ventrals about 136; subcaudals about 26, bifid, or a few of them entire; tail ending in a blunt point.

Hab. The dense heavy evergreen forests on the mountains at the south of Cumbum Valley, Madura district; elevation 5000 feet. Under old logs along with *Uropeltidæ*.

The specimen, which is unique, has been forwarded to the British Museum.

2. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. X. On the Birds of the Atlantic Islands and Kerguelen's Land, and on the Miscellaneous Collections. By P. L. SCLATER, M.A., F.R.S.

[Received May 2, 1878.]

In this paper, which concludes the preliminary reports on the terrestrial birds collected during the voyage of the 'Challenger,' I

give an account of the specimens obtained on the Tristan-d'Acunha group and Kerguelen's Land, and of a few small collections made at various other localities which were touched at during the course of the expedition. I have arranged all these, according to the dates at which the places were visited, as follows:—

	Date.	No. of specimens.
A. St. Iago, Cape-Verds	July 1873	4
B. Tristan d'Acunha	October 1873	12
C. Kerguelen Land	January 1874	16
D. New Zealand	June 1874	4
E. Hong-Kong	December 1874	7
F. Meangis Islands	February 1875	3
G. At sea	February 22, 1875	2
H. Humboldt Bay, New Guinea . .	February 24, 1875	2
I. At sea	April 7, 1875	5
J. Japan	May 1875	4
		—
		59

A. *St. Iago, Cape-Verds* (July 1873).

Four examples of the peculiar King-hunter of this Island, *Halcyon erythrogastra* (Temm.), Sharpe's Kingf. p. 171, pl. 63, were obtained here. In one specimen the eyes are marked "black," and the contents of the stomach "insects."

B. *Tristan-d'Acunha group* (October 1873).

Seven examples of the peculiar Thrush of Tristan d'Acunha, described by Mr. Gould, P. Z. S. 1855, p. 165, as *Nesocichla eremita*, were obtained. The sexes are not marked; but the specimens are all nearly alike, so that probably the sexes do not differ in plumage. The irides are noted as "black."

In the adjoining island "Inaccessible," five specimens of the peculiar Finch lately described by Dr. Cabanis (Journ. f. Orn. 1873, p. 154) as *Nesospiza acunhæ* were obtained. All five are alike; the eyes are marked "hazel;" but the sexes are not recorded.

Of *Crithagra insularis*, described by Dr. Cabanis at the same time as the *Nesospiza*, there is no specimen in the collection, nor of the Island-Hen (*Gallinula nesiotis*, Sclater, P. Z. S. 1861, p. 261). The latter is said to be now almost extinct¹.

The only oceanic birds in the collection from the Tristan-d'Acunha group are two Petrels, *Pelagodroma marina* and *Æstrelata mollis*, both from Nightingale Island, the most southern of the three islands of the group, and one Penguin (*Eudyptes chrysocome*) from Inaccessible; but Sir Wyville Thomson (Atl. ii. pp. 164, 178) mentions several others.

C. *Kerguelen Land* (January 1874).

The only land-birds from Kerguelen Land in the collection are

¹ Wyville-Thomson, 'Atlantic,' ii. p. 165.

nine specimens of *Chionis minor* and seven of *Querquedula eatoni*; and these are the only land-birds included by Mr. Sharpe in his memoir in the Royal Society's volume on the Transit-Expedition of 1875.

The female of the *Querquedula* (of which there is one example determined as such, and two others, evidently of the same sex) differs from the male not only in the absence of the green alar speculum, but also in its smaller size, in the fuscous edgings to the feathers generally, and in the much shorter tail. There is also one chick of this species in the collection.

D. New Zealand (June 1874).

In New Zealand only four skins, belonging to three species, were obtained, namely:—

- 1 *Miro albifrons* jr., Hardy Bay.
- 2 *Hæmatopus unicolor* jr., Hardy Bay.
- 1 *Botaurus pœciloptilus* jr., Wellington.

E. Hong-Kong, China (January 1875).

From Hong-Kong seven skins, belonging to four species, all known Chinese birds, were procured, viz:—

- 1 *Turdus mandarinus*, Bp.
- 1 *Halcyon pileata* (Bodd.).
- 2 *Alcedo bengalensis*, Gm.
- 2 *Coturnix communis*, Bonn.
- 1 *Turnix maculosus* (Temm.).

F. Meangis Islands (February 1875).

Four examples of *Eos indica* were obtained here (of which three have arrived home), under the circumstances mentioned in Mr. Murray's MS., as follows:—

“On the 10th February, 1875, while the ship was dredging, some natives came off in a boat. They had with them mats and coconuts and some Perroquets. The following are those which were purchased for tobacco:—

- | | |
|----------|--|
| “440, ♀. | } Feet black; bill orange; eyes red, or light brown in the male. |
| 441, ♀. | |
| 442, ♀. | |
| 443, ♂. | |

“We kept the male for several days alive; he used to fly about the ship and return to the house on deck when shown his food.

“He died from eating some green stuff, it is supposed, but was perhaps hurt aloft.

“The natives came from the southermost isle of the Meangis group.”

This is the most northern species of *Eos* known; its hitherto only ascertained locality is the neighbouring Sanghir group of islands².

¹ Cf. also Lord G. Campbell's 'Log-letters' p. 245.

² Cf. Rowley's Orn. Misc. p. 123, where a beautiful figure of this species is given.

G. *At sea* (February 22, 1875).

Two examples of *Phalaropus hyperboreus* in winter plumage (nos. 445, 446, both "females") were "shot by Mr. Moseley on February 22, 1875, among the drift wood." Mr. Murray "saw many the previous day."

This Phalarope is said to wander occasionally even as far south as the Aru Islands¹. The present examples were obtained the day before the ship arrived at Humboldt Bay, New Guinea.

H. *Humboldt Bay, New Guinea* (February 23, 1875).

At this most interesting locality but two birds, unfortunately, were obtained, namely:—

447. *Trichoglossus cyanogrammus*, Wagl.

448. *Arses insularis*, Meyer.

The first of these is a well-known Papuan species. Of the second (shot by Mr. Murray under the circumstances mentioned in Lord George Campbell's 'Log-letters,' p. 253) the only specimens yet known were obtained by Dr. A. B. Meyer on the island of Jobi². Its occurrence on the mainland is therefore of much interest.

Mr. Murray notes of this specimen, "Male; eyes brown; ring round the eye large and of a delicate sky-blue; bill and legs of a darker blue or violet.

"I landed in Humboldt Bay from the pinnace in a native canoe; and with some of the natives went a short way into the woods. Was not much over half an hour on shore. It was then that I shot the above two birds. I saw a Tern and a small Swift, also some Cockatoos, but all out of shot. I fired at another small bird, but did not get it. I also saw three Goura Pigeons, very fine large ones, and after a time got a shot at one, but did not bring it down. I should have had several more birds, but had to return to the boat on the signal."—J. M.

I. *At sea* (April 7, 1875).

Four days before arriving at Yokohama, and nearly due south of that port, five specimens of *Hirundo gutturalis*, the eastern form of our familiar *H. rustica*, were "caught round the ship. They were apparently in an exhausted state."

J. *Japan* (May 1875).

In Japan four specimens of birds were obtained—an example of *Buteo japonicus*, Bp., in Jedo Bay, and a hen *Phasianus versicolor* and two specimens of *Terekia cinerea* from the Inland Sea.

¹ Cf. Dresser, B. Europe.

² *Monarcha insularis*, Meyer, Sitz. Ak. Wien, lxxix. p. 395.

3. On new and little-known *Mantidæ*.

By J. WOOD-MASON.

[Received May 7, 1878.]

(Plates XXXV. & XXXVI.)

Genus DEIPHOBÆ, Stål.

M. Stål has recently¹ made the *Fischeria ocellata*, Sauss. (the nearest ally of *F. laticeps*), the type of a new genus, *Deiphobæ*, and restricted, rightly as it seems to me, the name *Fischeria* to *Fischeria bætica* and its allies, species in which, as in *Eremiophila*, structures ancillary to the ovipositor² are developed upon the two terminal ventral segments of the abdomen. Though *F. laticeps* differs from *Deiphobæ ocellata* in the form of the eyes (which are compressed and produced straight outwards in the form of blunt cones), in its long, stout, and subfoliaceous cerci (which extend far beyond the extremity of the abdomen), and in its more elongated and slenderer body, it yet resembles that species so closely in all other characters that its separation seems unwarrantable.

DEIPHOBÆ LATICEPS. (Plate XXXV. ♂ ♀.)

Fischeria laticeps, Wood-Mason, Ann. & Mag. Nat. Hist. 1876, 4th ser. vol. xviii. p. 337, ♂; *op. cit.* 1878, 5th ser. vol. i. p. 144, ♀.

Hab. ♀ ♀, Bangalore district, Mysore; ♂, Sheargaon, Kolapur State, India.

The typical specimens are in the Indian Museum, Calcutta.

HIERODULA (RHOMBODERA) TECTIFORMIS.

Rh. tectiformis, Saussure, Mém. Orthopt. tom. i. fasc. 3, p. 216, pl. v. fig. 19, ♀.

In all the numerous specimens of this species which I have examined the basal or superior angle of the facial shield is produced into a small projecting spiniform tubercle—a point of structure not mentioned by M. de Saussure in his description.

The first branch of the discoidal vein of the tegmina terminates at the sutural margin in males in two, in females in three branchlets.

Hab. I have a ♂ from Jalra-patan, captured by Mr. Cecil Templeton of the Indian Topographical Survey, a ♀ from Sahibganj by myself, and a ♂ from Doomarkoonda in the same district, and a ♀ nymph from Sambalpur by Mr. Valentine Ball.

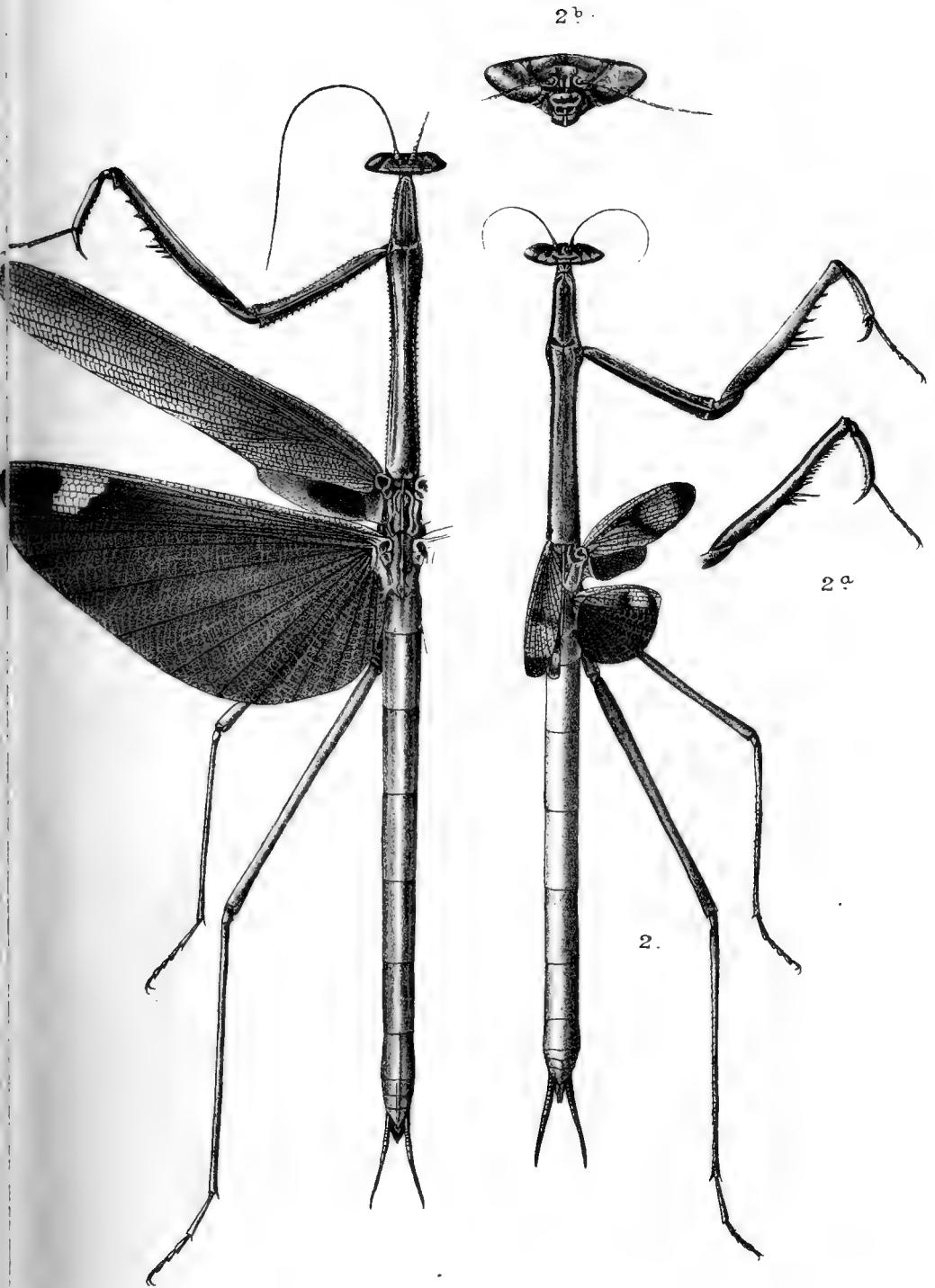
Obs. The lamellar fore margin of the tegmina is entire.

HIERODULA (RHOMBODERA) BUTLERI, n. sp. (Plate XXXVI. figs. 3, 3 a, 3 b.)

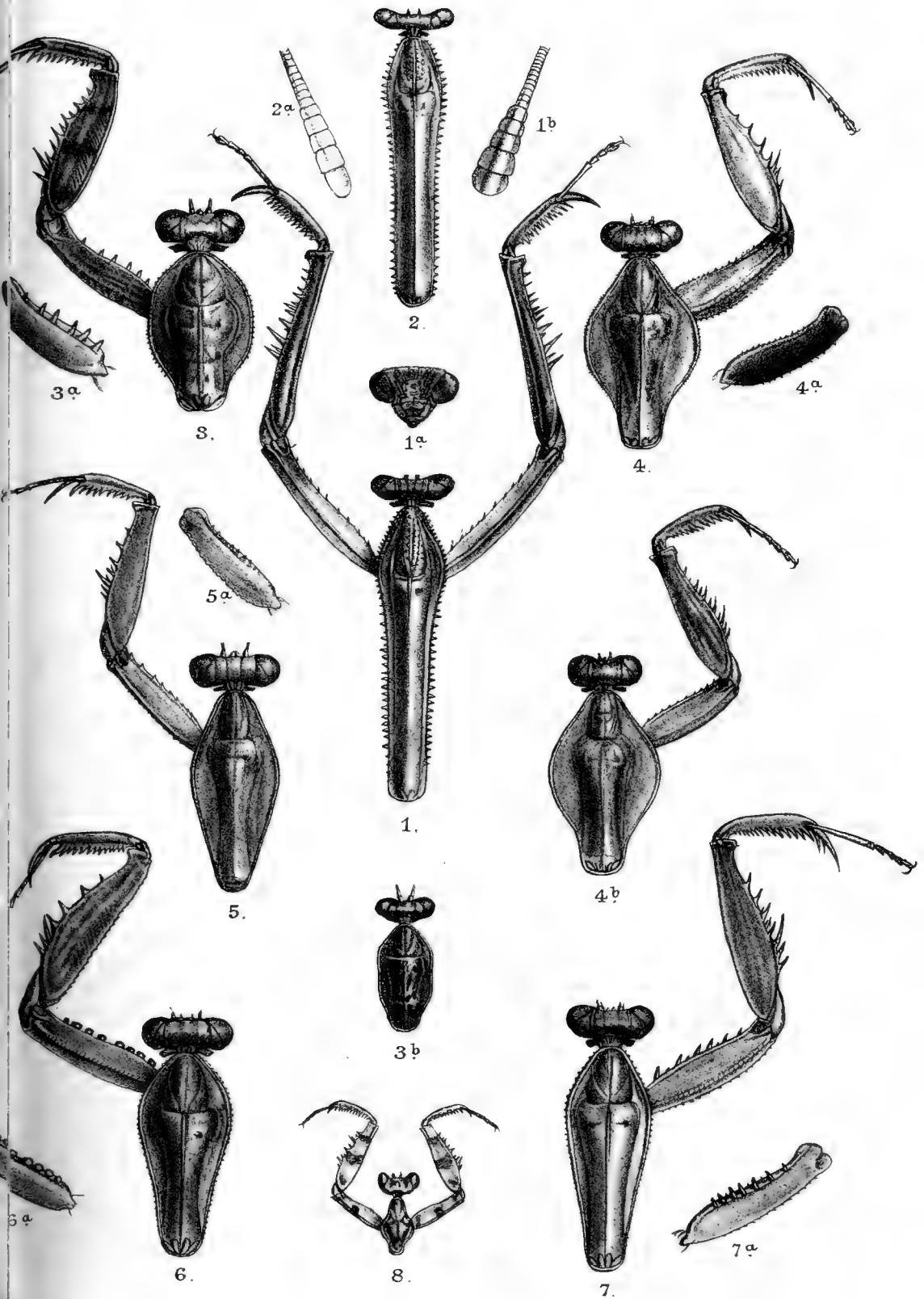
♂ ♀. Very closely allied to *H. (R.) tectiformis*, Sauss., from which it differs in having no projecting spiniform tubercle in the middle of

¹ Bihang till k. Svenska Vet. Akad. Hand. 1877, Bandet iv. No. 10.

² I have observed similar structures in the South-African *Chroicoptera vidua*, Stål. All the insects thus provided probably lay their eggs in the earth.







bern del

NEW MANTIDÆ.

Mintern Bro^s imp.



the superior margin of the facial shield, in having the lamellar expansions of the pronotum arcuate in outline, and consequently broader postero-laterally, and not angulate antero-laterally—in its more pointed tegmina, the first branch of the discoidal vein of which terminates at the sutural margin in three (♂) or four (♀) branchlets, instead of two and three respectively; the last branch of the median vein is undivided; and the stigma is bounded at either end by a dark blotch, is larger, and commences as much before the origin of the third branch of the discoidal vein as it does after it in the allied species,—in the armature of the fore coxæ, the anterior crest of which is furnished with five blunt and slightly curved conspicuous conical spines, arranged 3 + 2, and all arising from its inner side and not from its summit, the outer crest of which is only smoothly and obscurely denticulate—and in the coloration of the fore femora, which are transversely trifasciate externally, and have no conspicuous red blotch at the base of the inner face.

The fore tibiæ have thirteen teeth (♂ ♀) on the inner, and ten (eleven on one side in one ♀) on the outer edge.

The pronotum of the male is faintly constricted behind the setting-on of the fore legs; so that when viewed from above its lamellar margins appear slightly excised.

Total length, ♀ 72–82 millims.; length of pronotum, ♀ 20·5–22·25, ♂ 15·25; greatest breadth of pronotum (at the anterior end of its posterior lobe), ♀ 11·75–13·75, ♂ 7·75; breadth of primitive pronotum at dilatation, ♀ 8·5–10·75, ♂ 6; length of tegmina, ♀ 62–69, to stigma ♀ 19–22; breadth of tegmina, ♀ 22, of marginal field, ♀ 5·5; length of stigma, ♀ 5–6, ♂ 4·7; breadth of stigma, ♀ 1·3, ♂ 0·9.

Hab. The neighbourhood of Samaguting, Naga Hills, Assam, whence a specimen of the female was sent to me some years ago by my late friend Captain John Butler, the Political Agent, after whom I name it. A second and smaller specimen of the same sex has recently been obtained by Mr. A. W. Chennell, of the Indian Topographical Survey, in the valley of the Um-thana, W. Khasi Hills, at about 15,000 feet elevation. But the only male I have ever seen is a much mutilated and abnormally small insect from Sikkim in the collection of Mr. F. Moore.

Obs. The species differs in the form of the pronotum from *H. tectiformis* much in the same way as *H. deflexa*, Sauss., does from *H. laticollis*, Burm., Sauss.

The lamellar front margin of the tegmina is entire.

HIERODULA (RHOMBODERA) FRATRICIDA, n. sp. (Plate XXXVI. figs. 5, 5 a.)

♂. Allied to *H. (R.) macropsis*, Giebel, which it closely resembles in the form of the pronotum, but from which it differs in its larger size, in having the primitive pronotum apparently longer and stouter, the facial shield higher than broad and distinctly bicarinate, and in having the anterior crest of the fore coxæ rather lower and blunter (than usual) than produced and lamellar.

The organs of flight are long and rather pointed, extending, when closed, far (nearly a fourth of their length) beyond the extremity of the abdomen. The tegmina are hyaline everywhere except in the marginal field and along a very narrow linear space next to the principal nervure, between the base of the organ and the stigma, in which parts they are opaque green; the median vein gives off two branches; and the first branch of the discoidal is forked; the stigma is placed just after the origin of the third branch of the discoidal vein. The wings are throughout hyaline, save the marginal area, which is a little clouded with green; the discoidal vein is three-branched.

The front crest of the fore coxæ armed with ten to eleven low blunt tubercles, which become successively higher and sharper towards the distal end of the joint; and the external crest is quite smooth; the tibiæ have ten to eleven teeth on the outer edge, and 14 on the inner; the superior margin of the femora is slightly arcuate. The edges of lamellar margins of pronotum quite smooth.

Total length 85 millims.; length of pronotum 28, greatest breadth of pronotum 13·25; breadth of primitive pronotum at dilatation 8; length of abdomen 31+6 (last ventral segment)=37; length of tegmina 76, to stigma 20; width of tegmina 19, of their marginal field 5·25; length of stigma 4, breadth of stigma 0·9; length of antennæ 50.

Hab. The records of the British Museum state that the specimen was received in a collection of insects from Malabar.

Obs. The lamellar front margin of tegmina entire.

HIERODULA (RHOMBODERA) ATRICOXIS, n. sp. (Plate XXXVI. figs. 4, 4 a, 4 b.)

♂ ♀. Very closely allied to *H. (R.) laticollis*, Burm., from which it differs in having the lamellar expansions of the pronotum absolutely narrower, concave instead of straight postero-laterally, and not extended quite so far towards the base of the segment, and in having *the whole inner surface of the fore coxæ coloured jet-black*, and the hinder end of the prosternum and the mesosternum symmetrically marked with the same colour.

The anterior crest of the fore coxæ armed with minute blunt denticles and granules; tibiæ with eleven teeth (♂ ♀) on the outer edge, and ♀ 15, ♂ 14 on the inner.

Sexual differences the same as in the allied species.

Total length, ♀ about 80 millims.; length of pronotum, ♀ 27, ♂ 25·5, of which the anterior lobe is respectively, ♀ 8 and ♂ 7; greatest breadth of pronotum, ♀ 16, ♂ 15; breadth of primitive pronotum at supracoxal dilatation, ♀ 9·5, ♂ 9; length of tegmina, ♀ 50, ♂ 64, breadth of tegmina, ♀ 20, ♂ 19·5, breadth of marginal field, ♀ 6, ♂ 5; length of fore coxa, ♀ 18, ♂ 17; femur, ♀ 22, ♂ 20; of intermediate femur, ♀ 19, ♂ 18; tibia, ♀ 17, ♂ 15; of posterior femur, ♀ 22·5, ♂ 21·5; tibia, ♀ 23·5, ♂ 23.

Hab. ♀, Australia (*C. French*); ♂, one of the islands in Torres Straits (*MacFarlane*).

Obs. With the exception of the Indian *H. (R.) tectifomis*, which

has a great shining red blotch at the base of each of the femora, this is the only species of the genus which has any part of the internal face of the fore legs conspicuously coloured¹.

The lamellar fore margin of the tegmina is toothed² in both sexes, probably so as to act as a stridulating organ by scraping against the corresponding part of the wings.

HIERODULA (RHOMBODERA) PUSTULIFERA, n. sp. (Plate XXXVI. figs. 6, 6 a.)

♀. Allied to *H. (R.) major*, Sauss., but differing in its stouter and broader pronotum, which is more broadly rounded off in front, in the armature of the anterior crest of the fore coxæ, which is furnished with eight hemispheroidal yellow tubercles or callosities, all arising from its inner surface, gradually increasing in size from the proximal to the middle, and then gradually decreasing to the distal end of the joint, and constricted at the base so as closely to resemble the crushing-teeth of certain fossil fishes (*Pycnodus*).

The discoidal nervure of the wings emits four branches.

The fore tibiæ have eleven teeth on the outer edge and fifteen on the inner.

Total length 85 millims.; length of pronotum 29, greatest breadth of pronotum (just behind coxal groove) 12·5, of primitive pronotum at supracoxal dilatation 10, at middle of posterior lobe 6; length of tegmina 57, to stigma 21; breadth of tegmina 24, of marginal field 8; length of stigma 3, breadth of stigma 0·9.

Described from two alcoholic specimens.

A dried specimen in British Museum obtained at the same time measures total length 80 millims., and has the coxal callosities shrunken or less developed.

Hab. One of the islands in Torres Straits. The specimens were obtained by the Rev. M^rFarlane.

Obs. The lamellar fore margin of the tegmina toothed.

HIERODULA (RHOMBODERA) TAPROBANÆ. (Plate XXXVI. figs. 7, 7 a.)

Hierodula taprobanæ, Wood-Mason, Ann. & Mag. Nat. Hist. 1878, 5th ser. vol. i. p. 146, ♀.

Hab. Ceylon.

Obs. The lamellar fore margin of the tegmina is smooth.

ARCHIMANTIS MONSTROSA, n. sp. (Plate XXXVI. figs. 1, 1 a, 1 b.)

Mantis monstrosus, Bates, MSS., in coll. Brit. Mus.

♀. Closely allied to *A. armata*, W.-M., ♀, differing in its greater size, in its proportionally longer tegmina (which are fully equal to the prothorax in length), in the form of the pronotum (which is dilated at the setting-on of the fore legs, so as to be conspicuously

¹ These coloured femora serve, in all probability, to allure or fascinate the prey.

² I first met with this curious structure of the tegmina in the *Empusidæ*, in all of which it occurs in both sexes alike.

ovate-cordiform in front), and in the form of the cerci, the margins of the foliaceous terminal joints of which are arcuate.

Fore tibiæ with sixteen or seventeen teeth on the inner and ten on the outer edge.

Total length 115 millims.; prothorax 41, of which the neck is 10; width of prothorax at supracoxal dilatation 10; height of head 8, breadth of head 11·75; length of meso- and metanotum taken together 19, of abdomen 53, of cerci 12·75; breadth of terminal joint of cerci 2; length of fore coxa 22·5, femur 28, tibia to insertion of tarsus 11; of intermediate femur 27, tibia 27; posterior femur 33, tibia 38; tegmina 42 (or reaching to end of middle third of third abdominal segment); breadth of marginal field of tegmina 3; length of stigma 6·75; length from base of tegmen to stigma 14; length of wings 35.

Hab. Victoria River, N. Australia. The type in British Museum was "captured on March 10th, 1856, by R. Eelsey, Esq., during the exploring expedition under Mr. Gregory."

ARCHIMANTIS ARMATA. (Plate XXXVI. figs. 2, 2 a.)

A. armata, Wood-Mason, Ann. & Mag. Nat. Hist. 1877, 4th ser. vol. xx. p. 76.

Hab. North Australia (*C. French*).

ÆTHALOCHROA ASHMOLIANA.

Vates ashmolianus, Westw. Ann. & Mag. Nat. Hist. vol. viii. p. 272; Arcana Entomol. 1843, vol. ii. p. 52 (note †).

Popa? aschmolia, Saussure, Mém. Orthopt. tom. i. fasc. 3, p. 309.

Æthalochroa ashmolia, Wood-Mason, Ann. & Mag. Nat. Hist. April 1877, p. 308, ♂ ♀.

Arsacia ashmolia, Stål, Sv. Vet. Akad. Hand. 1877, Bd. iv. no. 10, 75, ♀.

A male (var. *simplicipes*) from Bombay, in the collection of Mr. F. Moore, differs from the type and from the specimens from Bengal (Calcutta and Murshidabad) in not having the crests of the four posterior femora developed into foliaceous lobes at the apex, and in having the upper crest of the four posterior tibiæ more developed and with more regularly arcuate margins, and in having the ridge of the posterior lobe of the pronotum more convex longitudinally.

A gigantic female (var. *insignis*) in the India (*olim* E.-I. Company's) Museum, South Kensington, marked "N. India," has the lobes at the extremities of the four posterior femora more highly but less regularly developed; this specimen measures:—

Total length 132 millims., length of prothorax 48, of which the neck is 10, abdomen 61—as against 115, 40, 9·5, and 52, the measurements of the same parts in the Calcutta specimen of the same sex.

A female in the collection of Mr. W. B. Farr (though not labelled as to locality, doubtless from Bengal) agrees exactly with the specimens from Calcutta and Murshidabad.

Genus CREOBROTER¹, Serville.

CREOBROTER PICTIPENNIS, n. sp. (Plate XXXVI. fig. 8.)

♀. Closely allied to *Cr. apicalis*, Sauss. (♀), from Assam, from which it differs in the form of the pronotum (which is slenderer and more distinctly quadrilobular), in its much narrower and less-depressed abdomen (a part which in the species mentioned, as also in *Cr. urbanus* ♀, is greatly dilated and suborbicular and depressed), in its less robust fore legs, and notably in the colour of the wings. The head also is a little smaller, its frontal spine much the same.

Organs of flight in repose, in the dried insect, extending by about a seventh of their length beyond the extremity of the fusiform abdomen, which is longitudinally strongly roof-shaped below. Tegmina bright green, yellow at the very base, furnished with a well-defined subquadrate or suborbicular bright yellow spot a short distance from the base, and with a still richer dead-yellow oval ocellus placed a little obliquely across the middle; this is bordered both on its external and on its internal margin by a curved black line; the black line that borders the base of the ocellus is but slightly curved or is a smaller segment of a larger circle, and sends forwards and inwards at its posterior end a small process, so as to present the appearance of a curved arrow that has lost one of its barbs; external black line strongly curved, or a larger segment of a smaller circle; it is preceded by an opalescent line rather broader than itself, and upon the veins and veinlets traversing which the yellow of the ocellus is continued; this is marked with three black dots, all placed in the same straight or slightly curved line, each upon one of the sectors of the organ; the yellow of the ocellus flows out, as it were, in an irregular stream from between the black bounding lines to the sutural margin, accompanied by the translucent white line only; but at the opposite side its exit is barred by the polished and slightly paler yellow oblong stigma, which there quite blocks up the interval between the ends of the black lines; the anal gusset is spotted with brown, paling towards the hinder margin, the network being pale green, very narrowly lined with hyaline, and its membranous meshes brown. Wings tricolorous, opaque at the base; the basal third of the posterior and the basal two thirds of the anterior field of a beautiful semiopaque cream-colour, slightly tinged with green; this is succeeded in the former by a broad band of clear brown (with dark amethystine reflections) lined with hyaline along the transverse veinlets, and in the latter by a narrower band of semiopaque dull vinaceous, the rest of both fields being throughout hyaline, slightly tinged and clouded with very pale greenish white, and having the venation rather distinct and also coloured pale greenish white.

The head, the pronotum, and the outsides of the fore legs bright green, concolorous with the elytra, variegated (the two first-named) and banded (the last) with yellow, much, in fact, as in *Cr. apicalis*.

¹ Neither "*Creobrota*" nor "*Creobotra*," nor "*Creoboter*," but "*Creobroter*," from κρέας, flesh, and βρωτήρ, an eater, κρεοβρωτήρ, so formed on the analogy of κρεοπώλης, κρεοφάγος, κ. τ. λ.

The anterior crest of the fore coxæ is armed with eight bluntish spiniform tubercles, between some of which are one or two minuter ones; the right fore tibia has fifteen teeth on each edge; the four posterior legs are wanting.

Total length about 32 millims.; length of pronotum 7·6; breadth of pronotum at supracoxal dilatation 4·3, at constriction behind dilatation 2·6; length of tegmina 26; length of abdomen 14, breadth of abdomen 8·5.

Hab. Ceylon. Communicated by Mr. F. Moore. There is also a specimen in the Hopeian collection at Oxford.

HYMENOPUS BICORNIS.

Mantis bicornis, Stoll, Spectres et Mantes, 1787, pl. xi. figs. 44 (♀), 44 A (nymph).

Mantis coronata, Olivier, Encycl. Méth. 1792, Insectes, t. vii. p. 638.

Empusa coronata, Latreille, Gen. Crust. et Ins. t. iii. p. 91.

Hymenopus coronata, Serville, Revue, p. 19. no. 1, et Hist. Nat. des Orthopt. 1839, p. 163 ♀.

Hymenopus coronatus, Burm. Handb. d. Entom. 1839, vol. ii. p. 549.

Hymenopus bicornis, Saussure, Mél. Orthopt. i. fasc. 3, p. 291.

The larvæ and nymphs, at any rate, of this species simulate blossoms, some specimens being rose-pink, others of a beautiful wax-white colour. The thighs of the four posterior pairs of legs are expanded into huge broad pear-shaped plates; so that (according to Mr. S. E. Peal, who has discovered the species in Assam, many hundreds of miles from any of its hitherto recorded habitats) the immature insect when seated on a twig with thorax and abdomen raised at right angles to one another, with the fore legs drawn up out of sight beneath the thorax, and with the four expanded thighs spread out two on each side, the tarsi being brought to one spot, presents in form as well as in colour a most perfect and deceptive resemblance to a flower. The small Mantis (exactly resembling a pink orchis-flower) which, according to Mr. Wallace, was shown to Sir Charles Dilke in Java, and was said to attract and devour butterflies, probably belongs to the same species.

Hab. Sibságar, Assam (*S. E. Peal*); Moluccas (*Serville*); Sunda Isles. The perfect insect is represented in one of the beautiful sketches of foliage and flowers made by Miss North in Java.

PARABLEPHARIS KUHLII.

Blepharis kuhlii, De Haan, Orthopt. Orient. p. 93, tab. 18. fig. 3, ♀.

Parablepharis kuhlii, Saussure, Bull. Entom. Suisse, iii. p. 223 (1870); id. Mél. Orthopt. i. 1871, fasc. 3, p. 320, ♀.

Hab. Java (*De Haan*); "les Indes Orientales?" (*Saussure*). A larva has been obtained by Mr. A. W. Chennell, of the Topographical Survey of India, in the Naga Hills, Assam.

EXPLANATION OF THE PLATES.

(N.B. All the figures are of the natural size, except where the contrary is stated.)

PLATE XXXV.

- Fig. 1. *Deiphobe laticeps*, p. 580. Male, with wings extended.
 2. *Deiphobe laticeps*. Female.
 2 a. The right fore femur and tibia, from the inner side.
 2 b. Front view of the head of female, magnified twice nat. size.

PLATE XXXVI.

- Fig. 1. *Archimantis monstrosa*, p. 583, ♀. The head, pronotum, and fore legs.
 1 a. Front view of the head of the same.
 1 b. One of the cerci from the side, enlarged.
 2. *Archimantis armata*, p. 584, ♀. The head and pronotum.
 2 a. One of the cerci from the side, enlarged.
 3. *Hierodula (Rhombodera) butleri*, p. 580, ♀ ♂. Head, pronotum, and left fore leg of a female.
 3 a. The right fore coxa, from the inside.
 3 b. Head and pronotum of a small male.
 4. *Hierodula (Rhombodera) atricoxis*, p. 582, ♀ ♂. Head, pronotum, and right fore leg of a female.
 4 a. The left fore coxa, from the inside.
 4 b. Head, pronotum, and right fore leg of a male.
 5. *Hierodula (Rhombodera) fratricida*, p. 581, ♂. Head, pronotum, and left fore leg.
 5 a. Right fore coxa, from the inside.
 6. *Hierodula (Rhombodera) pustulifera*, p. 583, ♀. Head, pronotum, and left fore leg.
 6 a. Right fore coxa, from the inside.
 7. *Hierodula (Rhombodera) taprobanæ*, p. 583, ♀. Head, pronotum, and right fore leg.
 7 a. Left fore coxa, from the inside.
 8. *Crebrotter pictipennis*, p. 585, ♀. Head, pronotum, and fore legs.

4. On new Genera and Species of Geodephagous Coleoptera from Central America. By H. W. BATES, F.L.S.

[Received May 11, 1878.]

The following diagnoses of new Central-American Coleoptera, of the families Cicindelidæ and Carabidæ (Geodephaga), are preparatory to the full descriptions which will be given in the work now preparing by Messrs. Godman and Salvin, entitled 'Biologia Americæ Centralis.' In that work figures will be given of all the more characteristic forms.

Family CICINDELIDÆ.

TETRACHA IGNEA.

T. carolinæ formæ similis, paullo magis angustata, supra igneo-cuprea; epistomate, thoracis et elytrorum lateribus viridi-æneis; elytris grosse confertim usque ad apices punctatis, macula apicali pallida, angusta, antice gradatim paullo dilatata; antennis articulis 1^{mo}-4^{um} subtus nigro-lineatis; femoribus quatuor posticis apice late

nigris: corpore subtus viridi-æneo, ventris apice utrinque flavo-fasciato.

Long. 8 lin. ♂ ♀.

Hab. Chiriqui.

CICINDELA BELTI.

C. roseiventri affinis, apud elytrorum humeros latior, his rectangulis. Saturate olivacea, elytris utrinque maculis albis quinque, scilicet una humerali, secunda antico-discoïdali paullo transversa, tertia mediana lineiformi recte transversa, quarta posteriore rotundata prope suturam, quinta prope angulum posteriorem transversa; subtus viridi-ænea, lateribus cupreis et dense albo-pilosis; femoribus infra cupreis; abdomine rufo, basi cupreo-nitido.

Long. 5½ lin. ♂.

Hab. Chontales, Nicaragua (Belt).

CICINDELA FLOHRI.

Elongata, capite angusto, thoracis lateribus anticis paullo rotundatis; elytris elongato-ovatis, apice obtuse rotundatis; supra rufo-cuprea subopaca, sericeo-micans, thoracis sulcis elytrorumque punctulis viridibus; elytris utrinque macula alba humerali et altera post humeros, fascia mediana omnino discoïdali obliqua, et maculis quatuor subapicalibus, quarum tribus marginalibus; corpore subtus late chalybeo, episternis rubro-cupreis, parce pilosis; abdomine toto late rufo.

Long. 5 lin. ♂ ♀.

Hab. Mexico; San Angel, Guadalupe, near the capital (Flohr).

CTENOSTOMA SIGMA.

Ad sectionem Procephalus pertinet. Cylindricum, æneo-fuscum nitidum, sparsissime griseo-hirtum, antennis pedibusque dilutioribus; capite impunctato, supra inæquali, fronte plana utrinque sulcata; elytris disperse punctulatis, apices versus sublævibus, apice obtuse sinuato-truncatis, utrinque macula parva anteriore subsuturali, et pone medium fascia valde flexuosa, S-formi, testaceo-albis.

Long. 7 lin. ♂ ♀.

Hab. Chontales, Nicaragua (Belt; Janson).

CTENOSTOMA LÆTICOLOR.

Ad sectionem Procephalus pertinet. Cylindricum, gracile, late viridi-auratum, glabrum, antennis (scapo metallico excepto) tibiis tarsisque piceis; capite impunctato, fronte tubere magno rotundato, sulcis antice et postice marginato, verticis lateribus etiam sulcatis; elytris pone scutellum subumbonatis, disco prope suturam undulatis punctisque ocellaribus impressis, reliquis sparsissime, versus basin grosse, punctatis, apice breviter sinuato-truncatis, utrinque macula parva anteriore subsuturali, et pone medium fascia valde obliqua intus hamata, testaceo-albis.

Long. 5½ lin.

Hab. Chontales, Nicaragua (Janson).

Family CARABIDÆ.

ASPIDOGLOSSA BRACHYDERUS, n. sp.

In hoc genere brevis; thorace brevi et lato. Nigro-ænea, palpis antennis pedibusque piceo-testaceis, elytris apicem versus diffuse rufescentibus; clypei margine haud emarginato, fovea frontali parva, simplici; thorace lato, convexo, antice angustato, lateribus fere ut in A. subangulata angulatis; elytris oblongo-ovatis, versus basin paullo angustatis, fortiter striatis, striis passim crenatis, interstitio tertio tripunctato.

Long. $2\frac{1}{4}$ lin.

Hab. Panamá.

STENOÛS OLIVACEUS.

Elongato-ellipticus, gracilis, supra æneo-fuscus, nitidus, subtus niger, pedibus piceis, femoribus obscurioribus; antennis rufo-piceis, articulis 1^{mo}-3^{um} pallidis; elytris striatis; limbo alutaceo-subopaco, viridi-tincto, striis obsoletis.

Long. $3\frac{3}{4}$ lin.

Hab. Mexico (Boucard).

DICÆLUS FLOHRI.

Oblongo-ellipticus, niger vix nitidus; capite minus robusto, collo angustiore; thorace antice paullulum angustato, lateribus vix rotundatis, omnino lævi; elytris striis omnibus obsoletis, seriebus punctorum suturali et marginali tantum exstantibus, carina humerali brevi, valde elevata.

Long. $9\frac{1}{2}$ -10 lin. ♂ ♀.

Hab. Mexico, San Angel (Flohr).

POLPOCHILA MEXICANA.

Angusta, parva, castanea, palpis, antennis basi, pedibus margineque apicali elytrorum flavo-testaceis; foveis frontulibus usque ad oculorum marginem posticum fortiter impressis; thorace late cordato, lateribus ante basin fortiter sinuatis, angulis posticis exstantibus; elytris profunde striatis.

Long. 3 lin. ♂.

Hab. Mexico, Vera Cruz (Boucard).

Specimens have been distributed under the name I have adopted, given by M. de Chaudoir.

ANISODACTYLUS ROTUNDANGULUS.

Elongatus, niger, modice nitidus, pedibus piceis, antennis palpisque piceo-rufis; thorace lateribus arcuatis, angulis posticis late rotundatis, foveis posticis latis, modice impressis; elytris apice haud sinuatis, supra simpliciter striatis, impunctatis.

Long. $7-7\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (Flohr).

NOTIOBIA DISPARILIS.

Æneo-cuprea (elytris ♀ cupreo-fuscis), glabra; epistomate, labro,

palpis, antennis et pedibus piceo-rufis; thorace valde transverso, ante medium late rotundato, deinde vix sinuatim angustato, angulis posticis rectis, anticis omnino rotundatis, supra impunctato, fovea basali utrinque magna irregulari, subrugata: elytris thorace basi latioribus, apice profunde sinuatis, supra (♂) fortiter striatis, interstitiis dorso subplanis, duobus marginalibus alutaceo-opacis; ♀ haud striatis, opacis, sutura costisque tribus elevatis nitidis.

Long. 6-7 lin. ♂ ♀.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA PARILIS.

Glabra, capite thoraceque chalybeis, elytris cupreo-violaceis, subtus nigra, antennis, pedibus antennisque interdum piceo-rufis; thorace valde transverso, ante medium late rotundato, deinde sinuatim angustato, angulis posticis rectis, anticis omnino rotundatis; elytris utroque sexu politis, sulcato-striatis, interstitiis omnibus valde convexis, apice sinuatis (nec dentatis).

Long. $6\frac{1}{2}$ lin. ♂ ♀.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA LIMBIPENNIS.

Subcupreo-ænea, nitida; thorace valde transverso, medio rotundato-dilatato, postice modice angustato, angulis posticis vix rectangulis; elytris oblongo-ovatis, apice fortiter sinuatis et extus dentatis, profunde striatis, limbo laterali (apicem versus latiore) alutaceo subtestaceo-opaco, fovea etiam lata antico-discoidali paullo alutaceo-opaca, interstitio tertio postice unipunctato; antennis, palpis et pedibus rufo-piceis.

Long. $5\frac{1}{2}$ lin. ♂.

Hab. Chontales, Nicaragua (*Belt*).

NOTIOBIA LEIROIDES.

Lator, supra æneo-olivacea, labro, antennis basi, palpis et pedibus rufis; thorace valde transverso, medio rotundato-dilatato, postice angustato, angulis posticis rectangulis; elytris apice paullulum sinuatis, regulariter striatis, interstitiis æqualibus, apicem versus angustioribus, marginalibus subopacis, tertio postice unipunctato, margine apicali testaceo.

Long. 7 lin. ♀.

Hab. Mexico, Vera Cruz (*Boucard*).

NOTIOBIA CUPREOLA.

Angustior, polita, nigro-ænea, elytris cupreo-violaceis; antennis (articulis 1^{mo}-3^{um} nigris exceptis) labro, palpis et tarsi fulvo-testaceis; thorace lateribus antice valde rotundatis, postice vix sinuatim angustato; angulis posticis fere rectis, supra impunctato, foveis basalibus latis vagis; elytris (♂ ♀) apice oblique leviter

sinuatis, supra striatis, ♀ subtilissime alutaceis sed politis, interstitio 3^{io} postice unipunctato.

Long. $4\frac{3}{4}$ lin. ♂ ♀.

Hab. Costa Rica, Irazu, alt. 6000–7000 feet (Rogers).

HARPALUS ALIENUS.

Oblongus, modice convexus, niger nitidus (♀ elytris sericeo-opacis), pedibus piceis, nennis palpisque rufo-piceis, illis articulis 2^o–4^{um} basi nigris; thorace transversim quadrato, postice plusquam antice angustato, lateribus rotundatis, angulis posticis obtusis, impunctato, basi coriaceo, fovea utrinque late impressa; elytris apice (♂ ♀) sinuatim subtruncatis, fortiter simpliciter striatis, interstitiis paullo convexis, 3^{io} postice unipunctato.

Long. $5\frac{1}{4}$ –6 lin. ♂ ♀.

Hab. Mexico, near the capital (Flohr).

SELENOPHORUS AMBLYDERUS.

Oblongus, convexus, nigro-æneus, antennarum articulo basali palpisque rufis, pedibus picescentibus; thorace lateribus arcuatis, angulis posticis rotundatis, fovea basali utrinque parva, margine medio multistriato; elytris glabris, striatis, striis apice profundioribus, interstitiis 3^{io}, 5^{to}, et 7^{mo} punctis seriatis parvis.

Long. $3\frac{1}{2}$ – $4\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (Flohr).

SELENOPHORUS CALLISTICUS.

Oblongo-ovatus, elongatus, minus convexus, cupreo-æneus; antennis basi pedibusque flavo-testaceis; thorace antice gradatim, versus basin citius, angustato, angulis posticis rotundatis, basi tota haud profunde punctulata; elytris apice sinuatis, supra fortiter striatis, interstitiis alternis punctis numerosis rotundatis seriatim impressis; tarsis posticis gracilibus, elongatis; tibiis et tarsis absque spinis fortibus.

Long. $4\frac{1}{2}$ lin. ♂ ♀.

Hab. Panamá (Salvin).

SELENOPHORUS TENUISTRIATUS.

Oblongus, cupreo-æneus, antennis basi, palpis, tibiis et tarsis rufescenti-testaceis; thorace transversim quadrato, antice minus et citius quam postice modice angustato; elytris apice haud sinuatis, tenuiter striatis, interstitiis planis, alternis conspicue seriatim punctatis.

Long. $2\frac{3}{4}$ lin. ♂ ♀.

Hab. Mexico, near the capital (Flohr).

SELENOPHORUS MITIS.

Oblongo-ovatus, niger, vix æneo vel chalybeo tinctus; palpis antennisque fulvo-testaceis, labro et pedibus piceis; capite lævi, foveis frontalibus obsoletis; thorace quadrato, lævi, foveis basalibus latis, vagis, lateribus paullulum arcuatis, antice gradatim, postice

vix angustato, angulis posticis obtusis; elytris apice leviter sinuatis, supra striatis, interstitiis alternis punctis parvis seriatis; tibiis anticis sparsim spinosis, tarsis dilatatis, ♂ subtus paucisquamosis.

Long. $3\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ATHROSTICTUS, nov. gen. *Selenophoro* affine.

Corpus elongato-ovatum, supra (præcipue elytris) dense minute punctatum. Caput ovatum, postice gradatim puullo angustatum. Oculi magni sed non prominentes, postice orbitu inclusi. Antennæ filiformes, graciles. Mentum profunde emarginatum, sinu fundo haud dentatum. Ligula angusta, apice libera, longe bisetosa; paraglossis latis ea longioribus. Elytra haud conspicue seriatopunctata. Cæteris ut in generibus Hypolitho et Harpalo.

Ad hoc genus *Selenoph. speciosus* (Dej.), *Pangus metallicus* (Reich.), *Hypolithus puberulus* et *H. chlænioides* (Dej.), et *Harpalus sulcatulus* (Dej.) pertinent.

ATHROSTICTUS OPALESCENS.

Oblongus, piceus, breviter erecte pubescens; labro, palpis, antennis et pedibus rufo-fulvis; capite et thorace nitidis, elytris opalescenti-micantibus; capite postice punctulato; thorace quadrato, lateribus fortiter arcuatis, angulis posticis fere rotundatis, basi late subrugose punctulatis; elytris apice leviter sinuatis, exarato-striatis, interstitiis minute crebre granulatis, 3^{io} et 5^{to} indistincte seriatim punctatis; corpore subtus nigro, læte opalescente; metasterno punctulato.

Long. 4 lin. ♂ ♀.

Hab. Panamá (*Salvin*).

ATHROSTICTUS SERICATUS.

Latiior, oblongus, niger, omnino punctulatus, breviter erecte fulvo-pubescens; antennis, palpis et tarsis obscure rufescentibus; thorace transversim quadrato, postice vix angustato, angulis anticis haud prominulis, posticis fere rectangulis, lateribus paullulum arcuatis; elytris læte aureo-sericeo relucentibus, fortiter striatis, interstitiis densissime punctato-granulatis; corpore subtus nigro nitido, opalescente, punctulato.

Long. $6\frac{1}{2}$ lin. ♀.

Hab. Mexico, Vera Cruz (*Boucard*).

BRADYCELLUS LUCIDUS.

Testaceo-rufis; elytris picco-fuscis, politis, striis (suturali, marginalibusque exceptis) nullis; meso- et metasternis ventrisque basi nigris; capite latiore; thorace vix elytris angustiore, postice valde sinuato-angustato, angulis posticis rectis.

Long. 3 lin.

Hab. Mexico.

BRADYCELLUS SUBOBOLETUS.

Castaneo-fuscus, subtus nigricans, antennis basi pedibusque flavo-testaceis; elytris striis suturali et marginalibus profundis, disco striato-punctatis.

Long. $2\frac{3}{4}$ –3 lin.

Hab. Mexico, near the capital (*Flohr*).

ACUPALPUS CIRCUMDATUS.

Elongato-oblongus, castaneo-fuscus; antennis basi, palpis, pedibus margineque angusto elytrorum flavo-testaceis; thorace postice valde angustato, lævi, basi utrinque haud foveato, parum punctato, lateribus antice fortiter rotundatis, postice sinuatis, angulis posticis prominulis rectis; elytris striis modice impressis, haud punctatis, striola scutellari nulla.

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

Hab. Mexico, Vera Cruz (*Boucard*).

ACUPALPUS FLOHRI.

Elongato-oblongus, castaneo-rufus, capite supra, elytris utrinque disco, abdomineque castaneo-fuscis; capite fronte foveolata; thorace lateribus usque angulos posticos obtusos rotundatis, basi utrinque grosse sparsim punctato; elytris simpliciter striatis, striola scutellari nulla.

Long. 2 lin.

Hab. Mexico, near the capital (*Flohr*).

ACUPALPUS OBESUS.

Latior, oblongo-ovatus, castaneo-fuscus, thorace et elytris indistincte castaneo-rufo limbatis; palpis, antennis basi pedibusque fulvo-testaceis; thorace transverso, sublunato, lateribus omnino rotundatis et angulis posticis fere nullis, supra impunctato; elytris subpunctulato-striatis, striola scutellari elongata, obliqua.

Long. $1\frac{1}{2}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS MONTEZUMÆ.

Elongatus, gracilis, piceo-niger; capite ovato; oculis haud prominentibus, orbitu posteriore sensim angustato; thorace elongato, truncato-cordato, lateribus explanato-reflexis, angulis posticis rectis; elytris convexis, elongato-ovatis, punctulato-striatis, apice oblique sinuatis, marginibus basali et laterali explanato-reflexis; pedibus elongatis.

Long. $4\frac{1}{2}$ – $5\frac{1}{2}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS TRANSPUNCTATUS.

A. anthracino (Dej.) affinis, oblongo-ovatus, niger, subtus cum pedibus nitidus; elytris sericeo-nitentibus; capite et thorace cyaneo-tinctis; antennis articulo basali subtus rufo-piceo; capite parvo, pone oculos gradatim angustato; thorace elytris multo

angustiore, rotundato, postice magis quam antice angustato; elytris tenuiter striatis, stria tertia 3-, stria secunda 2-punctata.

Long. 4 lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SCUTIFER.

Elongato-ovatus, niger, nitidus, supra leviter cyaneo-tinctus; antennis articulo basali rufo; capite lævi, oculis vix prominulis; thorace magno, ovato, lævi; elytris thorace vix latioribus, acute et fortiter striatis, interstitiis planis, tertio 4-5-punctato.

Long. $4\frac{3}{4}$ - $5\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS VIXSTRIATUS.

Parvus, gracilis, fusco-æneus politissimus; palpis, antennis basi, pedibusque fulvo-testaceis; thorace subcordato-ovato, angulis rotundatis; elytris ovatis, striis vix impressis, interstitiis paululum convexis 2^{ndo} bi- vel tripunctato; metasterni episternis brevibus, latis, epimeris transversis.

Long. $2\frac{3}{4}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS CONCISUS.

A. vixstriato affinis, metathoracis episternis brevibus. Fusco-æneus, modice nitidus; palpis, antennis, pedibus, margineque deflexo elytrorum fulvo-testaceis; capite collo transversim depresso; thorace subcordato, postice sinuatim angustato, angulis posticis fere rectis, margine laterali explanato-reflexo, fulvo; elytris ovatis apice oblique sinuatis, supra acute striatis, interstitiis planis, tertio tripunctato.

Long. $3-3\frac{1}{4}$ lin.

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SUFFECTUS.

A. conciso simillimus: differt elytris amplioribus, thorace angustiore marginibus lateralibus anguste reflexo-marginatis, postice magis sinuatis, antice angulatim rotundatis. Castaneo-fuscus; palpis, antennis pedibusque fulvo-testaceis, margine angusto thoracis, epipleuris que elytrorum obscure testaceis; elytris acute striatis, apice oblique fortius sinuatis, interstitio 3^{io} tripunctato.

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

Hab. Mexico (*Boucard*).

ANCHOMENUS NUGAX.

A. conciso affinis: differt thorace latiore, postice multo minus attenuato, antice distincte angustato. Castaneo-fuscus, vel cæneo-fuscus, nitidus; palpis, antennis et pedibus piccis, raro fulvo-testaceis; thorace quadrato, paulo ante medium subangulatim

dilatato, deinde postice paulo angustato, angulis posticis rectis, margine laterali anguste explanato-reflexo vix pallidiore; elytris minus rotundato-ovatis, apice vix sinuatim oblique truncatis, supra acute striatis, interstitiis planis, 3^{to} tripunctato; margine deflexo interdum testaceo.

Long. $3\frac{1}{4}$ lin. ♂ ♀

Hab. Mexico, near the capital (*Flohr*).

ANCHOMENUS SIMPLICIOR.

A. nugaci proxime affinis: differt tantum thorace paullulum angustiore, lateribus antice æqualiter rotundatis nullomodo angulatis, postice vix conspicue sinuatim modice angustato, angulis fere rectis, margine laterali angustissime explanato haud pallido: piceo-niger, vix æneo-tinctus, antennis palpis et pedibus piceo-rufis; elytris ovatis, subtiliter striatis etc. ut in precedentiibus.

Long. 3 lin.

Hab. Mexico, near the capital (*Flohr*).

GLYPTOLENUS, nov. gen. *Anchomeno* affine.

Corpus gracile. Caput angustum, ovatum. Mentum sinu dente magno elongato. Palpi nudi, articulis terminalibus cylindricis. Thorax angustus, ante medium angulatim dilatatus, dorso grosse transversim rugatus. Elytra ampla, convexa, apice haud sinuata, supra fortiter sulcata. Prosternum apice marginatum, prominulum. Metasterni episterna elongata. Pedes graciles; tibiæ et tarsi fortiter sulcata; tarsorum articulis 1^o-4^{um} latitudine æquales, plantis pubescentibus, 4^{to} emarginato.

GLYPTOLENUS RUGICOLLIS.

Niger, subnitidus; thorace capite vix latiore, oblongo, postice sinuatim paulo angustato, angulis posticis subrectis, supra grosse rugato; elytris latis, convexis, apice rotundatis, supra grosse profunde striatis, interstitiis convexis; antennis, palpis, tibiis et tarsis piceo-fulvis. ♀.

Long. $3\frac{1}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES STRICTICOLLIS.

Elongatus, niger, nitidus; palpis, antennarum articulis 4^o-11^{um} tarsisque piceo-rufis; thorace fere orbiculari, basi fortiter contracto, marginibus lateralibus rotundato-explanatis, supra lævi, polito; elytris convexis, marginibus lateralibus explanatis lævibus, apice vix sinuatis, supra valde convexis, sulcato-striatis.

Tarsi articulo 4^{to} latiusculo, emarginato, subtus sublonge setoso, articulis 1^o-3^{um} quatuor posteriorum supra bisulcatis.

Long. 6 lin.

Hab. Chontales, Nicaragua (*Belt, Janson*).

COLPODES INTERGENEUS.

Gracilis, piceo-niger; elytris purpureo-fuscis; palpis, antennis pedibusque pallide testaceis; capite collo supra transversim depresso; thorace angusto, quadrato, antice paulo rotundato-dilatato, postice vix sinuatim modice angustato, angulis posticis distinctis subobtusis, margine laterali angusto; elytris elongato-ovatis, apice oblique (haud sinuatim) truncatis, supra subtiliter subpunctulato-striatis, interstitiis planis, tertio 3-punctato.

Tarsi 2 antici articulo 4^{to} latiusculo, breviter bilobo, subtus longe setoso.

Hab. Costa Rica, Irazu, 6000-7000 feet (Rogers).

COLPODES GRATUS.

Elongato-ovatus, convexior, subæneo-niger; palpis, antennis, tibiis et tarsis piceo-rufis; palpis articulo ultimo sublineari; thorace ovato, lateribus æqualiter rotundatis, paullo ante basin sinuatim citius angustatis, angulis posticis subobtusis, margine æqualiter anguste explanato; elytris apice leviter sinuatis, interstitiis paululum convexis, 3^{io} puncto unico solum conspicuo.

Tarsi articulo 4^{to} subtus longe setoso, quatuor anteriorum breviter bilobo, lobis inæqualibus.

Long. $4\frac{3}{4}$ -5 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000-7000 feet (Rogers).

COLPODES DUPLEX.

Elongato-ovatus, subæneo-niger, elytris purpureo-fuscis; palpis, antennis (art. 5^o-11^{um} dilutioribus) pedibusque rufo-piceis; thorace quadrato, ante medium rotundato-dilatato, deinde paullo vix sinuatim angustato, angulis posticis subrectis; elytris apice oblique sinuatis, striatis, interstitiis planis (versus apicem convexis), 3^{io} tripunctato, puncto anteriore interdum deficiente; elytris raro æneo-fuscis.

Tarsi, articulo 4^{to} subtus sparsim longe setoso, quatuor anteriorum brevissimo bilobo.

Long. $3\frac{1}{2}$ -4 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000-7000 feet (Rogers).

COLPODES OBSCURELLUS.

Elongatus, vix convexus, nigro-olivaceus ænescens; palpis apice flavo-testaceis, antennarum articulis 3 basalibus et tarsis piceis; thorace parvo, quadrato-cordato, transverso, lateribus antice valde rotundatis, postice sinuatim modice angustato, angulis posticis subobtusis; elytris apice fortiter oblique sinuatis, supra subpunctulato-striatis, interstitiis paululum convexis, 3^{io} (in stris) tripunctato; metasterni episternis elongatis; epimeris postice fortiter rotundatis.

Tarsi, articulo 4^{to} subtus longe setoso, quatuor anterioribus leviter tantum emarginatis.

Long. 5 lin.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES LACTIPES.

Nigro-piceus, pedibus albo-testaceis, palpis antennisque rufo-testaceis; labro et mandibulis piceo-rufis; thorace cordato, antice fortiter rotundato, postice valde angustato, ante angulos breviter recto; elytris amplis, convexis, apice sinuatis, iridescentibus, striatis, interstitio 3^{io} tripunctato; metasterni episternis elongatis.

Long. 5 lin.

Tarsi, articulo 4^{to} latiusculo, 2 anterioribus breviter bilobis, cæteris emarginatis.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES PROCEPHALUS.

Elongatus, vix convexus, niger; elytris purpurascensibus; capite elongato, post oculos gradatim angustato, collo supra haud transversim depresso, oculis haud prominulis; palpis et antennis piceis; thorace valde elongato, oblongo-ovato, postice paullo leviter angustato, angulis posticis obtusis vel rotundatis, supra subtiliter transversim striato; elytris ellipticis, apice fortiter sinuatis, striatis, interstitio 3^{io} tripunctato; metasterni episternis brevibus quadratis.

Tarsi articulo 4^{to} latiusculo, profunde emarginato.

Long. 5 lin.

Hab. Guatemala (*Salvin*).

COLPODES PROLIXUS.

Elongatus, gracilis, pedibus antennisque valde elongatis, castaneo-piceus, palpis, pedibus et antennis rufo-piceis; capite elongato-ovato, post oculos crasso, rotundato, oculis vix prominulis, collo paullo angustato, supra transversim depresso; thorace quam caput vix latiore, cordato, postice sinuatim angustato, angulis postice rectis, apice obtusis; elytris oblongo-ellipticis, apice extus oblique truncatis, apud suturam triangulariter excisis, angulo apicali dentiformi, supra punctulato-striatis, interstitio 3^{io} tripunctato; metasterni episternis brevissimis.

Tarsi articulo 4^{to} profunde emarginato, lobulis valde inæqualibus.

Long. 6 lin.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES PARVICEPS.

Ellipticus, cæneo-olivaceus, politus, antennis tibiis et tarsis rufo-testaceis; palpis piceis, articulo ultimo apice attenuato rufo; capite parvo, oculis prominulis, mox pone oculos angustato; thorace quadrato, antice longe postice paullulum angustato, marginibus explanatis, angulis posticis rectis; elytris oblongis, prope basin transversim convexis, apice leviter sinuatis, dorso striato-punctulatis, striis prope basin evanescentibus, prope apicem incisis; metasterni episternis elongatis, angustis.

Tarsi articulo quarto profunde emarginato, lobulis valde inæqualibus.

Long. 4 lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES AUROTINCTUS.

Parvus, elongato-ovatus, supra nigro-æneus; elytris aurato-æneis viridi tinctis, politis; palpis, antennis, trochanteribus et tarsis rufo-piceis; corpore subtus femoribus tibiisque nigro-piceis; capite gracili, collo angustato, supra transversim depresso; thorace quadrato, lateribus fere regulariter paullo rotundatis, postice paullulum magis quam antice angustato, angulis obtusis, margine explanato rufescente; elytris ovatis, subtiliter acute striatis, interstitiis planissimis; metasterni episternis vix elongatis.

Long. $3\frac{1}{4}$ lin.

Tarsi articulo 4^{to} quatuor anteriorum profunde emarginato vel bilobo, duorum posteriorum modice emarginato, lobulis paullo inæqualibus.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES PROSTOMIS.

Elongato-oblongus, niger, nitidus, elytris violaceo-tinctis, palpis gracilibus antennisque rufo-piceis; capite mox pone oculos angustato, collo cylindrico, supra depresso; mandibulis valde elongatis; thorace elongato-quadrato, supra lævissimo; antice prope angulos angustato, postice longius et minus, vix sinuatim, angustato, angulis posticis subrectis apice obtusis, margine laterali subæqualiter explanato-reflexo; elytris oblongis, valde convexis, apice sinuatis, fortiter, prope apicem profundius, striatis, interstitiis paullo convexis, 3^{io} tripunctato; metasterni episternis brevibus.

Tarsi, articulo 4^{to} bilobo, lobulis valde inæqualibus.

Long. $6\frac{1}{2}$ –7 lin. ♂ ♀.

Hab. Costa Rica, Irazu, 6000–7000 feet (*Rogers*).

COLPODES CYANOSTOLUS.

C. cyanonoto affinis; differt thoracis angulis posticis fere rotundatis.

Oblongus, violaceo-vel chalybeo-niger, supra cæruleus; thorace lateribus regulariter rotundatis, angulis posticis obtusis; elytris subtilissime punctulato-striatis, striis apice haud profundioribus.

Tarsi, articulo quarto bilobo, lobulis valde inæqualibus.

Long. $5\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES CHONTALENSIS.

C. cyanonoto affinis, niger; elytris viridi-æneis, fortiter punctulato-striatis, striis apice haud profundioribus, interstitiis paulo convexis; thorace quadrato, lateribus regulariter rotundatis, postice haud sinuatis; antennis rufo-piceis.

Long. $5\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES LEBIOIDES.

C. chalybeo affinis, niger, capite thoraceque æneo-tinctis, elytris cæruleis; antennis tarsisque rufo-piceis; capite parvo, mox pone oculos angustato; thorace parvo, quadrato, medio leviter dilatato, angulis posticis subrectis; elytris latiusculis et brevibus, paulo convexis, apice haud sinuatis, acute striatis, interstitiis planis.

Tarsi supra trisulcati.

Long. $3-3\frac{3}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES PRINCEPS.

C. cæruleomarginato affinis, cæruleus, elytris læte purpureo-cupreis; thorace antice magis quam postice angustato, medio subangulatim dilatato, lateribus postice nullomodo sinuatis, angulis posticis obtusis; elytris striato-punctatis, margine incrassato cæruleo.

Long. $5\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES SUPERBUS.

C. cæruleomarginato affinis, nigro-politus, elytris læte aureo-cupreis; palpis, antennis et tarsis rufo-piceis; capite mox pone oculos prominentes angustato; thorace medio fortiter dilatato, antice gradatim postice citius et valde sinuatim angustato; angulis posticis exstantibus, rectis: elytrorum striis vix conspicuis.

Long. $6\frac{1}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES VIRIDIAURATUS.

C. cæruleomarginato affinis, subtus chalybeus, supra læte viridicænis, elytris interdum viridi-auratis vel cupreo-auratis; capite mox pone oculos prominentes angustato; thorace valde transverso, lateribus regulariter rotundatis, postice haud sinuatis, angulis posticis haud exstantibus, vix rectis; elytris conspicue striato-punctatis.

Long. 7 lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES CHRYSOPTERUS.

*Elongatus, niger nitidus, elytris aurato-æneis; thoracis margine, palpis, antennis et tarsis rufescenti-piceis; capite mox pone oculos magnos subito angustato; thorace fere ut in *C. cæruleomarginato*, medio rotundato-dilatato, lateribus postice sinuato-angustatis, angulis posticis subrectis; elytris elongatis, striato-punctatis, versus apicem striis acute incisus et minus punctulatis.*

Tarsi lati, subtus dense pubescentes, articulo 4^{to} bilobo.

Long. $5\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

COLPODES PROLONGATUS.

Valde elongatus, elegans, viridi-æneus, elytris læte aureo-cupreis; capite pone oculos elongato, gradatim angustato; thorace ovali, angulis posticis rotundatis; elytris apice sinuatis, longe productis sed haud spinosis, striatis, striis passim æqualiter fortiter incisis, interstitiis planis.

Tarsi articulo quarto 2 anteriorum bilobo, 4 posteriorum emarginato, lobulis haud prolongatis.

Articulo unguiculari biseriatim setoso.

Long. $6\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

LEPTOTRACHELUS PUNCTICOLLIS.

Fulvo-testaceus, immaculatus, pedibus pallidioribus; capite lævi, post oculos paullo rotundatim angustato, convexo; thorace antice prope apicem distincte angustato, ante medium rotundato-dilatato; supra passim punctulato, versus angulos posticos grossius punctato; elytris depressis, punctato-striatis.

Long. $4\frac{1}{4}$ – $4\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Janson*).

LEPTOTRACHELUS PANAMENSIS.

Fulvo-testaceus fuscescens, sutura angusta plagaque apicali nigro-fuscis; antennis et pedibus pallidioribus: capite lævi; thorace antice prope apicem angustato, lateribus anticis leviter rotundatis, ante basin paullo sinuatis, supra punctato et medio dorsi punctato-rugoso.

Long. $4\frac{1}{4}$ lin.

Hab. Panama.

CELIA COSTARICENSIS.

Oblongo-ovata, nigra, polita, plus minusve ænescens vel fusco-ænea; antennis piceo-nigris, articulis 1^o et 2^o vel 1^o–3^{um} rufis; thorace convexo, mox pone angulos anticos rotundato-dilatato, deinde usque ad basin leviter arcuato vel subrecto, basi utrinque foveolis duabus distantibus lævibus, interiore recta, exteriori versus angulum oblique ducta; elytris prope apicem angustatis et compressis, striatis, striis lateralibus evanescentibus, striola scutellari ad basin secundæ oriente suturam haud attingente, interstitiis paullo convexis; pedibus piceis, tarsis pallidioribus; prosterni apice dilatato subtruncato.

Long. 4 lin.

Variat. 1, *elytrorum interstitiis planissimis*; 2, *striis subtilissimis subpunctulatis*; 3, *forma abbreviata, ovata.*

Hab. Irazu, Costa Rica, alt. 6000–7000 (*Rogers*).

CURTONOTUS PUTZEYSI.

Elongato-oblongus, niger nitidus, subtus cum pedibus picescens, antennis et palpis piceo-rufis; thorace lateribus valde rotundatis, juxta basin fortiter subito constricto, angulis posticis rectis, limbo

antice et postice grosse punctato; elytris thorace vix lutiore, parallelis, striis conspicue punctatis, omnibus acute impressis.

♂ tibiis intermediis medio intus haud dentatis.

Long. $7\frac{1}{2}$ lin. ♂ ♀.

Hab. Mexico, near the capital (*Flohr*).

Differs from *C. substriatus* by its larger size and more robust proportions, and by the stronger and more uniform striation of the elytra. The ♂ is destitute of the broad tooth on the inner side of the middle tibiæ. Immature individuals are reddish piceous with paler margins.

DIPLOHARPUS EXSTRIATUS.

Oblongo-ovatus, supra lævissimus æneo-relicens, subiridescens; partibus oris, antennis pedibusque fulvis; mandibulis longissimis, rectis; thorace ovato, marginibus postice explanato-elevatis, angulis posticis rotundatis; elytris absque striis, marginali excepta.

Long. $3\frac{3}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

PERICOMPSUS LONGULUS.

Elongatus, parallelogrammicus, castaneo-piceus, capite marginibusque thoracis rufis; elytris fulvo-testaceis plaga mediana oblonga communi (postice usque ad marginem dilatata) nigro-picea; partibus oris, antennis pedibusque pallidis; thorace transverso, postice fortiter sinuatim angustato, angulis posticis rectis, marginibus paullo explanato-reflexis.

Long. 1 lin.

Hab. Mexico, near the capital (*Flohr*).

XYSTOSOMUS BELTI.

Elongato-ovatus, modice convexus, politus, viridi-æneus, elytris aureo tinctis; antennis fulvis, pedibus rufo-piceis, corpore subtus piceo; foveis frontalibus longis ab sulculo oculari utrinque carina separatis; oculis maximis; thorace transverso, antice prope angulos fortiter rotundato-angustato, postice haud angustato, angulis posticis rectis; elytris striis punctulatis novem, 1^{ma}-3^{tiam} vix impressis (1^{ma} versus apicem excepta), 4^a-^{am} apice evanescentibus.

Hab. Chontales, Nicaragua (*Belt*).

XYSTOSOMUS OLIVACEUS.

X. *belti* affinis; differt colore supra omnino olivaceo-æneo, antennis obscure cinereis, articulis 4 basalibus piceis; thorace transverso, antice subito rotundato-angustato, postice haud angustato, sed leviter sinuato, angulis posticis acutis; elytris paullo convexis, ovatis, mox pone humeros rotundato-dilatatis, margineque explanato et fortiter reflexo, punctulato-striatis, striis 1^a-3^{am} vix impressis; pedibus et palpis obscure piceis, articulo subulato rufo.

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

Hab. Chontales, Nicaragua (*Belt*).

TACHYS DIPLOHARPINUS.

Oblongus, modice convexus, sericeo-nitens, subopalescens; partibus oris, antennis pedibusque fulvis; mandibulis acute hamatis; oculis prominulis; foveis frontalibus fortiter impressis, post oculos curvatis; thorace lato, postice modice sinuato-angustato, angulis posticis exstantibus acutis, margine laterali elevato-explanato; elytris lævibus, stria suturali solum fortiter impresso, striola apicali recurva fortiter impressa, apice setifero, foveis irregularibus duabus submarginalibus, puncto discoidali mediano.

Long. $1\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (*Janson*).

A species remarkable for its many points of resemblance to the genus *Diploharpus*.

BEMBIDIUM (NOTAPHUS) FLOHRI.

Oblongum, parallelogrammicum, depressum, æneum nitidum, elytris pallido-testaceis, regione scutellari, gutta utrinque discoidali, maculaque majore postmediana transversa fuscis; palpis, antennis et pedibus fulvo-testaceis; sulcis frontalibus modice impressis simplicibus; capite lævi; thorace postice angustato, angulis posticis obtusis fere rotundatis, supra medio basi strigoso, fovea utrinque vaga, lata, rugulosa, carinaque acuta oblique ad angulum posticum ducta; elytris thorace vix latioribus, integriter punctulato-striatis, interstitiis planis, tertio tripunctato.

Long. $2-2\frac{1}{4}$ lin.

Hab. Mexico, near the capital (*Flohr*).

The species belongs to an unnamed group near *Notaphus*, and is only referred to the latter for general guidance as to its position.

BEMBIDIUM (NOTAPHUS) PLACITUM.

Elongato-oblongum, depressum, viridi- vel subcupreo-æneum, elytris cupreo-fuscis (♂ nitidis, ♀ subopacis) vitta laterali ab humero usque medium, intus biloba, fasciaque maculari ante apicem, fulvo-testaceis; sulcis frontalibus latis haud profundis; thorace late rotundato, postice magis quam antice angustato, angulis posticis obtusis, fovea media profunda carinaque parva juxta angulum; elytris subtiliter punctato-striatis, interstitiis planissimis, tertio 3-punctato; palpis, antennis pedibusque obscure piceis.

Long. 3 lin.

Hab. Mexico, near the capital (*Flohr*).

This species has been mistaken for *N. semifasciatus* of Say. His description, however, suits much better an equally common and similar, but smaller, Mexican species.

BEMBIDIUM (PERYPHUS) ROGERSI.

Gracile, convexiusculum, nigro-æneum, pedibus piceis, antennarum articulo basali subtus rufo; thorace anguste cordato, antice rotundato, postice sinuatim angustato, angulis posticis rectis, basi transversim depresso, vage punctato, foveis profundis carinaque elevata ad marginem fere parallela; elytris punctulato-striatis,

interstitiis convexis paulo undulatis, tertio foveis duabus magnis vagis impressis, stria 7^{ma} obsoleta.

Long. $2\frac{1}{4}$ lin.

Hab. Costa Rica, Mount Irazu, alt. 6000–7000 feet (Rogers).

BEMBIDIUM (PERYPHUS) SUBMACULATUM.

Elongato-ovatum, modice convexum, fusco-æneum, elytris utrinque versus apicem macula obliqua flavo-testacea; antennis piceis, articulo 1^{mo} et 2^{do}–4^{tum} basi pedibusque flavo-testaceis; palpis maxillaribus articulo penultimo obscuro; thorace transversim quadrato, antice modice rotundato, postice leviter sinuatim angustato, angulis posticis subrectis, fovea basali profunda vage rugosa, carinaque obliqua juxta angulum; elytris subtiliter striato-punctulatis, striis interdum magis impressis, 7^{ma} abbreviata, exterioribus omnibus versus apicem oblitteratis, interstitio 3^{io} bipunctato.

Long. $2\frac{1}{5}$ lin.

Hab. Mexico, near the capital (Flohr).

Specimens received from Paris as “*submaculatum*, Chaud. MSS.,” have the striæ impressed; in Mr. Flohr’s specimens the rows of fine clear punctures are superficial. The nearly allied *B. mexicanum*, Dej., is much larger, and has a short curved fold instead of a distinct carina at the hind angles of the thorax.

LACHNOPHORUS SEMIRUFUS.

Breviter oblongus, erecte pilosus, capite thoraceque rufis, elytris pectore abdomineque nigro-æneis, palpis antennarumque articulis 4 basalibus flavo-testaceis; capite postice modice angustato, oculis minus prominulis, vertice grossissime punctatis; thorace late cordato, versus basin modice angustato, grossissime intricato-punctato; elytris quadratis, fortiter punctato-striatis, interstitiis supra paulo planatis, crenulatis, tertio 3-foveato.

Long. $2\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (Belt).

LACHNOPHORUS LEUCOSCELIS.

L. lævicolli (Reich.) *proxime affinis. Elongatus, nigro-æneus, nitidus, supra glaber; palpis antennarumque articulis 4 basalibus rufo-testaceis; tibiis (apice excepto) albo-testaceis; capite (cum oculis) quam thorax latiore, punctis magnis conspersis; thorace rotundato-cordato, valde convexo, postice fortiter angustato, basi constricto et depresso, fere impunctato, polito; elytris profunde striatis, striis a basi usque paulo ultra medium grosse punctatis.*

Long. vix 2 lin.

Hab. Chontales, Nicaragua (Belt).

LACHNOPHORUS LONGULUS.

In hoc genere elongatus, convexior, olivaceo-æneus, breviter setosus; elytris sordide fusco-albis, pone medium fascia irregulari fusca prope suturam valde dilatata; antennis piceo-fuscis, articulo basali infra rufo; femoribus flavo-testaceis, basi et apice piceo-nigris;

tibiis et tarsis piceis, illis dimidio basali rufo-piceis; capite longitudinaliter vage striato; thorace angusto, elongato-ovato, lateribus anticis modice rotundatis, basi angustata, angulis posticis haud exstantibus, supra viridi-æneo subtiliter alutaceo et punctulato; elytris oblongis, apice distincte sinuato-truncatis, fortiter exarato-striatis, striis dimidio basali punctatis, interstitiis planis, seriatim punctulatis, disco utrinque 3-foveatis.

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

Hab. Chontales, Nicaragua (*Belt, Janson*).

LACHNOPHORUS SCULPTIFRONS.

L. elegantulo similis. Gracilis, breviter pallido-hirsutus, viridi-æneus; antennarum articulo basali infra, 2^o-4^{um} basi, femoribus (annulo basali et genibus exceptis) tibiisque (apice excepto) rufo-testaceis; elytris albo- et flavo-testaceis, fascia ultra medium fusco-ænea; capite crebre longitudinaliter strigoso et punctato, thorace elongato-cordato, paululum dilatato, alutaceo-opaco et sparsim punctulato; elytris acute striatis, striis basi punctatis, interstitiis planatis uniseriatim punctulatis, disco trifoveato, foveola anteriore solum conspicua.

Long. 2 lin.

Hab. Guatemala, Chinautla, alt. 4100 feet (*Salvin*); Chontales (*Belt*).

CHALYBE BELTI.

Gracilis, subæneo-nigra, breviter griseo-setosa, setis longioribus nigris commixtis; antennis ut in gen. Ega brevibus extus incrassatis, brevius hirsutis, articulis tribus basalibus flavis, 4^{to}-7^{mum} nigro-fuscis, 8^{vo}-11^{mum} albis; capite grosse reticulato-punctato; thorace gracile cordato, grosse discrete punctato; elytris pone basin valde transversim depressis, acute exarato-striatis, interstitiis summis planatis, distanter lineato-punctatis, utrinque fasciis angustis brevibus macularibus testaceo-albis duabus; pedibus albis, femoribus, tibiis tarsisque apice fuscis.

Long. $1\frac{3}{4}$ lin.

Hab. Chontales, Nicaragua (*Belt*).

CASNONIA TUBULIFERA.

Subæneo-niger, elytris macula anteriore antice ramum ad basin emittente, altera apicali marginibusque rufo-testaceis; antennis pedibusque rufescentibus; capite lævi, mox pone oculos subito constricto, deinde in collum tubuliforme prolongato; media fronte bicallosa; thorace minus elongato, grosse punctato; elytris oblongis, politis, nudis, apice leviter sinuatim truncatis, angulo anteriore obtuso, supra striato-punctatis, striis interioribus quatuor post medium interruptis, interstitio tertio trifoveato, calloque posteriore submarginali.

Long. 3 lin.

Hab. Chontales, Nicaragua (*Belt*).

CALOPHÆNA CRUCIATA.

C. acuminatæ (Oliv.) affinis. Nigro-cyanea, nitida; elytris utrinque maculis magnis quadratis duabus (interstitia sex occupantibus) albo-testaceis, basi et apice anguste cruceque mediana nigro-cyaneis; thorace valde elongato, antice magis quam postice recte angustato; elytris punctulato-striatis, interstitiis modice convexis; antennis articulis 5^o-11^{um} fulvis.

Long. 6½ lin.

Hab. Chontales, Nicaragua (*Belt*).

CALOPHÆNA LÆVIGATA.

C. acuminata (Ol.) affinis. Colore lætius cyanea; elytris medio violaceis, striis (apud maculas albas exceptis) nullo modo impressis; thorace valde elongato, antice subrotundatim, postice sinuatim angustato; elytris aculeatis, maculis utrinque duabus transversis, albo-testaceis, prima interstitia 5, secunda 6 occupante.

Long. 6½ lin.

Hab. Panamá.

CATASCOPUS CHONTALENSIS.

Supra læte viridi-cæneus, elytrorum limbo aurato, pectore et pedibus nigro-piceis, abdomine castaneo; capite post oculos gradatim modice angustato, sed haud elongato, oculis valde exstantibus; thorace transverso vel late cordato, angulis anticis modice proventis, margine exteriori late explanato et valde rotundato usque ad summum angulum, postice sinuatim angustato, angulis posticis exstantibus acutis; elytris punctato-striatis, interstitiis vix convexis.

Long. 6 lin.

Hab. Chontales, Nicaragua (*Belt, Janson*), 4 exempl.

The elytra viewed from the front against the light have a delicate milky opalescent bloom, as in *C. validus*, to which the species is very closely allied.

CATASCOPUS ANGULICOLLIS.

Supra viridi-cæneus, corpore subtus pedibusque nigro- vel rufo-piceis, abdomine castaneo; capite mox pone oculos subito angustato; thorace subquadrato, angulis anticis angustis prominulis, margine explanato, laterali angusto, ante medium angulato, postice sinuatim angustato, angulis posticis prominulis acutis, supra distinctius transversim strigato, margine explanato grosse punctato; elytris punctato-striatis, interstitiis paullulum convexis.

Long. 6 lin.

Hab. Chontales (*Belt*).

COPTODERA SCINTILLANS.

C. acutipenni (Buq.) affinis. Elongato-oblonga, supra capite thoraceque aurato-viridibus politissimis, elytris aurato-cupreis; partibus oris, epistomate, antennis, corpore subtus pedibusque fulvo-testaceis, tibiis obscuris; thorace valde transverso, lateribus rotundatis nullo modo angulatis, margine late elevato-explanato,

impunctato; *elytris amplis, truncaturæ angulis acutis sed non ut in C. acutipenni productis, subtiliter punctato-striatis, striis vix impressis, interstitiis planis.*

Long. 5 lin.

Hab. Chontales, Nicaragua (*Belt*).

EURYSOLEUS BELTI.

E. 13-punctato (*Chaud.*) *proxime affinis, differt maculis paucioribus magnitudineque æqualibus. Latus, ovatus, testaceo-rufus; elytris flavo-testaceis, maculis utrinque 7 margineque subapicali nigris; antennis rufescentibus, articulis 1^o (apice) et 2^o-4^{um}, palpis (apice excepto), femoribus apice, tibiis et tarsis nigris; elytrorum maculis 3 suturalibus (apicali communi antice dilatata), 1 subhumerali, 2 medianis, 1 rotunda subapicali, a margine laterali longe separata.*

Long. 5 lin.

Hab. Chontales, Nicaragua (*Belt*).

APENES COMIS.

Ad sectionem A. purpuripennis pertinet. A. sinuata paulo major, præcipue latior, supra plana, subopaca, fusco-cænea, antennis palpis pedibusque fulvis; capite fere lævi, subtiliter alutaceo, vix ruguloso; thorace late cordato, angulis posticis dentiformibus, basi media arcuata, sublobata, versus angulos subsinuata, lateribus marginulo explanato, supra passim subtiliter transversim strigato; elytris oblongis, apice subfortius sinuato-truncatis, punctulato-striatis, interstitiis planis alutaceis, fascia angusta, curvata, maculari, subapicali, rufa, interstitia 4-8 occupante, apud 7^{um} 8^{um}que maculis versus apicem elongatis, macula altera subhumerali minus distincta. ♂.

Long. 4 lin.

Hab. Panamá.

PINACODERA AMBLYGONA.

P. nigritæ (*Chaud.*) *proxime affinis, differt thorace angustiore et longiore angulisque posticis omnino rotundatis. Nigra, nitida, antennis tarsisque rufo-piceis; capite impunctato; thorace transversim striolato; elytris subtiliter punctulato-striatis, interstitiis planissimis, sparsim obsolete et minutissime punctulatis.*

Long. 5½ lin. ♀.

Hab. Mexico (*Boucard*).

PINACODERA ANGULIFERA.

P. nigritæ (*Chaud.*) *simillima, differt thorace postice latiore, angulis acutis exstantibus. Nigra, nitida, antennis tarsisque rufo-piceis; capite ruguloso, vix punctulato; thorace antice et postice subcrebre punctato; elytris acute striatis, striis subtiliter punctulatis, interstitiis vix convexis, grossius uniseriatim punctulatis.*

Long. 5½ lin. ♀.

Hab. Mexico.

LEBIA CALLIZONA.

L. bifasciatæ (Dej.) *proxime affinis, differt fascia postica metallica apud suturam antice fere divisa. Lævis, testaceo-rufa, capite fasciisque duabus elytrorum latis et macula apicali cæruleis, fascia prima postice medio emarginata, fascia secunda antice ad suturam fere divisa; antennis nigris articulo basali rufo; pedibus cæruleis, femoribus basi rufis; abdomine apice subtus rufo concolori, supra nigro.*

Long. 3 lin.

Hab. Guatemala.

LEBIA CORCULA.

L. nigricipiti (Chaud.) *similis, at capite flavo, elytris ovatis differt. Parva, ovatula, testaceo-flava; elytris fasciis duabus nigris, prima basali (latera haud attingente) postice medio angulatim emarginata, secunda pone medium (marginem lateralem haud attingente) antice et postice medio elytro leviter sinuata, interstitio suturali inter fascias autem nigro; thorace valde transverso, apud angulos posticos valde explanato; elytris profunde punctulato-striatis, interstitiis culminatis.*

Long. vix 2 lin.

Hab. Chontales, Nicaragua (Janson).

LEBIA CHARINA.

L. quinquenotatæ (Chaud.) *simillima, differt elytrorum maculis minoribus posticisque ad suturam conjunctis. Late ovata, flavo-testacea; palpis, articulis 4^{to}-11^{um} antennarum, capite, femoribus apice, tibiis et tarsis, abdominis segmento anali, et elytrorum utrinque maculis 3 nigris; thorace quam in *L. quinquenotata* angustiore; elytris obsolete striato-punctatis; elytrorum maculis, 1 ovata communi scutellari, 1 virguliformi humerali, et 1 postmediana transversa, antice apud suturam indentata, latera haud attingente, apice autem anguste nigro.*

Long. 3¼ lin.

Hab. Chontales, Nicaragua (Belt).

LIA QUADRIANNULATA.

In hoc genere convexa, polita, subcastaneo-rufa, subtus et pedibus testaceo-rufis; antennis articulis 4^o-11^{um} piccis; thorace angustiore, antice gradatim angustato; elytris utrinque annulis duobus flavis, primo mediano-laterali, secundo versus apicem, macula autem flava subhumerali.

Long. 5 lin.

Hab. Chontales, Nicaragua (Belt).

OTOGLOSSA CÆLESTINA.

O. terminali (Chaud.) *forma similis. Supra læte cyanea; elytris violaceo relucentibus, fascia apicali flava; antennis, partibus oris, pedibus et pectore chalybeis, tarsis abdomineque flavis; thorace angusto, pone medium fortiter sinuato-angustato, basi iterum*

subito dilatato, angulis apice rotundatis; elytris supra modice inæqualibus, obsolete punctulato-striatis.

Long. $3\frac{1}{4}$ lin.

Hab. Chontales, Nicaragua (Belt).

OTOGLOSSA OBSCURELLA.

Minor, nigra; elytris leviter violaceo-tinctis, apice fascia obscure rufa ad suturam angustata; tarsi rufo-piceis; abdomine flavo; capite post oculos paulo citius rectiusque angustato, occipite minus convexo; thorace angusto, pone medium fortiter sinuato-angustato, basi iterum dilatato; elytris supra modice inæqualibus, obsolete striatis.

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

Hab. Chontales, Nicaragua (Belt).

CALLEIDA SEMIRUBRA.

Elongato-oblonga, nigro-nitida, elytris (basi excepta) rufo-castaneis; abdomine rufo; capite post oculos magis quam in C. metallica incrassato, collo subito angustato; thorace quadrato, antice cum angulis rotundato, postice sinuato modice angustato, angulis posticis obtusis; elytris apice fortiter sinuatim truncatis, angulis externis dentiformibus, supra paulo inæqualibus, punctulato-striatis, interstitiis planis.

Long. 7 lin.

Hab. Chontales, Nicaragua (Belt).

Taken from the stomach of a toad on the summit of a hill near St. Domingo.

CALLEIDA LÆTIPENNIS.

Subgracilis, castaneo-rufo, elytris (epipleuris exceptis) aurato-æneis; capite angusto, post oculos gradatim angustato haud tumido, collo distincto; thorace quadrato-cordato, postice leviter sinuatim angustato, angulis posticis subrectis; elytris apice leviter sinuatim truncatis, angulis externis valde rotundatis, punctulato-striatis, interstitiis planis.

Long. $4\frac{1}{2}$ lin.

Hab. Chontales, Nicaragua (Belt, Janson).

CALLEIDA JANSONI.

C. onypterygoidi (Chaud.) coloribus similis, at minus nitida, formaque multo magis parallela. Cyanea; elytris purpureo-cupreis, subtiliter alutaceis; capite post oculos citius recte angustato, haud tumido; thorace elongato-quadrato, postice vix sinuatim modice angustato, angulis subrectis, supra subfortiter transversim strigoso; elytris elongatis, parallelis, truncatura angulis externis valde rotundatis, fortiter vix punctulatim striatis, interstitiis paulo convexis, tertio conspicue tripunctato.

Long. 6 lin.

Hab. Chontales, Nicaragua (Belt, Janson).

AGRA LÆTICOLOR.

Ad sectionem A. femoratæ (Kl.) pertinet. Gracilis, viridi-ænea, antennis pedibusque rufis, femoribus basi obscurioribus; capite maxime elongato, lævi, post oculos gradatim rotundato-angustato, juxta collum haud tumidulo; thorace angusto, elongato-conico, sulcis 4 longitudinalibus, foveolato-punctatis, impressis, quorum duobus dorsalibus antice carina abbreviata separatis; elytris ante medium sinuatim angustatis, postice iterum dilatatis, apice utrinque flexuoso-truncatis, angulo exteriori subspinoso, suturali acute dentato, supra punctato-striatis, interstitiis inter se lineolis transversis multifariam conjunctis.

♂ metasterno medio, femoribusque basi infra rufo-pilosis.

Long. 7 lin.

Hab. Chontales, Nicaragua (Belt).

AGRA CHRYSOPTERYX.

A. rutilipenni proxime affinis et similis. Castaneo-rufa, elytris (epipleuris exceptis) læte viridi-auratis; capite post oculos breviter semiovato, punctis nonnullis piliferis impresso; thorace medio modice rotundato-dilatato, paulo ante apicem fere subito angustato, lineatim subsparsum irregulariter foveato-punctato, longe piloso; elytris apice subrecte oblique truncatis, angulo exteriori breviter dentato, suturali rotundato, supra acute punctulato-striatis, striis secunda et quarta 5-6-punctatis, stria sexta bipunctato.

♂ metasterno et abdomine medio longe rufo-barbatis.

Long. 7 lin.

Hab. Chontales, Nicaragua (Janson).

AGRA PANAMENSIS.

Ad sectionem A. æneæ (F.) pertinet; at cæteris speciebus distinctissima. Lator, nigra, partibus oris, antennis, trochanteribus, genibus, tibiis et tarsis fulvo-castaneis; capite lato, pone oculos quadrato, margine posteriore ante collum exacte recto, supra impunctato; thorace quam caput longiore, pone medium rotundato-dilatato, antice usque ad apicem gradatim angustato, supra medio fere lævi, juxta marginem sparse punctato-impresso; elytris apice arcuatim truncatis, angulo exteriori fortiter spinoso, suturali acute dentato, supra vix inæqualibus, punctato-striatis, striis 2^a et 4^a seriatim rotundato-foveolatis, 6^a et 8^a magis confuse foveolatis.

♀ antennis art. 8^{vo} multo abbreviato.

Long. 12 lin.

Hab. Panamá (received from Mr. E. Bartlett).

5. Description of a new Species of *Tudicula*. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

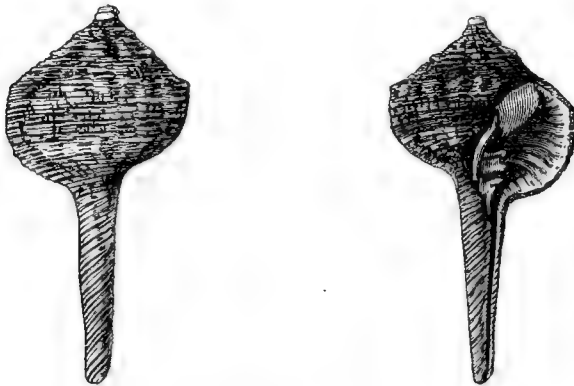
[Received May 11, 1878.]

TUDICULA INERMIS, n. sp.

Shell globosely turbinate, solid, white, ornamented with a broad band and descending flames of an orange-chestnut colour, sculptured throughout with numerous elevated concentric ridges alternating with smaller ones, the interstices crossed by very fine close-set descending striæ; whorls $6\frac{1}{2}$, flattened, last whorl large, tumid, flattened above and angulated at the periphery, suture impressed, apex papillary; aperture acuminately ovate; outer lip simple, arcuate, strongly grooved within; inner lip with a broad white callus spreading over the pillar, and with three transverse plaits at the lower portion of the columella; canal long, straight, somewhat longer than the entire body of the shell.

Long. 1 in. 8 lin., lat. 10 lin.

Hab. Singapore?



Tudicula inermis.

This remarkable shell belongs to the genus *Tudicula* of H. and A. Adams, constituting the third species of the genus as yet described.

The genus *Tudicula* was proposed by the learned authors of the 'Genera of Recent Mollusca' (in the Proc. Zool. Soc. 1863) for the reception of two species of shells "with spiny varices and three transverse plaits on the columella," viz. *T. armigera*, A. Ad., and *T. spinosa*, H. & A. Ad. The peculiar feature of the species now described is that it is destitute of spines, although it agrees perfectly with all the other characters of this well-marked genus, which, in my opinion, should be placed in the family Turbinellidæ.

I am indebted to my friend Dr. W. Newcomb, of Ithaca, New York, for an examination of this very interesting shell, two specimens





2
3

Hanhart

...IGA EVERETTI





1876

Hanhart

TRICHOSTOMUS RUFIFRONS

of which were obtained from a dealer at Singapore; but the exact locality of their habitat could not be satisfactorily determined.

Care must be taken not to confuse *Tudicula* of H. and A. Adams with *Tudicla* of Bolton, of which genus *T. (Murex) spirillus* of Linnæus is the type.

6. Contributions to the Ornithology of the Philippines.—
No. IX. On the Collection made by Mr. A. H. Everett
in the Island of Palawan¹. By ARTHUR, Marquis of
TWEEDDALE, F.R.S., President of the Society.

[Received May 16, 1878.]

(Plates XXXVII. & XXXVIII.)

Until visited by Dr. Steere in July 1874, when he remained for a month at the Spanish settlement of Puerto Princesa, the island of Palawan, so far as is on record, had not been explored by any naturalist. Nothing was known of its zoological productions; and its exact relationship as a zoogeographical area remained an unsolved problem. During his stay at Puerto Princesa Dr. Steere collected examples of 32 species of birds, all of which have been enumerated by Mr. Sharpe².

At the end of November 1877 Mr. A. H. Everett arrived at Puerto Princesa, and remained until the beginning of January, when, becoming disabled by fever, he was obliged to return to Manilla to recruit his health. He, however, succeeded in collecting specimens of 52 species of birds, 32 of which are additional to those obtained by Dr. Steere. This last gentleman discovered 12 species not sent to me by Mr. Everett; so that the total of known Palawan species of birds (and all are from Puerto Princesa and its vicinity) now amounts to 64. This small number cannot exhaust the avifauna of this large island; and as Mr. Everett is now happily recovered, and has returned to Palawan, I propose postponing any remarks on the character of the Palawan ornithology until we are in possession of the wider evidence which further collections will doubtless supply. Generally, however, it may be affirmed from the data before us that the birds of Palawan represent mostly Bornean genera and species, although a few distinctly Philippine types also occur.

The following species in the present collection have not hitherto been described:—

- | | |
|---------------------------------------|-------------------------------------|
| 4. <i>Tiga everetti</i> . | 22. <i>Brachypus cinereifrons</i> . |
| 12. <i>Dicrurus palawanensis</i> . | 25. <i>Criniger palawanensis</i> . |
| 17. <i>Broderipus palawanensis</i> . | 34. <i>Cyrtostomus aurora</i> . |
| 19. <i>Trichostoma rufifrons</i> . | 39. <i>Corvus pusillus</i> . |
| 20. <i>Dryocataphus cinereiceps</i> . | |

¹ I treat Palawan as being a Philippine Island in a political sense. It remains to be shown whether it does not in fact belong, zoologically, rather to Borneo.

² Trans. Linn. Soc. ser. 2, Zoology, vol. i.

1. TANYGNATHUS LUZONENSIS (3).

[P. Princessa, ♂, January 1878.]

Not separable from all other Philippine examples.

2. BUTASTUR INDICUS (20).

[P. Princessa, ♂ (?), November 28, 1877 : iris bright yellow ; cere light wax-yellow ; bill and nails black ; legs and feet dull yellow.]

3. CHRYSOCOLAPTES ERYTHROCEPHALUS.

Chrysocolaptes erythrocephalus, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 315. no. 13, t. xlv. f. 1.

[P. Princessa, ♂, December 2, 1877 : iris crimson ; bill pale yellow tinged with green ; feet and claws grey-green. ♀, November 27 : iris crimson ; bill pale yellow tinged with green ; feet and claws greyish green.]

The male example is in full adult plumage. That of the female (hitherto undescribed) resembles the male in all respects excepting the crown of the head and the crest, the feathers of which are ruddy brown, each being tipped with a pale rusty-yellow drop or spot. The cheeks, chin, and throat are washed with dilute crimson, not intense as in the male.

4. TIGA EVERETTI. (Plate XXXVII.)

Tiga javanensis (Ljungh.), Sharpe, *t. c.* p. 315. no. 14?

Three examples, two of the adult male and one of the adult female, were obtained near Puerto Princessa by Mr. Everett. They probably belong to the species doubtfully identified by Mr. Sharpe (*t. c.*) with *T. javanensis*. From this species, as well as from all the other species of the genus known to me, the present bird differs in the female having the head and crest uniform dark brown, the latter being broadly terminated with crimson. The lower part of the throat and the upper breast are uniform buffy brown, and not squamate.

Male. Forehead, crown and crest, uropygium, and upper tail-coverts crimson. Many of the dorsal plumes washed with crimson. Lores buffy brown. Space behind the eyes creamy white, each feather narrowly margined with pale brown. A patch commencing below the posterior angle of the eye and including the ear-coverts dark brown, this colour being continued as a narrow band round the occiput. Space below the eye buffy cream-colour, which is continued as a narrow line on the cheek, and expands into a broad stripe down the sides of the neck. A brown stripe commencing at angle of mouth and descending down the sides of the neck ; a few crimson feathers on the inner edge of this stripe. Chin and upper throat buffy cream-colour, many of the feathers tipped dark brown. Lower throat and crop uniform buffy brown. Breast-feathers pale yellow, very narrowly margined and boldly centred with dark brown ; within the brown centres a pale yellow stripe of varying dimensions. Abdominal and ventral feathers and the under tail-coverts pale yellow, with generally two cross bands of

dark brown. Back, wing-coverts, outer edges of secondaries, and exposed surface of tertiaries and scapulars golden. Primaries and rectrices dark brown.

Female. Differs from the male in having the top of the head dark uniform brown, almost black, the crest-plumes being terminated with crimson.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	5·37	4·12	1·00	1·37
♀	5·37	4·12	1·00	1·37

In one example (♂) the lower breast-markings are not so well defined, and the general markings of the lower surface are less pronounced. The upper tail-coverts are mostly black, some only being tipped with crimson, others with golden.

[P. Princessa, ♂, November 25, 1877: iris dark brown; bill black, basal half of mandible grey; feet greenish, nails grey. P. Princessa, ♀, November 27, 1877: iris crimson; other parts as in ♂.]

5. EURYSTOMUS ORIENTALIS (37).

[P. Princessa, ♀, November 29, 1877.]

6. CACOMANTIS MERULINUS (57)?

[P. Princessa, ♂, December 10, 1877; iris bright salmon-red; bill black, mandible light brown; feet yellow, claws black.]

A single example, not sufficiently mature to be identified with certainty.

7. SURNICULUS LUGUBRIS.

Cuculus lugubris, Horsf. Tr. L. S. xiii. p. 175.

[P. Princessa, ♀, December 6, 1877: iris dark brown; bill black; feet dark grey.]

8. PHENICOPHAES HARRINGTONI.

Dryococcyx harringtoni, Sharpe, *t. c.* p. 321. no. 34, f. 1.

[P. Princessa, ♂, November 29, 1877: iris light brown; orbital and loreal space deep crimson; bill light green, tinged with olive; feet and legs lead-grey; nails dark grey. ♀, December: iris brilliant yellow, with ring of ochreous orange.]

Of other males Mr. Everett notes the iris as being reddish brown.

This Coucal is a representative form of *P. curvirostris* and *P. erythrognathus*, closely resembling both species, but differing structurally in the shape and position of the nostril. Mr. Sharpe (*P. Z. S.* 1873, p. 604) has generically separated *P. curvirostris* from *P. erythrognathus*, on account of the shape and position of the nostrils in those two species being different, and for the same reason has established (*l. c.*) the genus *Dryococcyx* for the reception of this Palawan

representative form¹. That three birds, one inhabiting Java, another Borneo, the Malay peninsula, and Sumatra, and the third Palawan, all so closely resembling each other in their colouring and markings that they are difficult to recognize without careful comparison of their shades and tints, should possess nostrils structurally differing in all three is remarkable; but is it a sufficient reason to place them in three different genera? I can only regard the character as being specific.

The plumage of the sexes is alike. The amount of dark chestnut on the middle pairs of rectrices varies considerably, from three inches to one inch in depth.

9. *CENTROCOCCYX EURYCERCUS*.

Centropus eurycercus, A. Hay, Blyth, J. A. S. B. 1845, p. 551.

[P. Princessa, ♂, January 8, 1878: iris bright crimson; bill, legs, and feet black. ♂ (juv.), December 9, 1877: iris neutral tint; bill and legs jet-black.]

Rather smaller than the Malaccan type.

10. *LANIUS LUZIONENSIS* (72).

[P. Princessa, ♂ ♀, December 6 and 11, 1877.]

11. *GRAUCALUS SUMATRENSIS*.

Ceblepyris sumatrensis, S. Müller, Verh. Land- en Volkenk. p. 191.

[P. Princessa, ♀, December 1877: iris light lemon-yellow.]

Does not differ from Sumatran, Malaccan, and Bornean examples.

12. *DICRURUS PALAWANENSIS*.

In the Philippines three species of *Dicruridæ* are known:—*D. balicassius*, type of the genus *Dicrurus*; *D. mirabilis*, its representative form; and *D. striatus*. This last, by its even, almost unfurcated tail, resembles *D. balicassius* in structure, but in its general colouring and in the distribution of its markings exhibits a close relationship to the Papuan and Malaccan species associated by Mr. Sharpe with *Chibia hottentotta*. These Papuan species seemed to me to belong to a group distinct from that represented by *D. balicassius* on the one hand and *Chibia hottentotta* on the other; and their geographical range favoured this view². But Mr. Everett has discovered in Palawan a species which undoubtedly belongs to the Papuan section of the *Dicruridæ*; and it would appear that, with *D. striatus* as a connecting link, the Papuan and the Philippine species must be regarded as members of one section of the family, to which the title of *Dicrurus* should be applied. Besides this undescribed species, Palawan is inhabited by at least one other member of the family, belonging to the genus *Buchanga*; and Palawan and Lombeck are the only two islands or areas known to me where there is a second species associated with a true species of *Dicrurus*, unless,

¹ The type was from Balabac; but the Palawan bird does not appear to differ.

² Count T. Salvadori has recently (*antèa*, p. 88, note) proposed the generic title of *Dicruropsis* for this group.

indeed, *D. læmostictus* is shown to also inhabit New Ireland or *D. megarhynchus* New Britain.

Male and female. Upper surface of wings and tail burnished bronze-green. Glistening scale-like feathers on crown of head bluish metallic green. Neck-hackles and pectoral and gular spots dark metallic steel-blue; these spots, which extend from lower part of the throat and cover the breast, are lengthened and ovate in form rather than round, and occupy the tips of the feathers. With their exception, the entire under surface is dull jet-black. The nape, back, and uropygium is black with a blue gloss. The tail is forked for about one inch in depth; and the distance between the extremities of the outer pair of rectrices is nearly three inches; upper tail-coverts tipped with metallic green.

Dimensions:—

	Wing.	Tail.	Tarsus.	Culmen.
	in.	in.	in.	in.
♂ ♀	5.5	5.5	1.0	1.5

[P. Princesa, ♂, November 1877: iris crimson; bill and feet black. ♀, December: iris deep brown.]

All the female birds have the iris noted as being deep brown by Mr. Everett. On the label of one of the males Mr. Everett has written:—"Iris in the living bird deep crimson."

D. palawanensis most nearly resembles *D. leucops*, *D. pectoralis*, and *D. læmostictus*; but, besides being much smaller, the shape and position of the pectoral and gular spots are different, not being so round, but narrower.

13. BUCHANGA LEUCOPHÆA.

Dicrurus leucophæus, Vieill. Nouv. Dict. d'Hist. Nat. ix. p. 587.

Buchanga cineracea (Horsf.), Sharpe, *t. c.* p. 324. no. 48.

[P. Princesa, ♂, November 29, 1877: iris crimson; bill and feet black. ♂, December: iris deep rich orange-brown. ♀, December: iris orange-brown.]

14. CYORNIS BANYUMAS.

Muscicapa banyumas, Horsf. Tr. L. S. xiii. p. 146.

Muscicapa cantatrix, Tem. Pl. Col. 226.

[P. Princesa, ♂, December 1877: iris chocolate; bill black; legs and feet purplish grey; claws dark grey. ♀, January 1877: iris chocolate; bill black; legs lead-grey.]

The female of this species is well described, but badly figured, by Temminck (*l. c.*).

15. HYPOTHYMIS AZUREA (85).

[P. Princesa, ♀, December 1877: iris deep brown; bill entirely black, interior of gape golden; legs and feet dark blue-grey.]

16. HIRUNDO JAVANICA.

Hirundo javanica, Sparrm. Mus. Carls. t. 100.

[P. Princesa, ♀, December 7, 1877.]

17. *BRODERIPUS PALAWANENSIS*, n. sp.

[P. Princessa, ♀, January 1878.]

A representative form of *B. acrorhynchus*, but smaller and with a shorter bill. The yellow space included with the black horseshoe-mark on the head extends far beyond the eyes, and measures in depth over one inch. There is no yellow alar spot.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♀	5·9	4·5	1·0	1·5

18. *ORIOLOS XANTHONOTUS*.

Oriolus xanthonotus, Horsf. Tr. L. S. xiii. p. 153; Zool. Res. Java, t. 46; Temm. Pl. Col. 214.

[P. Princessa, ♂, December 30, 1877: iris crimson; bill burnt sienna; legs dark lead-grey.]

In the colouring and markings the single specimen sent by Mr. Everett (an adult male) is not to be distinguished from Malaccan, Bornean, and Sumatran individuals; but it greatly exceeds them by its dimensions—wing 4·63 inches, tail 3·50.

19. *TRICHOSTOMA RUFIFRONS*, n. sp. (Plate XXXVIII.)

Mr. Everett has sent three skins of a Timeline bird which appear to belong to a somewhat aberrant form of the genus *Trichostoma*. The bill, seen in profile, has the exact contour of the bill of *T. abboti*, but is somewhat stouter; at the base it is slightly broader; and the rictal bristles are longer. The tail is also more graduated, the outer pair of rectrices being shorter than the penultimate pair, which, again, are not quite so long as the remainder. Perhaps this species is congeneric with the two described and figured by Mr. Sharpe (*t. c.*) under the titles of *Zeocephus cinnamomeus* and *Z. cyanescens* (species with which I am unacquainted); but if so, they cannot be classed under the Muscipidæ.

Male and female. Forehead bright rufous-brown, contrasting with the duller rufous-brown of the vertex and occiput. Nape and back earthy brown, tinged with olive and paler on the nape. Long, lax feathers of the uropygium bright rufous. Upper tail-coverts pure chestnut; rectrices dull chestnut. Lores and supercilium, which extends behind the eye, pure grey. Cheeks and ear-coverts greyish brown. Chin, throat, and vent pure white. Breast, abdomen, flanks, under tail-coverts, and under wing-coverts tawny, with a pale brown shade on the breast. Primaries brown, edged with pale tawny chestnut. Remaining quills and the wing-coverts dull chestnut, tinged with the colouring of the back.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	3·37	3·50	1·00	0·94
♀	3·12	3·25	0·95	0·87

[P. Princessa, ♂ ♀, December 10, 1877: iris pale Naples-yellow; bill dark plumbeous; feet pale plumbeous.]

20. *DRYMOCATAPHUS CINEREICEPS*, n. sp.

This species is congeneric with *Brachypteryx malaccensis*, Hartl., which Count T. Salvadori retains under the genus *Brachypteryx*. But *B. malaccensis* is certainly nearer to *Drymocataphus* than to *Brachypteryx*, although it may perhaps be advisable to form a separate genus for its reception, more especially as the species which inhabits Palawan, about to be described, is identical in structure with the Malaccan and Bornean form (which is also said to inhabit Sumatra), and also as *Brachypteryx murinus* is congeneric.

Female. Forehead, crown, and occiput dark iron-grey. Ear-coverts, space before the eye, and nape pale grey. Back, uropygium, scapulars, upper tail-coverts, and exposed surface of wing and tail ruddy brown, brighter than in *D. malaccensis*. Dorsal plumes pale-shafted. Chin, throat, upper breast, abdomen, and vent pure white. Flanks, a band across the breast, under tail-coverts, and thigh-coverts, wing-lining, and axillaries pale rufous-brown.

Dimensions:—

	Wing.	Tail.	Tarsus.	Culmen.
	in.	in.	in.	in.
♀	2.50	1.00	1.06	0.75

[P. Princessa, ♀, January 1878: iris burnt sienna-orange; bill brownish grey, mandible white; legs pallid, the front of tarsus tinged brown.]

Distinguished from *D. malaccensis* by its dark-grey head, its light-grey ear-coverts, and the brighter rufous of the dorsal plumage.

21. *MIXORNIS WOODI*.

Mixornis woodi, Sharpe, *t. c.* p. 331. no. 69.

[P. Princessa, ♂, December 5, 1877: iris dark ochre-yellow; bill black, mandible grey; legs and feet horn-yellow. ♀, January 1878: iris ochreous orange; bill dark grey, mandible pale grey; legs greenish olive.]

22. *BRACHYPUS CINEREIFRONS*, n. sp.

Male and female. Chin, throat, and breast pale cinereous brown, palest and whitest on the chin and throat. Abdomen and ventral region pale yellowish white, in some examples with a certain admixture of the colouring of the breast. Flanks pale earthy-brown. Thigh-coverts ochreous yellow. Under tail-coverts light yellow, with a slight ochreous tinge. Wing-lining and axillaries pale yellow; carpal edge ochreous yellow. Ear-coverts pale cinereous, with almost white shafts. Space before the eye uniform dull brown. Cheeks dull cinereous brown, with a few white-shafted feathers. Head and nape olive-brown, tinged with pale grey, the frontal feathers being distinctly tipped and centred with pale grey. Back, scapulars, wing-coverts, and uropygium olive-brown, olive predomi-

nating, the long, lax, and fluffy uropygial feathers being of a slightly lighter shade of olive-green. Upper tail-coverts olive-green. Quills light brown, margined with a brighter olive-green. Rectrices light brown, edged with olive-green, and some with pallid yellowish apices. Underneath pale brown, washed with very light yellowish green. Shafts above brown, below yellowish white.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	3·37	3·37	0·88	0·88
♀	3·25	3·12	0·87	0·75

[P. Princessa, ♂, December 14, 1877: iris deep rich burnt-sienna; bill blackish brown; legs and feet purple-brown. ♂, November 28: iris chocolate; bill dark brown; legs pale brown.]

One example marked ♀ equals the ♂ in its dimensions.

Mr. Everett procured a good series of this short-footed Thrush. At first sight it can be easily mistaken for *B. plumosus* (Blyth), of which it is a representative form. It is to be distinguished by its pale abdomen, which in *B. plumosus* is browner and nearly uniform with the breast, by its pale greyish breast, by its yellow under tail-coverts, which in *B. plumosus* are ochreous-brown, by its pale yellow, and not ochreous, wing-lining and axillaries, and by the cinereous or pearl-grey edgings and centres of the frontal plumes. Nor is the green of the quills and rectrices nearly so developed. The colouring of the abdominal plumage resembles that of *Iole olivacea*, but is not so distinctly yellow.

23. BRACHYPODIUS MELANOCEPHALUS.

Lanius melanocephalus, Gm. S. N. i. p. 309.

[P. Princessa, ♂ ♀, January 1878: iris violet-blue; bill and legs black.]

Undistinguishable from typical examples.

24. CRINIGER FRATER.

Criniger frater, Sharpe, *t. c.* p. 334. no. 77.

[P. Princessa, ♂, December 1, 1877: iris red-brown; bill horn-grey, darker on culmen. ♀, December: iris red-brown; bill dark grey; mandible whitish; legs, feet, and nails pallid brown.]

25. CRINIGER PALAWANENSIS, n. sp.

Male and female. Chin, lower breast, abdomen, vent, under tail-coverts, wing-lining, axillaries, and carpal edge bright yellow. Feathers of the throat, cheeks, and upper breast of the same yellow, the centres towards the apices being pale grey. These parts have thus a streaked appearance. Sides of the breast and the flanks clouded with pale brown; a few of the nareal plumes bright yellow. Space before the eye yellowish grey. Head, ear-coverts, and nape reddish brown, the frontal and coronal plumes being sublanceolate and with pale central streaks. Back, scapulars, wing-coverts, and uropygium

ruddy olive-brown. Upper tail-coverts, which are almost concealed by the mass of loose and lax uropygial plumes, ruddy brown. Rectrices of a darker tone than the tail-coverts. Quills brown, margined with the colour of the dorsal plumage.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	3·25	3·20	0·75	0·87
♀				

[P. Princessa, ♂, January 1878: iris lemon-yellow. ♀, December 27, 1877: iris lemon-yellow; bill dark smoky grey, the mandible whitish; legs and claws pale brown.]

26. PHYLLORNIS PALAWANENSIS.

Phyllornis palawanensis, Sharpe, *t. c.* p. 333. no. 72, t. 50. f. 1, 2.

[P. Princessa, ♂ ♀, January 1878.]

The only example marked ♀ has the terminal portions of the moustache deep blue. Two examples marked ♂ have it white. Mr. Sharpe's conclusions (*l. c.*) on the point were the reverse. This is one of the most beautiful species of the genus. The throat is bright golden; and the whole colouring of Mr. Keuleman's figures (*l. c.*) is much too pallid.

27. ÆGITHINA SCAPULARIS.

Iora scapularis, Horsf. Tr. L. S. xiii. p. 158.

[P. Princessa, ♂ ♀, December 12, 1877: iris white; bill lead-grey, the culmen black; legs and feet bluish grey; claws black.]

All the males are without a trace of black on the upper parts. They agree with Bornean and Malaccan examples (*I. viridis*, Bp.?). Bornean individuals are stated by Count T. Salvadori to be identical with Javan (*Ucc. Borneo*, p. 191).

28. MONTICOLA SOLITARIUS (103).

[P. Princessa, ♂ ♀, December 1877.]

29. CITTOCINCLA NIGRA.

Cittocincla nigra, Sharpe, *t. c.* p. 335. no. 82, t. lii. f. 1, 2.

[P. Princessa, ♂, December 14, 1877: iris very dark brown; bill, legs, and feet black. ♀, January 1878: iris dark brown; bill black; legs lead-grey.]

30. ORTHOTOMUS RUFICEPS.

Edela ruficeps, Lesson, Tr. d'Orn. p. 309.

[P. Princessa, ♂ ♀, December 1877.]

31. ANTHUS MACULATUS.

Anthus maculatus, Hodgs. Gray's Zool. Misc. p. 83; Tweeddale, P. Z. S. 1877, p. 596. no. 48.

[P. Princessa, ♀, January 2, 1878.]

32. MYZANTHE PYGMÆA (121).

[P. Princessa, ♂, January 7, 1877: iris dark brown; bill and legs black.]

33. NECTAROPHILA SPERATA (122).

[P. Princessa, ♂, January 1878. ♀, December 29, 1878: iris warm brown.]

Two males, not adult; the violet throat and plastron bounded on both sides with a white border, the scarlet breast mixed with white, the crown dingy dull brown.

34. CYRTOSTOMUS AURORA, n. sp.

Notwithstanding that Captain Shelley, in his beautiful work on the Sun-birds, includes the large group of Asiatic and Australian Nectariniidæ, of which *C. jugularis* and *C. asiaticus* may be taken as types, along with a number of other species, under Cuvier's genus *Cinnyris*, I still adhere to the view expressed by me (*Ibis*, 1870, p. 19) that these Sun-birds form a natural, distinctive, and separate section of the family. For it I adopted Dr. Cabanis's generic title *Arachnechthra*; but as the type of that genus is *C. lotenia*, L., which may be considered generically separable (although not so in my opinion), and as Dr. Cabanis established his genus *Cyrtostomus* (type *C. jugularis*, L.) before that of *Arachnechthra*, according to strict rule, the generic title of *Cyrtostomus* should be employed; and I observe that this is the view of Count Salvadori. There are now twelve species of this group described—namely, *C. asiaticus*, *C. lotenia*, *C. osea*, *C. brevirostris*, *C. flammaxillaris*, *C. andamanicus*, *C. rhizophoræ*, *C. pectoralis*, *C. frenatus*, *C. jugularis*, *C. zenobia*, and *C. solaris*. To this list Mr. Everett's researches in Palawan enable me to add a thirteenth.

Male. Above uniform dark olive-green. Forehead, chin, throat, cheeks, and upper breast metallic steel-blue with shades of green and violet in certain lights. Lower breast fiery orange-red. Remainder of lower surface, under tail-coverts, and wing-lining bright yellow. Quills brown, faintly edged with olive-green. Rectrices black; terminal half of outer pair white, a broad white terminal patch on the penultimate pair; apices of third pair fringed with white, of fourth pair still less so.

Female. Above and ear-coverts olive-green, slightly lighter in shade than that of male. Superciliaries, cheeks, and all the under surface and the wing-lining bright yellow. Wing-feathers brown, margined with olive-green. Rectrices as in male.

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	2.25	1.62	0.62	1.00
♀	2.00	1.62	0.60	0.87

[P. Princessa, ♂, November 30, 1877: iris deep crimson; bill and legs black. ♀, January: iris dark brown; bill and legs black.]

The flame-coloured lower breast at once distinguishes this Sun-bird from all others. Its nearest ally is *C. solaris*, in which the flame-colour covers the abdomen also.

35. *CHALCOSTETHA INSIGNIS*.

Nectarinia insignis, Jardine, Nat. Lib. xxxvi. p. 274.

[P. Princesa, ♂, January 1878: iris warm brown; bill and legs black.]

A single example of an adult male, and not to be distinguished from Sumatran and Malaccan individuals.

36. *ÆTHOPYGA SHELLEYI*.

Æthopyga shelleyi, Sharpe, Nature, 3rd August, 1876, p. 297; Tr. L. S. 2nd ser. Zool. i. p. 343. no. 105; Shelley, Monogr. Cinnyridæ, pt. iii. t.

[P. Princesa, ♂, December 2, 1877: iris brown; bill black; legs and feet very dark brown. ♀ (?), January 4, 1877: bill and legs dark brown.]

The female has not been described; and it is with some doubt that I so identify the single skin noted above. The chin, throat, and upper breast is pale grey; the lower breast and abdomen and wing-lining are pale yellowish white. The vent and under tail-coverts of a more decided shade of yellow. The head is greyish olive-brown. Remainder of upper surface a clear olive-green, lightest on the upper tail-coverts. The quills and rectrices are dark brown edged with olive-green, having a slight ruddy hue. Cheeks and ear-coverts pale grey with a greenish tinge. The dimensions are sensibly smaller than those of the male—wing 1.75; culmen 0.56.

37. *ANTHREPTES MALACCENSIS*.

Certhia malaccensis, Scopoli, Del. Flor. et Faun. Insubr. ii. p. 91. no. 62.

[P. Princesa, ♂, January 1878: iris Indian red; bill black; legs greyish olive; scales of feet yellow. ♀, December 29, 1877: iris bright Indian red; bill very dark sepia-brown; legs and feet yellowish olive; soles of feet yellow; claws pale brown. ♂ (jun.), November 27, 1877: iris Indian red; bill dark brown; legs yellowish olive.]

The example of the young male above noted is in the exact plumage of the adult female, its sex being betrayed by a couple of metallic plumes on the crown.

38. *ARACHNOTHERA DILUTIOR*.

Arachnothera dilutior, Sharpe, Nature, 3rd August, 1876, p. 297; t. c. p. 341. no. 100; Shelley, Cinnyridæ, pt. iii. t.

[P. Princesa, ♂, December 6, 1877: iris brown; bill black; legs and feet dark grey. ♀, January 1878: iris dark brown; denuded orbital skin green-yellow; bill black; mandible grey; legs and feet blue-grey.]

Bill of female considerably shorter than that of male.

39. *CORVUS PUSILLUS*, n. sp.

Female. Basal portion of plumage white. Above purple-black, with a slight greyish shade. Wing-coverts and outer margins of rectrices deep purple-black. Plumage underneath dull ashy black, with a purplish gloss on cheeks and throat. Contour of bill as in the *C. validus* group.

Dimensions :—

	Wing.	Tail.	Tarsus.	Culmen.
	in.	in.	in.	in.
♀	8.75	5.25	1.75	2.12

[P. Princesa, ♀, December 27, 1877: iris deep brown; bill, legs, and claws shining black.]

This Crow, or rather small Raven, is a diminutive form of *C. validus* and its allies. It has no affinity with true *C. enca*.

40. *CALORNIS PANAYENSIS* (128).

Calornis chalybeus (Horsf.), Sharpe, *t. c.* p. 343. no. 111.

[P. Princesa, ♀, December 1877: iris brilliant red; bill and feet black.]

A large series is sent by Mr. Everett, which I refer to the Philippine rather than to the Bornean species.

41. *GRACULA JAVANENSIS*.

Corvus javanensis, Osbeck, Voy. China & E. Ind. i. p. 157, "Java" (Eng. tr. 1771).

[P. Princesa, ♂, January 1878: iris deep brown; bill fine deep orange; wattles and legs chrome-yellow; claws dark brown. ♀, December 3, 1877: iris deep brown; bill red-orange; wattles orange-yellow; legs yellow.]

These examples are not to be distinguished from Bornean, although they are somewhat smaller and have slenderer bills than Javan and Sumatran individuals.

42. *OXYCERCA EVERETTI*.

Oxycerca everetti, Tweeddale, P. Z. S. 1877, p. 699, t. lxxiii. f. 2.

[P. Princesa, ♂, December 1877: iris rich deep orange-brown; bill, maxilla black, mandible pale grey; feet, legs, and claws dark lead-grey. ♂ juv.: iris umber-brown; mandible blackish; maxilla black; angle of gape pure white; legs, feet, and claws lead-grey.]

Oxycerca everetti is a very closely allied form of *O. leucogastra* of Malacca and Borneo, mainly to be distinguished by the crown of the head being striated in the former and uniform in the latter, and the breast and general colouring being nutmeg-brown and not sooty brown. These Palawan examples, although not quite identical with either species, most nearly resemble *O. everetti*. The general tone of colour is nutmeg-brown; but the crown of the head is not striated.

43. OSMOTRERON VERNANS (135).

[P. Princessa, ♀, January 2, 1878: iris (in dead bird) orange; bill lead-grey, base yellow-olive; feet carmine; claws grey.]

44. TRERON NASICA.

Treron nasica, Schlegel, Ned. Tijdschr. Dierk. i. p. 67.

[P. Princessa, ♂ ♀, January 1878: iris deep brown, with outer ring of burnt sienna-orange; orbital skin bright emerald-green; base of bill dull crimson, the rest pale greenish-yellow; feet carmine.]

45. CARPOPHAGA ÆNEA (141).

[P. Princessa, ♂, January 1878: iris pure crimson; bill bluish grey; feet violet-carmine; nails dark grey. ♀, December 28, 1877: iris deep crimson; orbital ring crimson; bill light grey; feet carmine; nails dark grey.]

46. POLYPECTRON EMPHANES.

Polyplectron emphanum, Temm. Pl. Col. 540; Elliot, Phasianidæ, vol. i. pl. 9.

[P. Princessa, ♂, January 1878: iris dark rich brown; orbital and loreal regions crimson; bare setigerous skin above the eye livid brown; bill, including vaulted base of maxilla, very dark brown, tip horny; legs, feet, and nails purple-brown.

Native name "Tandikan."

♀ juv.: orbital skin black, otherwise not different from the male.]

The male of this beautiful Pheasant was first described and figured by Temminck on the 14th of May, 1831, from a single example in the museum of the Prince of Essling (*l. c.*). Its habitat was unknown, but was believed to be either one of the Sunda Islands or else one of the Moluccas. In the same year, but earlier, Lesson (*Tr.* p. 437) enumerated the species under number 47 of the genus *Polyplectron*, and called it *P. napoleonis*; but as he gave no description, his title falls.

A second specimen of the species was afterwards acquired from Messrs. Verreaux by the British Museum; but the habitat still remained unknown, the late Mr. G. R. Gray giving it as the Moluccas (*List Birds B. Mus., Gallinæ, 1867, p. 25*). Mr. Sclater (*P. Z. S. 1863, p. 124*) attributed its habitat, with some doubt, to the island of Borneo, in which he was followed by Mr. Elliot (*l. c.*). Mr. Everett has now cleared up all doubts; for he has found this Pheasant living in the island of Palawan near the Spanish settlement of Puerto Princessa, and has sent me three examples—one of the adult male, one of the immature female, and one of an immature male.

This is the second instance in which Mr. Everett has established the correct habitat of a little-known and remarkable bird.

The young male has the lengthened crest-plumes brown, partially tinged with green. The brilliant bluish-purple wing-coverts and interscapulars of the fully adult are absent, only a trace presenting itself on one covert of each wing. Whereas in the adult the nape and neck are black with brilliant green borders to the feathers, and

the whole throat and breast are black with green reflexions, the immature bird is brown. The quills and underparts are also very dark brown in the adult, whereas in the immature bird they are light brown. The ocelli on the rectrices in the immature bird are not so perfectly formed, and the dark brown ground-colour of the dorsal plumage and of the rectrices is not so well defined.

The skin of the female (immature) has the chin, space before the eye, and throat dingy white. The green ocelli only occur on some of the rectrices, and are small. The remainder of the plumage resembles that of the young male, the crest being shorter and uniform brown.

47. MEGAPODIUS CUMINGII.

Megapodius cumingii, Dillwyn, P. Z. S. 1851, p. 118, t. 39.

[P. Princessa, ♂, January 1878: iris warm brown; orbital skin coral; auricular region washed with bright red; bill horn-yellow; legs reddish, brighter than in female; tarsal scutellæ and feet dark olivaceous brown; the red of the face brighter than in female.

♂ juv., January 1878: character of soft parts as in mature male, only paler. ♀, January 2, 1878: iris warm brown; bill horn-yellow; orbital skin coral; auricular region washed with vermilion-red (not crimson); legs yellowish grey, the tarsal scutellæ dark grey.

Note.—In these birds the bill is sometimes horn-yellow, sometimes the same more or less deeply tinged with brown on culmen and at the base. “Tabun” of the natives.]

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂	9·00	3·50	2·50	1·25
♀	9·25	3·50	2·50	1·18

The Palawan megapode closely resembles the Labuan (*M. cumingii*), and can hardly be separated specifically. In this view Mr. Sharpe concurs.

48. EUDROMIAS GEOFFROYI (161).

[P. Princessa, ♂, November 29, 1877.]

49. ÆGIALITES CANTIANUS.

Charadrius cantianus, Lath. Suppl. Ind. Orn. p. lxvi.

[P. Princessa, ♀, November 29, 1877.]

50. TRINGOIDES HYPOLEUCUS (183).

[P. Princessa, ♀, December 11, 1877.]

51. BUBULCUS COROMANDUS (194).

[P. Princessa, ♂ ♀, December 1877.]

Forehead in both examples buffy yellow.

52. BUTORIDES JAVANICA (197).

[P. Princessa, ♀ juv., January 6, 1878.]

7. On the Trachea of *Tantalus loculator* and of *Vanellus cayennensis*. By A. H. GARROD, M.A., F.R.S.

[Received May 21, 1878.]

In his 'Beiträge zur Naturgeschichte von Brasilien,' Maximilian, Prince of Wied¹, describes briefly and figures the lower end of the trachea of *Tantalus loculator*. A male specimen of the species having recently died in the Society's Gardens, I take the opportunity of more minutely pointing out its peculiarities and of comparing it with *T. ibis*, the windpipe of which, with its elaborate convolutions, I have had the opportunity of bringing before the notice of the Society upon a previous occasion².

In *Tantalus loculator* the trachea is not elongated as it is in *T. ibis*; nevertheless it is peculiarly modified, and differs in detail from that of any bird with which I am acquainted, although its plan of construction is perfectly Ciconiine.

The seventy-eight lowermost rings of the trachea are those which are modified, the rings above them being quite typical, of average depth, notched in front as well as behind, and overlapped to produce the well-known zigzag markings on the surface.

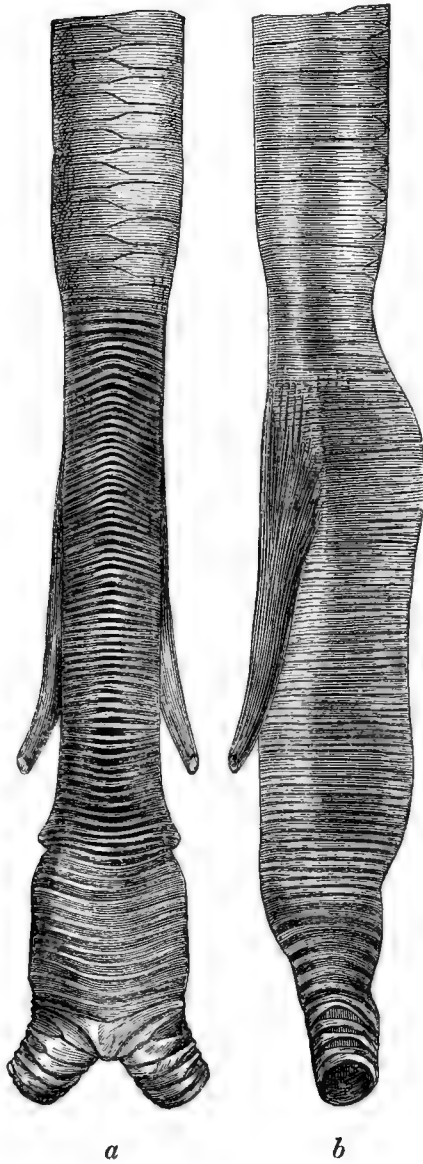
With the exception of the last one, all the modified rings are much reduced in depth; and of them the sixty-one upper rings are compressed from side to side and bent sharply in front, whilst the lower seventeen are somewhat flattened from before backwards and sharply bent laterally, the general effect of which is to produce a lateral flattening and an anterior carination of the whole tube opposite the fifty-one rings, as well as an antero-posterior flattening with a lateral carination in the part below. The change from the superior unmodified tube to the laterally compressed portion is somewhat abrupt, as is that between the two differently modified parts. In figure 1 *a* (p. 626) the front view of the lower end of the trachea is represented, figure *b* giving a side view of the same.

The powerful sterno-tracheal muscles leave the wind-pipe opposite the middle of the laterally flattened portion of the tube; and a few muscular fibres from their anterior margin are continued downwards for a short distance, but not nearly to the last ring, they being lost upon the sides of the trachea.

The arrangement above described is only an exaggeration of what is found in *Ciconia alba*, in which species the lowermost nine-and-twenty tracheal rings are extremely shallow and slender, the fifteen above the bifurcation of the bronchi being antero-posteriorly flattened, the fourteen above them being in no wise peculiar except for their slenderness. In *C. alba* there is, however, a small prolongation upwards of the lateral portions of the three lowermost tracheal rings, which forms a consolidated triangular process on each side, overlapping the next few rings, and looking extremely like rudiments of the

¹ Band iv. p. 687, tab. 1. figs 7 and 8.² P. Z. S. 1875, p. 298.

Fig. 1.



Lower end of the trachea of *Tantalus loculator* ♂.
a. View from the front; *b.* View from the right side.

similarly situated *processus vocales* of the passerine tracheophone syrinx, which resemblance is increased by the thinness of the neighbouring rings and their being flattened from before backwards.

In *Tantalus loculator* there is no trace of these triangular processes. Its last tracheal ring, or three-way piece, is not enlarged, as it is in so many birds; and the rings of the bronchi for some considerable distance are complete as in the Ciconiidae generally, which is so very seldom found to be the case in the Class. In this last feature the Storks agree with the Cathartidae, and the general arrangement of the bifurcation of the Stork's windpipe would require but little change to pass into a Cathartine type.

The uppermost bronchial rings are thinner on the outer side of each bronchus than they are internally, which consequently leaves greater gaps between them along the outer margin of the tubes. Ring four on one side and ring three on the other are partly reduplicated, the extra processes ending freely in the bronchial membrane.

From this description it is evident that these two *Tantali* differ greatly in the arrangement of their windpipes, whilst a recent comparison of specimens makes it evident to me that what I thought on seeing *T. loculator* might have been an error in my account of *T. ibis*, namely the *posterior* carination of the windpipe, is correct, in which, as well as in the relative lengths of trachea, the two species differ so much.

In other anatomical characters *Tantalus loculator* agrees with *T. ibis*, and is perfectly ciconiiform. In both the great pectoralis muscle is formed of two layers, as in the Steganopodes, Procellariidae, and Cathartidae only. The ambiens muscle is slender; the femoro-caudal is minute, without any accessorius; and the semitendinosus, as well as its accessorius, are not large. There is no great gluteus muscle, nor any muscular slip from the biceps of the wing running to the patagium.

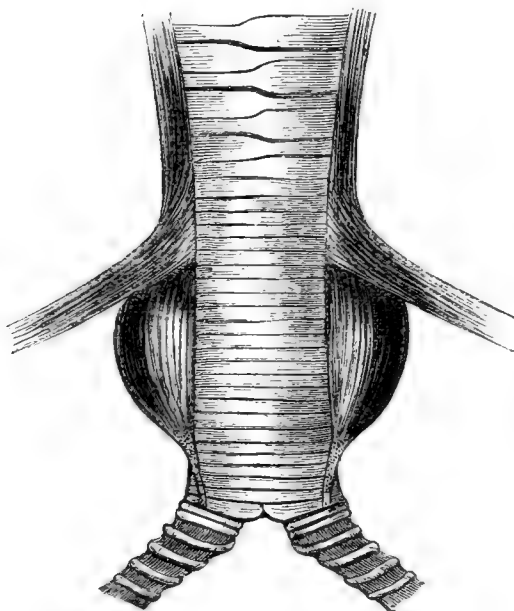
The small intestine measures six and a half feet, the cæca half an inch, and the large intestine nearly three inches. The stomach is capacious, with but a small muscular development. The tongue is an inch long and arrow-head shaped. The sub-equilobed liver has a gall-bladder.

In *Vanellus cayennensis* there is an exaggerated development of the intrinsic muscles of the trachea a short way above its bifurcation in both sexes that is quite worthy of special note, because the amount of muscular fibre there present is proportionately as much as in any bird with which I am acquainted.

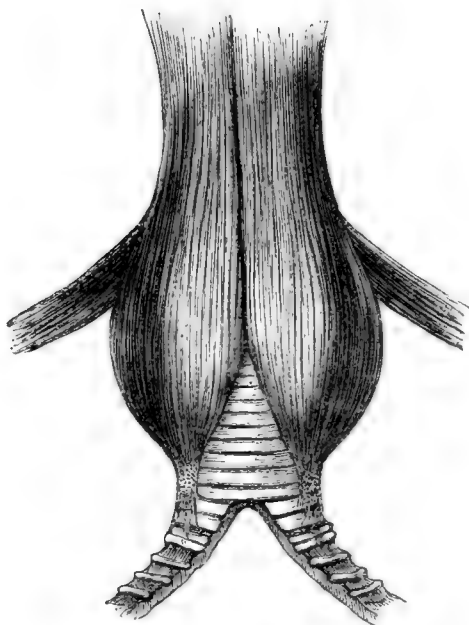
There is nothing peculiar about the windpipe itself or the bronchi, which are represented in the accompanying figure (p. 628). The uppermost two bronchial semirings are not like those which succeed them, but are like halves of tracheal rings. The third and fourth semirings are closely united, whilst those which follow are not modified in any way.

The sterno-tracheal muscles are powerful, and besides springing directly from the side walls of the windpipe opposite the spot where

Fig. 2.



a.



b.

Windpipe of *Vanella cayennensis*.
a. Anterior aspect; *b.* Posterior aspect.

they run off, their upper fibres are continuous up the trachea itself in front of and in contact with the intrinsic muscles. These latter, one on each side as usual, meet in the posterior middle line of the trachea, but are not unusually near in front; they are of considerable size throughout. Near their lower ends they increase immensely in bulk to form, combined posteriorly, a large subglobose mass which is situated opposite the twenty-four lowermost rings of the trachea, which are considerably shallower than those above them and consequently occupy a much less space than if they were of the same depth, as is the case in *Tantalus loculator*. There is a consolidation of the last few rings in adult birds, with which the first two bronchial semirings fuse to form a compound three-way piece, and it is to the lower elements of this that the powerful lateral muscles are attached (as well as to the third and fourth bronchial semirings slightly) by a broad fibro-tendinous continuation of their muscular substance, which fixes itself on each side along nearly the whole length of the semirings, especially the second, of which the extremities are alone free.

So far as I can find out by watching the living birds, there is nothing peculiar in their note to lead one to surmise so large a muscular supply for their lower larynx. They make a powerful screech, with no modulation in it; and it can hardly be possible that the extra muscular development has not some other function to perform. What that may be it is not easy to surmise.

8. On the Anatomy of the Maleo (*Megacephalon maleo*).

By A. H. GARROD, M.A., F.R.S.

[Received May 21, 1878.]

Besides being a Megapode, *Megacephalon maleo* is interesting as a peculiar form; I therefore take the opportunity of bringing before the Society the results of my dissection of three specimens of this bird which have died in the Gardens.

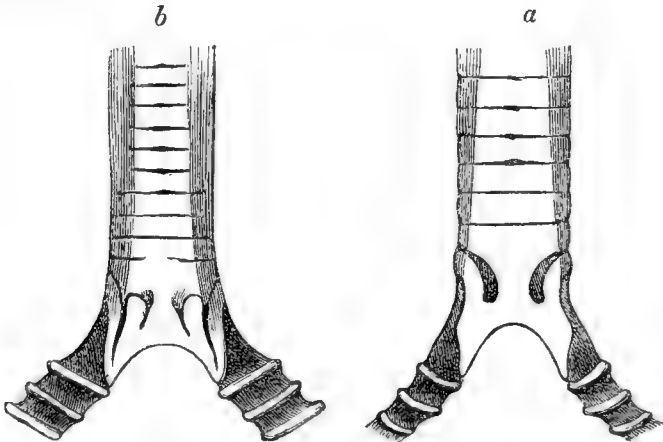
Pterylosis.—In the distribution of its feather-tracts the Maleo is somewhat different from the typical Gallinæ. Nitzsch briefly records what he found in a bad specimen of *Megapodius rubripes*, mentioning that the tracts were not different from those in allied birds, and that the oil-gland was tufted. This is all we know of the pterylosis of the group.

In *Megacephalon maleo* the anterior surface of the neck is covered, not thickly, with feathers, which only tend to divide opposite the furcula into the two pectoral tracts, each of which descends, strong and uniform in breadth, to opposite the middle of the carina sterni, where it ceases obtusely. The ventral tract does not exist over the anterior or upper part of the pectoral region, but commences narrow close to and opposite the middle of the carina sterni, dilating opposite the abdomen, near the middle line of which it descends parallel to its fellow, to just above the anus, where the two meet. The skin over the carina and in the middle line of the abdomen is hard and

scaly. The hypopteral tract is but feebly represented, and the termination of the pectoral tract is some distance from the commencement of the abdominal tract, the angle between the direction of the one and the other being about 25° .

A strong tract traverses the middle dorsal line of the neck, with a space on each side of it. This does not bifurcate in the scapular region, but ceases abruptly a little below the level of the shoulder-joints, undilated. Over the rump and the inferior scapular region the dorsal tract is diffused and indefinite, ceasing before the *nude* oil-gland is reached. There is no ephippial space. There are sixteen rectrices. The lumbar tract is only well developed over the tibia-head and for a little way behind it. The humeral tract is not in any way peculiar. I counted nine primary and sixteen secondary remiges, the first and second secondary feathers being considerably shorter than those which follow.

Down-feathers are generally distributed. The after-shaft is weak, and the rachis of each feather is not swollen, except in some of the smallest size.



Lower larynx of *Megalocephalon maleo*.

a. From the front; b. From behind.

Visceral Anatomy.—The tongue is simple and fleshy; a well-developed crop is present, situated between the limbs of the very open furcula; the proventriculus is zonary, the gizzard powerful; the small intestine is four and a half feet long, the simple cæca five and a half inches, and the large intestine five inches in length.

There is only one carotid artery, the left, as in all the *Megapodiidæ*.

In its *myology* the bird is perfectly gallinaceous, the third pectoral muscle being found beneath the much larger second of the same name, the femoro-caudal and semitendinosus with their accessories, the ambiens, gluteus maximus, being all present. The obturator internus is triangular; a vinculum joins the two deep flexors of the foot, and the biceps of the arm sends a fasciculus to the patagium. The expansor secundariorum muscle ends by running to the scapula at the same time that it sends a slip of tendon to the first rib.

The lower end of the trachea is represented in the accompanying figures (p. 630), from the front and from behind. It differs in arrangement from all other of the Gallinæ with which I am acquainted. To the terminal tracheal three-way ring is fused the first bronchial semiring by its extremities, its bowed free portion being upturned with its limbs almost perpendicular. In the middle line posteriorly the penultimate tracheal ring fuses with the what may be compound three-way piece, in the posterior aspect of which a small upward-directed tongue of cartilage develops from its upper border. The sterno-tracheal muscles are minute and the intrinsic tracheal muscles form thin broad sheets which almost cover the tube and end on the outer surface of the first bronchial semiring and in the semicartilaginous large membrane between it and the unmodified following semiring.

June 4, 1878.

Prof. Flower, F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1878 :—

The total number of registered additions to the Society's Menagerie during the month of May 1878 was 104, of which 43 were by birth, 39 by presentation, 8 by purchase, 7 by exchange, and 7 were received on deposit. The total number of departures during the same period by death and removals was 120.

The most noticeable additions during the month of May were as follows :—

1. Two male Lesser Birds of Paradise (*Paradisea minor*), purchased of Mr. Leon Laglaize, May 2. On his return from the Eastern Archipelago in October last, Mr. Laglaize brought with him four living specimens of this Paradise-bird. All of these passed the winter safely in the Jardin des Plantes at Paris; and two of them in full plumage have now been acquired by the Society.

The only other examples of Paradise-bird previously living in the Society's Gardens were the two individuals of the same species brought by Mr. Wallace from Singapore in April 1862¹. One of these lived until 25th December, 1863, the other until the 28th March, 1864, in the Society's Gardens.

2. A Copper-head Snake (*Cenchrus contortrix*) presented by Dr. Frederick Painter, F.Z.S., of South Pittsburg, Tennessee, U. S. A. This is a well-known venomous snake in the United States; but we have not previously received living examples of it.

3. A Hairy or Andean Tapir (*Tapirus roulini*²), obtained in exchange from Mr. C. Rice, May 25.

Although we have had in our Gardens examples of all the other three known species of Tapirs, this is, I believe, the first example

¹ See P. Z. S. 1862, p. 123.

² See, for the reasons for adopting this name, footnote, P. Z. S. 1870, p. 51.

of this rare and little-known animal that has been seen alive in Europe¹.

Mr. Wolf's sketch (Plate XXXIX.) will give a good idea of the external appearance of the present specimen, which is a young male, probably not full-grown, and with the teeth small and imperfectly developed. The hairs over the whole body are nearly uniformly thick, but short; they are barely an inch in length, and of nearly uniform black colour throughout, with just a shade of brown tinge. The hairs on the nape of the neck and sides of the body are rather longer; those on the sides of the face are brown, and there is a slight white spot at the corner of the mouth, and some white hairs at the extremity of the muzzle. There is a slight white external edging to both ears. There are no white rings round the feet; but the upper margins of the naked nails have a whitish appearance. The irides are of a light bluish hazel, quite different from those of the ordinary *Tapirus terrestris*, in which they are brown.

The height of the animal at the shoulders is about 26 inches; the length from the end of the extended snout to the base of the tail about 54 inches.

There can be no question, to my mind, that Dr. Gray's *Tapirus leucogenys* (P. Z. S. 1872, p. 483) is merely an individual variety of the present species. The figure given (*l. c.* pl. xxi.) is altogether of too brown a tinge; and in Dr. Gray's specimen itself, which is now in the British Museum, the general colour is darker and more of a greyish black, and, except as regards the white sides of the jaws and grey face, does not materially differ from that of our specimen. As regards the white cheeks, upon which Dr. Gray lays so much stress, it may be remarked that M. Roulin's "*Tapir pinchaque*" had traces of the same colour², and there are likewise traces of it in our living specimen.

The Secretary exhibited a young specimen of Temminck's Manis (*Manis temmincki*), which had been brought from Zanzibar by Mr. Frederick Holmwood, Assistant Political Agent at Zanzibar, and read the subjoined extract from a letter of Mr. Holmwood referring to it:—

"The mother of this little Pangolin came from the coast opposite Zanzibar, lat. 6° S.; but I have seen what I took to be the same animal, both in Somali-land under the equator and as far south as the Makna country opposite Mozambique. They always appeared to burrow in hard or stony ground; and I saw them always in the daytime.

"The mother of the specimen I send you lived three months in Zanzibar. She only fed at night, and remained coiled up in a ball all day. She regularly retired to the dark corner of my harness-room at daylight, and left for the garden at sunset. There were very few ants; but she seemed to get plenty of insects. She bur-

¹ Unless it be true, as stated in Mr. Jamrach's letter to 'The Times' of May 31st, that an example of the same animal has lately been acquired by the Zoological Gardens of Antwerp.

² *Vide* Ann. des Sci. Nat. xvii. p. 109.



TAPIRUS ROCCUINI



rowed at intervals all round the garden-walls ; but this was evidently only to try and escape, as she never made a hole large enough to give cover. The day she had the young one she came out during the day ; but not being quite up to grubbing for insects, she went into the stable and remained among the horses grubbing in the dung. After the birth she tried to entice the young Pangolin to suck (apparently), sitting up like a dog when begging, and coiling up the moment she got it in her lap. I could not, however, detect whether she managed to suckle it ; indeed I was quite ignorant of the habits of the animal in its natural state. The first day the young one had soft scales ; but they hardened the second day, and it died the same night. The mother wandered about for two days afterwards, then came into the house and died.”

Mr. Sclater stated that he had, in company with the Superintendent, examined the living examples of *Ciconia maguari* now in the Society's Gardens, and could confirm what Mr. Ridgway had so clearly described (Bull. U.S. Geol. Surv. vol. iv. p. 250) as to extraordinary mimicry of the true rectrices by the elongated upper tail-coverts. The same was also the case with *Ciconia episcopus*, of which there were also living examples in the Society's Gardens.

Mr. Ridgway's generic term *Euxenura*, however, based on this peculiar structure, had, it appeared, been anticipated by Dr. Cabanis, who, in 1850, had proposed the name *Dissoura*¹ for this form of Stork ; so that the two species should stand for the future as *Dissura maguari* (Gm.) and *D. episcopus* (Bodd.).

On behalf of Dr. Elliott Coues, C.M.Z.S., two specimens of *Synaptomys cooperi*, Bd., were exhibited by Mr. Edward R. Alston. This species, Mr. Alston observed, was the type of *Synaptomys*, proposed in 1857 by Prof. Baird as a subgenus of *Myodes*², and accorded full generic rank by Dr. Coues in 1874³. The present specimens were, as far as was known, the first typical specimens sent to Europe. When Mr. Alston wrote his paper "On the Classification of the Order Glires"⁴ he was only acquainted with Dr. Coues's preliminary remarks, and hesitated at accepting the full generic value of this form ; he was therefore now desirous of expressing his full recognition of its rank. *Synaptomys* was particularly interesting as presenting a connecting link between the Lemmings and Field-Voles, combining the general cranial and dental characters of *Myodes* with the external peculiarities of *Arvicola*, but differing from both in its grooved upper incisors. Its range was much less boreal than that of the Lemmings, extending as far south as Kansas. The specimens exhibited were destined for the British and Berlin Museums.

¹ Cf. Reichenow, J. f. Orn. 1877, p. 168. The name is written *Dissoura* ; but *Dissura* is more simple and more correct.

² Mamm. N. Amer. pp. xlv, 558.

³ P. Ac. Philad. 1874, p. 192. Cf. Mon. N. Am. Rodent. p. 223.

⁴ P. Z. S. 1876, pp. 61-98.

Prof. Ray Lankester, M.A., F.R.S., read a memoir on the hearts of *Ceratodus*, *Protopterus*, and *Chimæra*. The structure of the conus arteriosus and its valves was more particularly described in this paper. Owen and Hyrtl had shown that the conus of the Dipnoans differed from that of cartilaginous fishes and Amphibians in the fact that its walls were devoid of pocket-valves, and presented instead a long spiral valve and a second short vertical valve. Dr. Günther, the only author who had described the heart of *Ceratodus*, showed that it possessed in the upper part of the arterial cone pocket-valves, whilst the spiral valve was shortened so as to be absent from this upper region. The possession of pocket-valves served as a very important character to connect the Dipnoans and the other fishes.

Prof. Lankester now showed that in the lower part also of the arterial cone of *Ceratodus* there were numerous small pocket-valves, in addition to those in its upper part; and further he showed that these small pocket-valves (so called "ganoid valves") were also present in the lower part of the arterial cone of *Protopterus*, the African Mud-fish, which had been generally supposed to be quite devoid of this kind of valve. The basal fibro-cartilage of the floor of the heart was described and compared in *Ceratodus* and *Protopterus*, and a possible rudiment of this remarkable structure pointed out in *Ceratodus*.

This Paper will be published entire, with illustrations, in the Society's 'Transactions.'

The following papers were read:—

1. On the Skull of a Rhinoceros (*R. lasiotis*, Scl.?) from India. By WILLIAM HENRY FLOWER, F.R.S., V.P.Z.S.

[Received October 12, 1877.]

Mr. Sclater has put into my hands for examination the skull of a Rhinoceros, which he had received from Dr. W. D. Stewart, of Cuttack, Orissa, being the skull of the two-horned Rhinoceros killed near Comillah, in Tipperah, as mentioned in P. Z. S. 1877, p. 269. Mr. Sclater thinks that the skull may not improbably belong to the species (at present only known by the living animal in the Society's menagerie) which he has named *R. lasiotis*.

It is that of a nearly adult animal. All the sutures of the upper surface of the cranium are consolidated; and all the permanent teeth in both jaws are in place except the posterior molars, which are still concealed in their alveoli.

In size and general conformation it resembles the skull of *R. sumatrensis*, and possesses all the essential characters¹ which distinguish that species from *R. indicus* and *R. sondaicus*, viz. the separation of the postglenoid from the posttympanic processes of the squamosal below the auditory meatus, the backward position of the occipital crest (though, perhaps, less marked than usual), and the

¹ See "On some Cranial and Dental Characters of the existing Species of *Rhinoceros*," P. Z. S. 1876, p. 443.

indication of a second or frontal horn. I have compared it with the eight skulls assigned to *R. sumatrensis* at present in London—four in the British Museum, and four in the Museum of the College of Surgeons.

These skulls present considerable individual variation in general conformation, proportional breadth to length, in the development and form of the nasal bones, number and position of the lachrymal foramina, form of the posterior margin of the palate, and other details. The present skull, however, is strikingly different from all in its superior breadth compared with its length, and especially the breadth and flatness of the frontal region. The annexed table of dimensions exhibits the extent of this peculiarity; and, to make it more manifest, I have added the ratio of the breadth, taken between the anterior margins of the orbits (where the difference is most characteristic), compared with the entire length of the skull, the latter being taken as 100. On looking down this column of the Table, it will be seen that, though there is a considerable variation among the

	Length from occipital crest to anterior extremity of nasals.	Greatest breadth across zygomata.	Breadth across anterior edge of orbits, in groove above lacrymal eminence.	Proportion of last to length as 100.	Breadth across maxilla above middle of last premolar tooth.	Length of upper molar and premolar teeth (excluding first and last).	Proportion of last to length of skull as 100.
1. Adolescent (all permanent teeth except milk-molars), from Tipperah	20.0	12.0	6.8	34.0	7.3	8.0	40.0
2. Aged ♀. Malacca. Died in Zool. Gardens, 1872. B. M.	20.7	11.8	6.0	29.0	6.4	6.5	31.4
3. Aged ♀. Sumatra. Mus. R. C. S. No. 2933	20.4	11.1	5.2	25.5	6.1	6.6	32.6
4. Adult. Pegu. B. M.	21.4	11.1	5.9	27.6	6.6	6.9	32.7
5. Adolescent ♂ (all permanent teeth except last molars). Sumatra. M. R. C. S. No. 2935	23.0	12.0	6.0	26.1	7.0	7.6	33.0
6. Young (last milk-molar remaining). Sumatra. M. R. C. S. No. 2937	19.0	10.6	5.0	26.3	6.5	7.3	38.0
7. Young (dentition as last). B. M.	18.9	10.5	5.0	26.4	6.3	6.9	36.5
8. Younger (all milk-molars and first and second permanent molars). Sumatra. M. R. C. S. No. 2936.....	21.0*?	10.7	5.2	24.8?	6.4	7.0	33.3?
9. Still younger (all milk-molars and first permanent molars). Borneo. B. M.....	18.1	9.6	5.0	27.6	6.2	Teeth nearly all lost.	

* Nasals broken.

other skulls, the difference between the narrowest and widest being almost as great as that between the latter and the present skull, yet there are intermediate gradations in the former case, whereas the Tipperah skull is completely isolated from the others. It is curious that the skull which comes next to it in width is that of the small dark-coloured animal from Malacca, which died in the Society's menagerie in 1872, and of which the external characters were certainly quite unlike those of *R. lasiotis*.

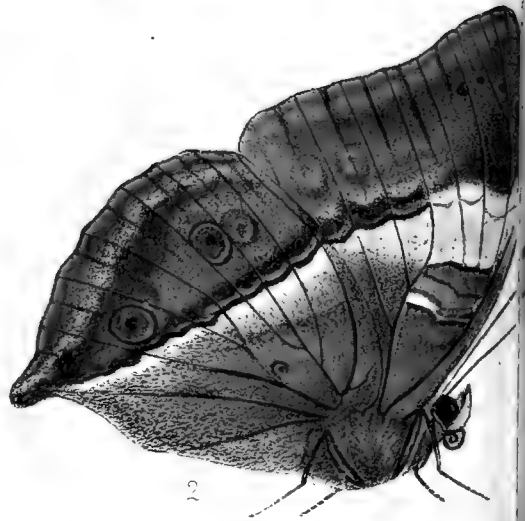
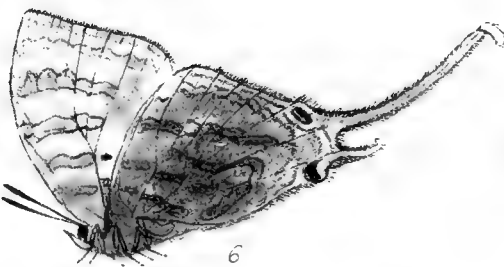
A second peculiarity by which this skull is distinguished from all the others, and one to which I am inclined to attach still more importance, is the greater size of the teeth, especially the premolars, both absolutely and relatively. This is also seen in the Table, in which is given the absolute length of the series of molars and premolars, excluding the first and last, which are either absent or not developed in many of the specimens under consideration, and including, therefore, the three posterior premolars and the two anterior molars. In the case of the younger skulls, milk-molars occupy the place of premolars; but this probably does not materially affect the length of the series. It will be seen that in the present skull this length absolutely exceeds that of any of the others, and, relatively to the length of the skull (taken as 100), it is 40·0, whereas, of the other seven, five range between 31·4 and 33·3, and the other two, which give a higher figure, are both young animals, in which the skull had not attained its full dimensions, and the teeth therefore appear relatively larger than they otherwise would have been. It is probable that sex may affect the size of the teeth, as in the two known females (Nos. 2 and 3 of the list) they are smaller than in any of the others. Not only in antero-posterior diameter are the premolars larger in the present specimen, but still more notably in breadth. Thus the last premolar in the Pegu adult skull (No. 4) is 1"·8 in greatest breadth, in the Sumatran female (No. 3) 1"·85, in the Malaccan skull (No. 2) 1"·9, in the Sumatran male (No. 5) 2"·05, in the present skull 2"·2. The lower molars exhibit the same superiority of size; but in other respects the dentition does not differ appreciably from that of the various specimens of *R. sumatrensis*.

As an individual peculiarity may be noted the single lachrymal foramen on each side, whereas many of the others have two; but in both the Malacca and one of the other British-Museum skulls, the foramen is also single on both sides, and in the Pegu and one of the Sumatran specimens it is single on one and double on the other side. Again, the great amount of ossification in the base of the pterygoid fossa, at the posterior end of the vomer, forming a sort of "paraspheoid" mass, is worthy of note; but it is repeated in the Pegu skull, and partially in the old Sumatran specimen (No. 2), though not in the equally aged Malacca female.

I have pointed out the peculiarities of this skull, which are interesting in connexion with the fact that it was obtained from a locality quite beyond the hitherto known range of the Sumatran Rhinoceros; but, in the absence of other evidence, will not attempt to decide whether they should be considered of specific value.

62
44





H. F. R. pp. 511b.

Hanhart. imp.

2. Catalogue of Lepidoptera collected by Mr. S. N. Walter in the Island of Billiton. Rhopalocera by F. D. GODMAN and OSBERT SALVIN; Heterocera by H. DRUCE.

[Received May 17, 1878.]

(Plate XL.)

RHOPALOCERA.

That the Rhopalocerous fauna of Billiton should largely partake of the character of that of the surrounding islands of Sumatra, Java, and Borneo, and of the peninsula of Malacca was to be anticipated. Of the thirty-three species represented in this collection (which was made in Billiton by Mr. S. N. Walter, and has been sent to us by Lord Tweeddale for examination), all but one are well-known forms from one or all of these islands. The single exception, the *Myrina*, described below, has, so far as is at present known, its sole representative in a nearly allied species from Tenasserim, also described in the present paper.

The differential elements of the Butterfly faunas of Borneo, Sumatra, Java, and Malacca have not yet been traced with sufficient precision to enable us to say to which of the four localities the island of Billiton has most affinity. With Borneo it is certainly very closely allied; but it possesses several species in common with Java, and others with Malacca. Unfortunately our series of Sumatran Butterflies is not very complete; but, so far as we can see, many species are also found in that island, geographically its nearest neighbour.

Fam. NYMPHALIDÆ.

Subfam. DANAINÆ.

1. HESTIA CLARA.

Hestia clara, Butl. Trans. Ent. Soc. ser. 3, v. p. 469.

? *Hestia leuconoe*, Druce, P. Z. S. 1873, p. 337.

A single female specimen, agreeing with Mr. Butler's types in the British Museum. The species also occurs in Borneo, whence we have an example of the same sex. Its occurrence in Java is doubtful.

2. DANAIS PHILOMELA.

Euplœa philomela, Zink. Nov. Act. Ac. Nat.-Cur. xv. p. 184, pl. 16. f. 17; Druce, P. Z. S. 1873, p. 337.

Agrees with Malaccan and Bornean examples.

3. DANAIS SIMILIS.

Papilio similis, Linn. Syst. Nat.

Danaïs similis, Druce, P. Z. S. 1873, p. 338.

Identical with Malaccan and Javan examples.

4. DANAIS JUVENTA.

Papilio juventa, Cr. Pap. Ex. pl. 188. f. B.

Danaïs juventa, Druce, P. Z. S. 1873, p. 337.

Agrees with Bornean specimens.

5. DANAIIS HEGISIPPUS.

Papilio hegisippus, Cr. Pap. Ex. t. 180. f. A.

Agrees with Malaccan specimens.

6. DANAIIS CHRYSIPPUS.

Papilio chrysippus, Linn. Cr. Pap. Ex. t. 118. f. B, C.

Identical with specimens of this widely dispersed species.

7. EUPLŒA MÊNÉTRIÉSII.

Euplœa ménétriésii, Feld. Wien. ent. Mon. iv. p. 398; Druce, P. Z. S. 1873, p. 338.

Agrees with specimens thus named in the British Musium.

8. EUPLŒA BREMERI.

Euplœa bremeri, Feld. Wien. ent. Mon. iv. p. 398; Druce, P. Z. S. 1873, p. 338.

Found also in Borneo and Malacca.

9. EUPLŒA THOOSA.

Trepisichrois thoosa, Hübn. Ex. Schmett. t. viii.

Agrees very well with Hübner's figure, being also identical with Malaccan specimens.

10. EUPLŒA MULCIBER.

Papilio mulciber, Cram. Pap. Ex. t. 127. f. C, D; Druce, P. Z. S. 1873, p. 338.

Also a Bornean species.

Subfam. ELYMNIINÆ.

11. ELYMNIAS NIGRESCENS.

Elymnias nigrescens, Butl. P. Z. S. 1871, p. 520, t. 42. f. 1; Druce, P. Z. S. 1873, p. 340.

A female specimen agreeing with Bornean examples of the same sex.

12. ELYMNIAS LAIS.

Papilio lais, Cr. Pap. Ex. t. 110. f. A, B.

Elymnias lais, Druce, P. Z. S. 1873, p. 340.

Also found in Borneo and Java.

Subfam. MORPHINÆ.

13. AMATHUSIA PHIDIPPUS.

Papilio phidippus, Linn. Syst. Nat.

Amathusia phidippus, Druce, P. Z. S. 1873, p. 340.

Both sexes of this widely ranging species.

14. ZEUXIDIA HORSFIELDI.

Zeuxidia horsfieldi, Feld. Voy. Nov. Lep. p. 460, t. 62. f. 4;
Druce, P. Z. S. 1873, p. 340.

Agrees with Bornean specimens.

Subfam. NYMPHALINÆ.

15. CYNTHIA DEIONE.

Cynthia deione, Erichs. Nov. Act. Ac. Nat.-Cur. xvi. Suppl.
t. 50. f. 2, 2 a.

Cynthia arsinoe, Druce, P. Z. S. 1873, p. 342 (nec Cramer).

Agrees with this widely-ranging species, of which we have specimens from Java, Malacca, Borneo, and the Philippine Islands.

16. JUNONIA LAOMEDIA.

Papilio laomedia, Linn. Syst. Nat. i. p. 772.

Junonia laomedia, Druce, P. Z. S. 1873, p. 342.

A widely-distributed species, occurring throughout the Indo-Malayan subregion.

17. JUNONIA IDA.

Papilio ida, Cr. Pap. Ex. t. 42. f. C, D.

Junonia ida, Druce, P. Z. S. 1873, p. 342.

Agrees with Javan, Bornean, and Philippine-Islands specimens.

18. NEPTIS ACERIS.

Papilio aceris, Lepechin, Tageb. d. Reise Russ. Reich. i. p. 203,
t. 17. f. 5.

Neptis aceris, Druce, P. Z. S. 1873, p. 344.

A single specimen of this very widely-distributed species.

19. TANAËCIA, sp. ?

A single specimen of a species of this genus which we have not been able to determine.

20. ADOLIAS, sp. ?

Agrees with a Malaccan specimen of an unnamed species in our collection. Others from the same locality in the British Museum, have a MS. name of Mr. Butler's attached to them.

21. SYMPHÆDRA DIRTEA.

Papilio dirtea, Fabr. Ent. Syst. iii. p. 59.

Symphædra dirtea, Butl. P. Z. S. 1868, p. 613; Druce, P. Z. S.
1873, p. 346.

Adolias boisduvali, Bdv. Sp. Gén. t. 8. f. 2.

A male agreeing with Sumatran and Bornean examples.

22. *CHARAXES SCHREIBERI*.

Nymphalis schreiber, Godt. Enc. Méth. ix. p. 825.

Charaxes schreiberi, Druce, P. Z. S. 1873, p. 346.

Found also in Java and Borneo.

Fam. LYCÆNIDÆ.

23. *MYRINA NIVEA*, sp. n. (Plate XL. figs. 3, 4.)

♀. Exp. 2·2 inches. Secondaries with projection at the anal angle and a long tail on the first median branch; outer margin slightly dentate, pure white; outer margin of primaries black, blending into a delicate blue in the apex, the blue colour extending along the costal margin; a black spot between the median branches of the secondaries and a faint black submarginal line on the same wings. Beneath pure white, both wings crossed with five concentric bands, consisting of confluent spots, each enclosed in a faint dark line; a submarginal black line to both wings; the black spot of the upper surface between the median branches of the secondaries is mostly blue; and there are two blue spots near the margin, one between the submedian nervure and the first median branch, and one at the anal angle.

Hab. Billiton Island.

Mus. nostr.

This beautiful species, of which there is only a single female specimen in the collection, seems to belong undoubtedly to the genus *Myrina*, as defined by Westwood (D. W. & H. Gen. Diurn. Lep. ii. p. 475). In coloration it is quite distinct from any hitherto described member of the genus. We have, however, since received from Mr. A. O. Hume an example of a closely allied species, which was taken at Meetan in Burma. This is also a female, and we describe it as follows:—

MYRINA HIEMALIS. (Plate XL. figs. 5, 6.)

Exp. 2·2 inches. In shape exactly like *M. nivea*, the dark apex of the primaries more extensive and the inner edge of this dark mark with two prominent indentations instead of being simply curved; beneath, the bands of the wings are better defined, and the dark marginal lines of each band enclose a greyish space, whereas in *M. nivea* the inside of the spots forming the bands is white.

Hab. Meetan, Burma.

Mus. nostr.

Fam. PAPILIONIDÆ.

Subfam. PIERINÆ.

24. *CALLIDRYAS CATILLA*.

Papilio catilla, Cr. Pap. Ex. t. 55. f. C, D.

Callidryas catilla, Druce, P. Z. S. 1873, p. 355.

A widely ranging species found in Borneo and elsewhere.

25. *TERIAS*, sp. ?

A bad specimen.

26. TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. p. 763.

Terias hecabe, Druce, P. Z. S. 1873, p. 354.

A widely ranging species, also found in Borneo.

Subfam. PAPILIONINÆ.

27. PAPILIO ANTIPHATES.

Papilio antiphates, Cr. Pap. Ex. t. 72. f. A, B; Druce, P. Z. S. 1873, p. 357.

Agrees with Bornean specimens.

28. PAPILIO SARPEDON.

Papilio sarpedon, Linn. Syst. Nat. i. p. 747; Druce, P. Z. S. 1873, p. 559.

A wide-ranging species, found in Borneo and Malacca.

29. PAPILIO EURYPYLUS.

Papilio eurypylus, Linn. Syst. Nat. i. p. 754; Druce, P. Z. S. 1873, p. 357.

Agrees with Bornean examples.

30. PAPILIO PAMMON.

Papilio pammon, Linn. Syst. Nat. i. p. 746.

Papilio polytes, L. Druce, P. Z. S. 1873, p. 357.

The caudal appendage in Billiton specimens is but slightly developed; and in this respect they agree best with Javan examples.

31. PAPILIO ISWARA.

Papilio iswara, White, Entom. i. p. 280; Doubl. & Hew. Gen. D. Lep. t. 3. f. 1.

Agrees with a Malaccan specimen.

32. PAPILIO MEMNON.

Papilio memnon, Linn. Syst. Nat. i. p. 747; Wall. Trans. L. S. xxv. p. 47, pl. 1. figs. 2, 4.

A female agrees with Javan specimens and with figure 4 of Mr. Wallace's plate, and with Cramer's figure of his *P. aches*. A second female resembles figure 2 of Mr. Wallace's plate, except that the white band of the secondaries is slightly narrower. This form is represented by Cramer under the name *P. agenor*.

Fam. HESPERIDÆ.

33. CASYAPA THRAX.

Papilio thrax, Linn. Syst. Nat. i. p. 794.

Casyapa thrax, Druce, P. Z. S. 1873, p. 358.

Agrees with Indian examples.

HETEROCERA.

Fam. SPHINGIDÆ.

Subfam. CHÆROCAMPINÆ.

Chærocampa suffusa, Walk. List Lep. Brit. Mus. Het. pt. viii. p. 146 (1856).

The type was obtained at Hong-Kong. Mr. Moore tells me he has specimens from Borneo.

Fam. LITHOSIIDÆ.

HYPسيا SILVANDRA, Cr.

Phalæna (Bombyx) silvandra, Cram. Pap. Exot. iv. pl. 369. f. D (1782).

Fam. SATURNIIDÆ.

ANTHERÆA BILLITONENSIS, Moore, n. sp.

Male. Upperside pale purplish ferruginous, suffused with grey on external borders; ocelli oval, defined by a narrow dusky line, blind, outer half bordered within by a narrow yellow line and a central transverse line: *fore wing* with the area within and below the cell brighter ferruginous; apex yellowish; an oblique discal, pale ferruginous, narrow lunular band, bordered within by a dusky lunular line and without by a straight dusky line; a dusky black streak crossing the middle of the cell, and another from its base to the hind margin: *hind wing* with the base brighter ferruginous; a dusky-bordered, pale yellowish, transverse, discal, sinuous band, the dusky border encircling the ocellus and terminating on abdominal margin above end of sinuous band. Body bright ferruginous.

Expanse $4\frac{1}{4}$ inches.

Hab. Billiton Island, Malay archipelago. In coll. H. Druce. Nearest allied to *A. frithii*, from Darjiling.

Fam. EREBIDÆ.

NYCTIPAO CREPUSCULARIS.

Phalæna (Attacus) crepuscularis, Linn. Syst. Nat. 2811. 13; Clerck, Icon. pl. 53. f. 1-4; Drury, Ins. i. p. 37, pl. 20. f. 1, 2.

A species frequently sent from Hindostan.

Fam. HYPOPYRIDÆ.

HYPOPYRA FENISECA.

Hypopyra feniseca, Guén. Noct. iii. 200. 1599 (1852).

In the British Museum, from Silhet.

Tribe URANIDES.

Fam. NYCTALEMONIDÆ.

NYCTALEMON DOCILE, Butler, in litt.

Very closely allied to *Nyctalemon hector*, White, from Borneo,

the principal difference being its larger size, broader white bands, and longer tails to the posterior wing. Mr. Butler's description has been in the hands of the Linnean Society for some time.

GEOMETRIDÆ.

Fam. ENNOMIDÆ.

ENNOMOS TESTACEARIA.

Ennomos testacearia, Moore, P. Z. S. 1867, p. 623.

EXPLANATION OF PLATE XL.

Figs. 1, 2. *Doleschallia comrii*, p. 646.

3, 4. *Myrina nivea*, p. 640.

5, 6. — *hiemalis*, p. 640.

3. List of the Butterflies collected in Eastern New Guinea and some neighbouring Islands by Dr. Comrie during the Voyage of H.M.S. 'Basilisk.' By F. D. GODMAN and OSBERT SALVIN.

[Received May 17, 1878.]

(Plate XL.)

The small collection made by Dr. Comrie, of which we here give a list, was got together under many difficulties and pressure of official duties. It is therefore not surprising that the number of species it contains is not greater than it is. We make no apology for presenting this list to the Society, seeing that several of the places touched at by Captain Moresby's expedition were absolutely unknown as to their Butterfly-fauna before Dr. Comrie visited them. Amongst these we may specially mention the D'Entrecasteaux Islands, which lie some little way from the eastern shores of New Guinea. The result of a comparison of the Butterflies of these islands with those of the New-Guinea mainland shows that, so far as we can see at present, no difference can be said to exist. In fact these islands are (as far as their Butterflies are concerned) as essentially a portion of New Guinea as the Aru Islands are known to be, if not more so.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

DANAIS CITRINA.

Danais citrina, Feld. Voy. Nov. Lep. p. 350, t. 42. f. 5-7.

Danais gloriola, Butl. P. Z. S. 1866, p. 56.

D'Entrecasteaux Islands.

Agrees with specimens from the Aru Islands, whence both Dr. Felder's and Mr. Butler's types were obtained.

DANAIS AFFINIS.

Papilio affinis, Fabr. Syst. Ent. p. 511.

Danais affinis, Blanch. Voy. Pôle Sud, Zool. iv. p. 389; Atl. Lep. t. 2. f. 7.

D'Entrecasteaux Islands and mainland of New Guinea.

A widely-ranging species, found in the islands neighbouring New Guinea and also North Australia, whence it was originally described.

EUPLŒA CALLITHOE.

Euplœa callithoe, Boisd. Voy. Astr. Ent. p. 93; Kirsch, Mitth. k. z. Mus. z. Dresden, i. p. 115.

D'Entrecasteaux Islands.

A single specimen agrees with one of Dr. Meyer's examples obtained in North-western New Guinea.

EUPLŒA IPHIANASSA?

Euplœa iphianassa, Butl. P. Z. S. 1866, p. 287.

D'Entrecasteaux Islands and mainland of New Guinea.

These specimens only agree approximately with Mr. Butler's type, which came from New Hebrides. The chief difference consists in the absence in the male of the submarginal row of spots on the underside of the secondaries.

EUPLŒA NOX?

Euplœa nox, Butl. P. Z. S. 1866, p. 278.

D'Entrecasteaux Islands.

An imperfect specimen, probably of this species, the type of which was obtained in the Aru Islands.

EUPLŒA EURIANASSA.

Euplœa eurianassa, Hew. Ex. Butt., *Eupl.* i. f. 2.

D'Entrecasteaux Islands.

Described from a specimen taken on board ship, off the coast of New Guinea.

EUPLŒA TREITSCHKII?

Euplœa treitschkii, Boisd. Voy. Astr. Ent. p. 98; Salv. & Godm. P. Z. S. 1877, p. 142.

D'Entrecasteaux Islands.

A single female specimen probably belongs to this species, though it differs somewhat from our specimen from Duke-of-York Island as regards the arrangement of the spots on the secondary wings. The specimen is in poor condition.

HAMADRYAS ZOILUS.

Papilio zoilus, Fab. Syst. Ent. p. 480.

D'Entrecasteaux Islands and mainland of New Guinea.

Subfamily SATYRINÆ.

MYCALESIS MEDUS.

Papilio medus, Fabr. Syst. Ent. p. 488.

Mainland of New Guinea.

A single tattered specimen seems to belong to this widely-ranging species. The white cross bands of the underside are nearly obsolete.

MYCALESIS DORYCUS.

Satyryrus dorycus, Boisd. Voy. Astr. Ent. p. 152.

D'Entrecasteaux Islands and mainland of New Guinea.

Dr. Comrie's specimens agree with Boisduval's description in not having any of the fulvous colour of the secondaries near the anal angle of the primaries. In this respect they differ from Guérin's figure of his *S. duponchelii* (Voy. Coq. Zool. Atl. Ins. t. 17. f. 3). The ocelli on both wings are small, and differ much in size from those of the female figured by Hewitson (Ex. Butt. *Myc.* t. 2. f. 7, 10).

Subfamily MORPHINÆ.

DRUSILLA CATOPS.

Drusilla catops, Westw. Gen. D. Lep. p. 335, note; Trans. Ent. Soc. ser. 2, iv. p. 181.

D'Entrecasteaux Islands and mainland of New Guinea.

DRUSILLA MYOPS.

Drusilla myops, Feld. Wien. ent. Monatschr. iii. p. 109, t. 1. f. 1.

D'Entrecasteaux Islands and mainland of New Guinea.

These specimens agree fairly with Dr. Felder's figure; the white spot on the primaries, however, is more elongated, and the basal portion of the secondaries much paler.

Subfamily NYMPHALINÆ.

CETHOSIA CHRYSIPPE.

Papilio chrysisippe, Fab. Syst. Ent. p. 502; Donovan. Ins. N. Holl. t. 24.

D'Entrecasteaux Islands and mainland of New Guinea.

Agrees with North-Australian and New-Guinea specimens.

RHINOPALPA AMELIA.

Vanessa amelia, Guér. Voy. Coq. Zool. p. 278, t. 14 bis. f. 1.

D'Entrecasteaux Islands and mainland of New Guinea.

Agrees closely with Guérin's figure. We much doubt whether *R. algina*, Boisd., is really distinct. The figure of the latter in the 'Voyage au Pôle Sud' does not seem to be very accurately drawn.

CYNTHIA ARSINOE.

Papilio arsinoe, Cr. Pap. Ex. t. 160. f. A, B.

Mainland of New Guinea.

A single female specimen.

JUNONIA IPHITA.

Papilio iphita, Cr. Pap. Ex. t. 209. f. C, D.

Mainland of New Guinea.

JUNONIA VELLIDA.

Papilio vellida, Fab. Mant. Ins. ii. p. 35; Donovan. Ins. N. Holl. t. 25. f. 3.

Mainland of New Guinea.

DOLESCHALLIA COMRII, n. sp. (Plate XL. figs. 1, 2.)

♀. Expanse 4 inches. Outer third of both wings dark blackish brown, basal portion reddish brown; a subtriangular large white patch on primaries beyond the cell, its base on the costa, its apex nearly reaching the inner margin; a black spot at the end of the cell; between the white patch and the apex are four white spots, placed transversely in an irregular line, and below them, on either side of the lower radial, two irregular bluish spots. Beneath reddish brown; a straight band crosses the secondaries near the middle and passes into the primaries, on the inner side margined with white; and outside it (running parallel) is a dark brown band; the white spots show as on the upperside of the primaries; and on the secondaries are two ocelli—one between the first and second median branches, the other between the middle and upper radials.

Mainland of New Guinea (*Dr. Comrie*).

The sexes in the members of this genus do not differ to a great extent; so that we may expect the male of this species to be somewhat similar to the female specimen now described. There is no described member of the genus which the present species is at all like. This, we trust, will be sufficiently apparent from the figure on the Plate accompanying this paper. There is only a single specimen in *Dr. Comrie's* collection.

CYRESTES ACILIA.

Nymphalis acilia, Godt. Encyc. Méth. ix. p. 478.

Mainland of New Guinea.

Agrees with other New-Guinea specimens, and with others from Waigiou.

ATHYMA VENILIA.

Papilio venilia, Linn. Syst. Nat. i. p. 780.

Mainland of New Guinea.

Agrees with Amboina and New-Guinea specimens.

ATHYMA LACTARIA.

Athyma lactaria, Butl. Ann. & Mag. N. H. ser. 3, xvii. p. 98.

Mainland of New Guinea.

Agrees with the specimens in the British Museum.

DIADEMA NERINA.

Papilio nerina, Fab. Syst. Ent. p. 509; Donovan. Ins. N. Holl. t. 27. f. 1.

D'Entrecasteaux Islands.

A female specimen, agreeing with others from Australia.

DIADEMA ALIMENA.

Papilio alimena, Linn. Syst. Nat. i. p. 780.

D'Entrecasteaux Islands.

Agrees with Amboina specimens.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. p. 763.

Mainland of New Guinea.

Subfamily PAPILIONINÆ.

ORNITHOPTERA POSEIDON.

Papilio poseidon, Doubl. Ann. & Mag. N. H. xix. p. 173; Wall. Trans. L. S. xxv. p. 35.

Possession Bay and D'Entrecasteaux Islands.

Dr. Comrie obtained a number of specimens of Ornithoptera (mostly females) in these two localities. Unfortunately most of them are in broken condition; but enough remains to show an interesting range of variation in the females—enough, indeed, still further to discredit the many species of the *O.-priamus* group that have been attempted to be set up at various times.

Some of the females from Possession Bay have the primaries spotless brown; others show a trace of the light-coloured spot near the end of the cell. The specimens from D'Entrecasteaux Islands are strongly marked, indeed as much so as female examples of *O. arruana*.

Unfortunately, Dr. Comrie's collection contains only one male (from Possession Bay) in a condition to compare with examples from other localities. This seems to agree closely with typical specimens of *O. arruana*, the apical angle of the secondaries being perhaps rather less acute; but the difference is very slight. Comparing this with Montrouzier's description of his *O. boisduvalii*, from Woodlark Island (no great distance from Dr. Comrie's locality), we find it agree in every respect.

So far, then, as we can see, these specimens tend to confirm the

accuracy of Mr. Wallace's views on these Ornithopteræ, expressed in his paper on the Papilionidæ of the Malayan region.

PAPILIO ERECHTHEUS.

Papilio erechtheus, Donovan. Ins. N. Holl. t. xiv., xv.

Mainland of New Guinea.

A female, agreeing with specimens from Moreton Bay, Australia.

PAPILIO EUCHENOR.

Papilio euchenor, Guér. Voy. Coq. Zool. p. 273, t. 13. f. 3.

Mainland of New Guinea.

PAPILIO POLYDORUS.

Papilio polydorus, Linn. Syst. Nat. i. p. 746; Wall. Trans. L. S. xxv. p. 42.

Mainland of New Guinea.

These specimens have a light spot on the primaries; and the secondaries are more elongated than in *P. leodamas*, Wall., the species we should have expected to find here. They do not differ from the ordinary type of *P. polydorus*.

4. Description of a new Species of the Orthopterous Genus
Phylloptera from Madagascar. By ARTHUR G. BUTLER,
F.L.S., F.Z.S., &c.

[Received May 23, 1878.]

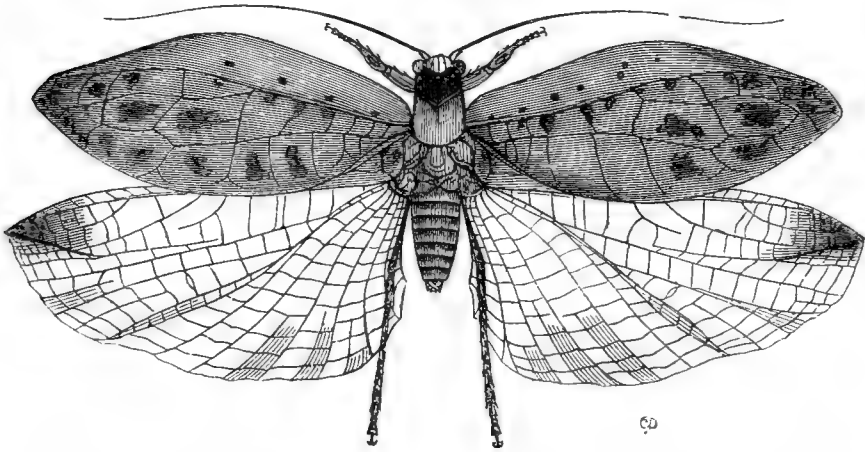
The genus *Phylloptera* is one of the numerous interesting groups amongst the Orthoptera which exhibit a striking resemblance to leaves, some of them being imitated in a green condition, and others when faded.

The species now before me is an admirable example of this adaptation to surrounding conditions, the tegmina being quite like sear and yellow leaves in which the brown patches of decay have begun to appear.

PHYLLOPTERA SEGONOIDES, n. sp.

Tegmina of the normal elliptical form; horn yellow, with the veins and borders more or less tinted with burnt sienna; the whole of the areoles, excepting those along the anterior border, with central irregular dull greyish-brown spots or patches; under surface paler, with greenish borders; wings hyaline-white, veins yellowish, the normal black-dotted horn-yellow cuneiform patch bounded by an oblique brown line at the very acuminate apex; frons testaceous; eyes (in the dead example) chocolate-brown; antennæ black, with testaceous scape; back of head sordid whitish, with two divergent grey lines from behind the antennæ; pronotum black, whitish in front, with the sides, posterior third, and a V-shaped central

marking pale castaneous; meso- and metathorax glassy greyish, with two or three opaque whitish spots; abdomen sordid testaceous, sides of the venter whitish; pectus and posterior coxæ whitish; anterior femora with the upper or interior surface castaneous at the proximal end, otherwise greyish, spotted with cream-colour, with two small tuberculose castaneous dots and a short longitudinal black dash, three black denticles along the supero-interior margin, inferior or exterior surface deeply grooved, paler, the distal half sordid whitish, with an irregular longitudinal brown dash; tibiæ with the proximal half whitish, expanded, compressed, and marked on each side by two deep pyriform impressed spots, distal half cylindrical, castaneous in the centre and black at the extremities, interior margin with three fine spinules; tarsi black, the terminal joint



Phylloptera segonoides.

castaneous, with black claws: middle pair of legs longer than the anterior pair, the tibiæ yellowish, banded with black across the centre and at each end, without the impressed markings of the anterior pair: posterior legs with the femora compressed, tawny, with an external longitudinal blackish lateral streak, inferior margin deeply grooved, its exterior edge with four short black denticles; tibiæ above flattened, slaty grey, with the distal end and a lateral series of triangular spots cream-coloured, twelve black denticles along the inner and eight along the outer margin, otherwise castaneous, subcylindrical, with about eleven delicate little spinules along the inferior margin; tarsi as in the other legs. Length of the body 23 millims., of the tegmina 91 millims., of the wings 96 millims.

This species much resembles the New-World genus *Segona*, but differs markedly in the structure of the anterior pair of legs.

5. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. XI. On the Steganopodes and Impennes. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.R.S.

[Received May 24, 1878.]

a. STEGANOPODES.

Of this order the collection contains 33 specimens belonging to 9 species, as follows :—

1. FREGATIDÆ.

1. FREGATA AQUILA (Linn.).

a, adult, }
b, young, } Ascension Island (March 1876).
c, young, }

2. FREGATA MINOR (Gm.).

Attagen ariel, Gould, B. Austr. vii. pl. 72.

133, male, Raine Island.

"Legs and feet black; bill grey; skin of throat red; eyes red. The skin of the throat is of a lighter red in the male than in the female. The stomach contained remains of cuttlefish, *Spirula*, and a fish."—*J. M.*

134, female, }
135, young, female, } Raine Island.
136, nestling, female, }

"Feet red; eyes red. The bill and feet of the young birds are of a white colour with a shade of blue; eyes black.

"In the adult birds the male has the eyelids, feet, and eyes black. The female has these parts red. This holds good in all our specimens."—*J. M.*

144, female, Raine Island.

482, male, Admiralty Island.

"Eyes black; flesh of throat red. Stomach contained fish. I shot this bird from the pinnacle while with several others. It was hovering over a shoal of fish. A Noddy and Black-headed Terns, and a Puffin or Petrel, larger than a Cape-Pigeon, were also fishing."—*J. M.*

The series before us, so far as it goes, tends to show that this smaller Frigate-bird may remain distinct from its larger brother, although we are not aware of any other obvious point of difference than that of size.

The specimens measure as follows :—

	Wing.	Bill from gape.
<i>Fregata aquila</i> , a	23·5	5·0
" " jr., b.	23·0	4·5
" " jr., c.	22·0	4·4

		Wing.	Bill from gape.
<i>Fregata minor</i>	♂, 133	20·5	3·9
"	" ♀, 134	20·5	4·0
"	" ♀, 144	20·5	4·0
"	" ♂, 482	20·5	4·0

The bill of *F. minor* is also narrower at the base, and more feeble.

2. PHAËTHONIDÆ.

3. PHAËTHON ÆTHEREUS, Linn.

a, Ascension Island (1876, March).

143, female (young), Raine Island.

"Eyes black, legs white, claws black, bill dark brown colour. The only one seen on the island."—*J. M.*

4. PHAËTHON FLAVIROSTRIS, Brandt.

a, } Fernando Noronha (Sept. 1873).
b, }

c, male, } Ascension (March 1876).
d, male, }

e, female, Tongatabou.

507, female, at sea, 19th March, 1875.

"Eyes black, legs lake-white. The claws and membrane between the toes quite black. Bill pale yellow. Came on board the ship on the morning of the 19th March, 1875, before daylight. The bill of a cuttlefish was in the stomach."—*J. M.*

3. PELECANIDÆ.

5. SULA LEUCOGASTRA (Bodd.).

Pelecanus sula, Linn. S. N. i. p. 218.

Le Fou de Cayenne, Buff. Pl. Enl. 973, undè

Pelecanus leucogaster, Bodd. Tabl. de Pl. Enl. p. 57.

Sula leucogastra, Salvin, Trans. Zool. Soc. ix. p. 496.

141, male, Raine Island.

"Eyes grey; feet light green; bill bluish towards the base, white at the tip."—*J. M.*

510, female, at sea.

"Eyes white or light grey. Stomach had cuttlefish; feet yellow with green tinge; bill flesh-colour, cere greenish. Came on board the ship on the evening of the 6th April, 1875."—*J. M.*

a, female. Ascension (March 1876).

b, } St. Paul's rocks, Atlantic (August 1873).
c, }

6. SULA PISCATOR (Linn.).

Pelecanus piscator, Linn. S. N. i. p. 217.

Dysporus piscator, Finsch et Hartl. Orn. Centr.-Polyn. p. 255.

123, female, off Cape York, at sea.

"Eyes brown; bill and throat light blue-reddish towards the base,

and the tips of both mandibles brown; feet coral-red. The stomach contained cuttlefish about $3\frac{1}{2}$ and 4 inches long, allied to *Gonatus amoenus*, and the caudal portion of a fish. There were a great many lice on this bird (preserved in a tube).”—*J. M.*

139, female, Raine Island.

“Eyes hazel; feet red; bill light blue, red towards the base. Stomach contained fish and cuttlefish.”—*J. M.*

7. SULA CYANOPS, Sund.

Sula cyanops, Sund. Phys. Sällsk. Tidskr. 1837, p. 218.

Dysporus cyanops, Finsch et Hartl. Orn. Centr.-Pol. p. 252.

137 and 138, females, Raine Island.

“Eyes yellow, skin of the throat black, legs and feet slate-colour. Stomach contained fish and cuttlefish.”—*J. M.*

8. PHALACROCORAX IMPERIALIS.

Phalacrocorax imperialis, King, P. Z. S. 1831, p. 20.

Phalacrocorax carunculatus, Scl. et Salv. Ibis, 1870, p. 500.

637, male, Core Harbour, Messier Channel.

“Eyes brown. Stomach had shells.”—*J. M.*

This Cormorant appears to be different from the *P. carunculatus* of New Zealand, with which we have hitherto united it, having a broad white patch on the middle of the back in the adult plumage, no crest, and the white extending further over the cheeks. Both species have the white bar on the upper wing-coverts.

The species of the Falkland Islands which has hitherto been called *Ph. carunculatus* (Scl. P. Z. S. 1860, p. 391; Abbott, ‘Ibis,’ 1861, p. 166) is again different, having a recurved crest and the caruncles on the front largely developed. It should probably stand as *P. albiventris*, Lesson’s *Carbo albiventer* (Trait. d’Orn. p. 604) being apparently based upon the young of this species.

9. PHALACROCORAX VERRUCOSUS.

Haheus (Hypoleucus) verrucosus, Cab. Journ. f. O. 1875, p. 450.

Halieus verrucosus, Cab. et Reich. Journ. f. O. 1876, p. 359, tab. 1.

Phalacrocorax verrucosus, Sharpe, Zool. of Kerguelen, p. 49.

a, male,

b, male,

c, male (young),

d, female,

e, female,

f, sex ind.,

} Betsy Cove, Kerguelen Land, January 1874.

The series of this Shag is quite sufficient to warrant us in adhering to the species as distinct. The principal characters are clearly pointed out by Dr. Cabanis in his original description; and a good figure is given of the adult male under the second reference given above. Not one of the six specimens, of which *a*, *b*, and, apparently, *f* are adult, shows any traces of the white line along the upper wing-coverts

or of the white spot in the middle of the back which distinguish *P. imperialis*. The female, *d*, is in young plumage.

b. IMPENNES.

Of Penguins the collection contains 37 specimens, belonging to 6 species.

1. APTENODYTES LONGIROSTRIS.

Apterodyta longirostris, Scop. Del. Faun. et Flor. Ins. ii. p. 91.

Aptenodytes longirostris, Coues, Pr. Ac. Phil. 1872, p. 193 ; Sharpe, Zool. Kerg. p. 52.

a, Kerguelen Land.

b, Christmas Harbour, Kerguelen.

c, Marion Island.

734, female, } Falklands.
735, male, }

"Eyes brown; the stomach of the female had the remains of cuttlefish, there being many beaks of these and also a weed-like substance. Female weighed 20 lb. ; skin of male weighed 10 lb."—*J. M.*

2. PYGOSCELES TÆNIATUS.

Aptenodytes papua, Forst. Nov. Comm. Gott. iii. p. 140, tab. iii.

Aptenodytes tæniata, Peale, U.S. Expl. Exp. p. 264 (1848).

Pygosceles wagleri, Scl. P. Z. S. 1860, p. 390.

Pygosceles tæniata, Coues, Pr. Ac. Phil. 1872, p. 195 ; Sharpe, Zool. Kerg. p. 54.

a,
b,
c,
d,
e,
f, } Kerguelen Land.

3. SPHENISCUS DEMERSUS.

Diomedea demersa, Linn. S. N. i. p. 214.

Spheniscus demersus, Temm. Tabl. Méth. p. 107 (1836).

a,
b,
c,
d, } Cape of Good Hope.

4. SPHENISCUS MAGELLANICUS.

Aptenodytes magellanicus, Forst. Nov. Comm. Gott. iii. p. 143, tab. v.

Spheniscus magellanicus, Scl. P. Z. S. 1860, p. 382.

Spheniscus demersus, var. *magellanicus*, Coues, Pr. Ac. Phil. 1872, p. 209.

689, male, Port Churrucha.

"The only one seen. Eyes hazel; the stomach had many portions of fish, some of considerable size; upper part of the feet white, bill black or slate-coloured."—*J. M.*

741, female, Falklands.

"Eyes brown; stomach had fish."—*J. M.*

In our opinion this species is quite distinct from *S. demersus* of the Cape, having a double band on the chest, as is well represented in Forster's figure.

5. EUDYPTES CHRYSOLOPHUS.

Aptenodytes chrysocome, Forst. N. Comm. Gott. iii. p. 135.

Catarractes chrysolophus, Brandt, Bull. Ac. Pét. ii. p. 315.

Eudyptes chrysolophus, ScL. Ibis, 1860, pp. 338, 432, et P. Z. S. 1860, p. 390; Abbott, Ibis, 1861, p. 163; Sharpe, Zool. Kerg. p. 57.

Eudyptes diadematus, Gould, P. Z. S. 1860, p. 419.

a-c, males, }
d, female, } Christmas Harbour, Kerguelen.
e, pale var., }

On comparison of the Kerguelen specimen with others from the Falklands we find no reason for considering them otherwise than of the same species. There is, however, less appearance of the white upper tail-coverts in the Falklands specimens. Why Mr. Sharpe should have supposed that *E. chrysolophus* (ScLATER et ABBOTT) of the Falklands was his *E. saltator* we cannot understand.

Forster evidently had both the "Rock-hopper" and "Macaroni" Penguins under his eyes when he described his *Apt. chrysocome*¹. Brandt first clearly separated the two species, which are quite distinct and easily recognized by the character which Brandt gives.

The type specimen of *E. diadematus*, Gould, for which we have made every inquiry, is unfortunately no longer to be found. Mr. Gould has parted with it, he knows not whither. It was *probably* only an individual variety of this species.

6. EUDYPTES CHRYSOCOME.

Aptenodytes chrysocome, Forst. N. Comm. Gott. iii. p. 135 (partim).

Catarractes chrysocome, Brandt, Bull. Ac. Pét. ii. p. 314.

Eudyptes chrysocome, ScL. P. Z. S. 1860, p. 390.

Eudyptes nigrivestris, Gould, P. Z. S. 1860, p. 418.

Eudyptes saltator, Sharpe, Zool. Kerg. p. 60.

a-e, Inaccessible Island.

f, male, }
g-k, } Kerguelen.

l, m, males, }
n, young, } Falklands.

On comparison of the series from these three localities we cannot satisfactorily recognize more than one species of "Rock-hopper." The bird from Inaccessible Island has the elongated superciliary

¹ He describes the crest "in aliis individuis in fronte unita, in aliis divisa" (*L. s. c.* p. 137).

plumes more produced; those of the Falklands and Kerguelen have them rather shorter.

As regards the Australian and New-Zealand bird (*E. pachyrhynchus* of Gray), to which Mr. Sharpe proposes to restrict the name *chrysocome* of Forster, we likewise doubt its distinctness. The only differential characters given by Mr. Sharpe consist in the relative lengths of the black and yellow feathers of the superciliary tufts. At the same time we should like to examine a series of this form before pronouncing a decided opinion on the point.

June 18th, 1878.

Arthur Grote, Esq., F.Z.S., V.P., in the Chair.

Extracts were read from a letter addressed to the Secretary by Mr. E. L. Layard, F.Z.S., dated British Consulate, Noumea, March 30th, 1878.

Mr. Layard pointed out that Mr. Gould's *Glycyphila fasciata* (Handb. B. Austr. i. p. 499; B. Austr. iv. tab. 30) was quite a different bird from *G. fasciata* (Forster) of New Caledonia, the latter being nearly half as large again. Mr. Layard proposed to change the name of the Australian species to *G. gouldi*.

Mr. Layard also sent the subjoined note on *Petroica kleinschmidti* of Finsch:—

“Dr. Finsch has described as new, under the name of *Petroica kleinschmidti*, the little *Petroica* of Fiji (P. Z. S. 1875, p. 643). I wish to point out that this species will not stand, and that the Fijian species is not separable from the Samoan *P. pusilla*, Peale. Dr. Finsch says, ‘it differs from *P. pusilla*, Peale, from the Navigators, in lacking the white front and the large white mark on the wing-coverts.’ Dr. Finsch’s description is evidently taken from a female; and she lacks the white marks, which, however, are very visible in the male.

“I have before me two pairs of Fijian birds (♂ and ♀), and three males from Samoa. Unfortunately one of these, from Mr. Whitmee, is unsexed; the other two are of my own killing: one is a young male, and I have no doubt Mr. Whitmee’s bird is also a male; none are in very good plumage, whereas my Fijian birds are in splendid order.

“Now, I can affirm that the males are not to be distinguished one from the other, except that the Fijians are in brighter plumage; so that *P. kleinschmidti* must sink into a synonym of *P. pusilla*, with Peale’s description of which (U.S. Expl. Exped. p. 165) it entirely agrees.”

Mr. Sclater called the attention of the members present to the unique specimen of his *Felis lanea* (P. Z. S. 1877, p. 532), still living in the Society’s menagerie, and read the subjoined extract from a letter of Mr. E. L. Layard, F.Z.S., relating to this animal:—

“It will interest you to know that there is a second specimen of

your *Felis lanea* in the South-African museum, sent from the same place (the Beaufort-West Karras) by the late Arthur V. Jackson, who killed it himself. Unfortunately I received the skin in very bad condition. The ground-colour is much paler than in your plate, almost white.

“Jackson and I thought it an albinism (or rather erythrism) of *F. jubata* (see Catalogue of S. A. Museum, p. 38, No. 82, *Gueparda jubata*, specimen *b*). At p. 39 of the same Catalogue, I remark that we have had notices of a second species of Maned Leopard, with solid spots and with retractile claws, from Natal. The claws of your animal are not shown in Smit’s plate. What is their structure?”

On this last point Mr. Slater stated that, so far as could be told from examination of the living animals, the claws of *Felis lanea* resembled those of *Felis jubata*, being observable when the feet were at rest, and being but slightly extensile.

The existence of a second specimen of the animal in the South-African Museum (of which Mr. R. Trimen had also informed Mr. Slater) was a fact of great interest.

Mr. Slater read some Supplementary Notes on the Curassows (Cracidæ), mainly based on specimens which had been received by the Society alive since Mr. Slater’s previous memoir on this subject had been read five years ago.

This paper will be published in the Society’s ‘Transactions.’

The following papers were read:—

1. On the Squirrels of the Neotropical Region.

By EDWARD R. ALSTON, F.L.S., F.Z.S., &c.

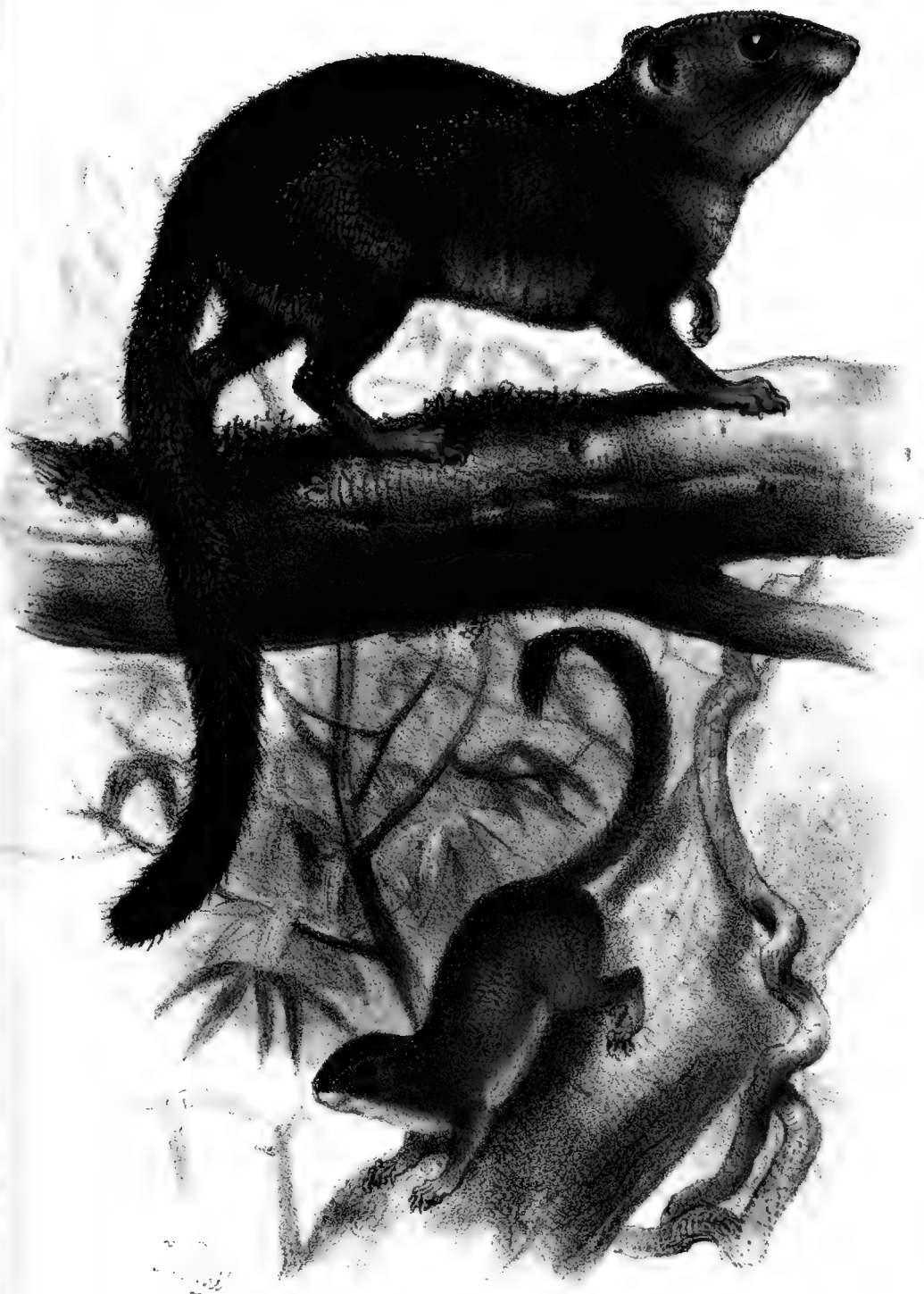
[Received June 3, 1878.]

(Plate XLI.)

No better example of a polymorphic genus can be found than the almost cosmopolitan *Sciurus*. Even our common European Squirrel assumes such phases of coloration in the north, in the east, and among the Alps that the extremes would undoubtedly be considered perfectly distinct species if the intermediate links were not known. The same variability is found to a still greater extent in many of the Oriental species; while the polymorphism of some of the North-American forms was pointed out by Professor Baird more than twenty years ago.¹

It is only lately that similar critical attention has been given to the Squirrels of the Neotropical Region. Of these no fewer than *fifty-nine* nominal species have been described by various writers. The late Dr. Gray, in 1867, published a “Synopsis of the Species

¹ Mamm. North Amer. pp. 244, 245.



J. Smit. lith.

Leach & Co. int.

SCIURUS PUSILLUS.



of American Squirrels in the Collection of the British Museum”¹, in which he recognized *twenty-nine* Neotropical species as being represented in the national cabinet, *nineteen* of them being described as new. Last year appeared Messrs. Coues and Allen’s exhaustive volume of ‘Monographs of North-American Rodentia’², in which the Squirrels are discussed by the last-named zoologist, who includes the South-American species in his scope. Having had access to considerably larger series of specimens than were available to most previous writers, Mr. Allen was led to reduce the number of valid species of Neotropical Squirrels to ten, with two “subspecies,” namely:—

<i>Sciurus carolinensis.</i>	<i>Sciurus leucops.</i>
—— —, var. <i>yucatanensis.</i>	—— <i>astuans.</i>
—— <i>colliæi.</i>	—— —, var. <i>rufo-niger.</i>
—— <i>aureigaster.</i>	—— <i>tephrogaster.</i>
—— <i>boothia.</i>	—— <i>gerrardi.</i>
—— <i>hypopyrrhus.</i>	—— <i>variabilis.</i>

He further remarked that he thought that “on the whole the number of species will, by future investigations, be further reduced rather than increased,” and that he had erred in recognizing too many species rather than too few.

No one who is acquainted with Mr. J. A. Allen’s recent memoirs on the geographical variation of species, needs to be reminded of his breadth of view and extreme carefulness in comparison; and in the present monograph these qualities are as conspicuous as ever. In it Mr. Allen has done a great service in reducing the complicated synonymy of the South-American Squirrels to some order; and if some of his identifications prove to be erroneous, the fault lies in the often totally insufficient or even misleading descriptions of some previous writers.

Within the last year I have been able to examine in the British Museum and the Museums of Berlin and Paris, the types of no less than *forty-one* nominal species of Neotropical *Sciuri*. In these collections I have also been able to compare much more extensive series of specimens than even Mr. Allen had access to; and, through his kindness, I have examined typical examples of the species recognized by him. This study has led me to accept many of Mr. Allen’s identifications (some of which are sufficiently startling at first sight), and in some instances to carry the reduction of species still further; but it has also enabled me to correct a few errors in his synonymy, and to point out a few apparently valid species with which he was not acquainted.

Particularly rich in this group are the Paris and British Museums; and the study of their long suites of specimens leads one irresistibly to conclusions which must appear strange to those who only know the extreme links of the chain. Among other things they

¹ Ann. & Mag. Nat. Hist. 3rd ser. xx. pp. 415-434.

² Rep. U.S. Geol. Survey of Territories, vol. xi.

have convinced me that Mr. Allen has laid too much stress on the comparative size of the ears, and length and bushiness of the tail, as distinctive characters. In both these points, as well as in the quality of the pelage, every intermediate stage is often to be found; and I have therefore been obliged to unite Mr. Allen's *S. aureigaster* and *S. leucops*, his *S. boothiæ* and *S. hypopyrrhus*, and his *S. gerrardi* and *S. variabilis*. On the other hand, I have felt obliged to recognize, at least provisionally, the specific rank of *S. stramineus*, *S. griseogenys*, *S. rufo-niger*, and *S. pusillus*, and more doubtfully that of *S. griseoflavus*,—thus raising the number of species from ten to twelve.

In facing the intricate and often baffling problem of distinguishing between "species" and "varieties" in such a protean group, I have endeavoured to act in harmony with Mr. Darwin's directions: "When a naturalist can unite by means of intermediate links any two forms, he treats the one as a variety of the other"¹. It must be remembered that many of these "varieties" apparently breed true and prevail in certain parts of the range; but all that are here brought together are united by such intergradations that a sufficient series at once convinces one of their identity. It is evident, however, that still more complete material will be required before every point can be regarded as definitely settled.

Before proceeding to remark on the various species², I must return my warmest thanks to all who have assisted me in this investigation, especially to Mr. J. A. Allen, Professor A. Milne-Edwards, Dr. Peters, and Dr. Günther.

I. SCIURUS CAROLINENSIS.

Sciurus carolinensis, Gmelin, Linn. Syst. Nat. i. p. 148 (1788, ex Pennant); Allen, Mon. N.-Am. Rodent, p. 700.

Length of head and body averaging 10 inches; of tail-vertebræ about 8 inches.

Upper parts grey or brownish grey, the middle of the back brownish, a rufous lateral stripe usually present; lower parts white. Tail moderate, washed with white, the hairs yellowish brown or whitish, with narrow black rings, broader black subterminal bands and white tips.

Hab. Southern Canada; Eastern United States; Mexico; Yucatan; Guatemala (?).

Concerning this well-known Nearctic form I can add almost nothing to Mr. Allen's exhaustive account. He distinguishes three geographical races or varieties, of which two, his "var. *carolinensis*" and "var. *yucatanensis*," are found within the Neotropical limits. The former, smaller and browner than the northern *leucotis* race, is apparently the *S. carolinensis* which M. de Saussure records from Mexico³ and Mr. Tomes from Guatemala⁴; and

¹ Origin of Species, 6th ed. p. 36.

² The species of which I have been able to examine the types or typical species are distinguished in the following pages by an asterisk.

³ Rev. et Mag. de Zool. 1861, p. 4.

⁴ Proc. Zool. Soc. 1861, p. 282.

there are specimens from Nuevo Leon in the National Museum at Washington. Mr. Allen's "var. *yucatanensis*" is based on specimens collected at Merida, which agree in their pale coloration, the absence of rufous on their flanks, their small size, and the comparative coarseness of their pelage. He considers that this form is "possibly specifically distinct," but remarks that the Nuevo-Leon examples are fairly intermediate; and, judging from the single typical example which Mr. Allen kindly lent me, I think he was wise in refusing it specific rank, at least for the present.

Of the geographical variations presented by the Grey Squirrel throughout its very extensive range, Mr. Allen observes they consist "mainly in decrease in size southward, and an increase in intensity of coloration, the whitish tips of the hairs of the dorsal surface seen in northern specimens being replaced by yellowish-brown in the southern ones, except in the case of var. *yucatanensis*." The decrease in size as we go southwards is of course strongly in favour of the distinctness of the next species.

II. SCIURUS ARIZONENSIS.

**Sciurus arizonensis*, Coues, Amer. Nat. i. p. 357 (1867).

(*Sciurus collicæi*, Allen, Mon. N.-Am. Rodent, p. 738, nec Richardson.)

Length about 12.50, of tail-vertebræ 11 inches. Upper parts grey, more or less mixed with yellowish-brown, especially along the middle of the back; lower parts pure white. Tail long, very bushy, strongly washed with white, the hairs tawny or fulvous with two narrow and one broader black band, succeeded by a long white tip.

Hab. Arizona; California; Mexico.

Misled by imperfect descriptions and a bad figure of Richardson's type, Mr. Allen has referred the Arizona Squirrel of Dr. Coues to Richardson's *S. collicæi*. He has since kindly intrusted me with a typical example of *S. arizonensis*; and I find that it is quite distinct from *S. collicæi* (which is Mr. Allen's *S. boothice*), being much more nearly allied to *S. carolinensis*, from which, however, both Dr. Coues and Mr. Allen consider that it is "thoroughly distinct." The superior size, coloration of the long heavy tail, and absence of a lateral line appear to be constant, but in some specimens in the Paris and British Museums the grey of the upper flanks is not so clear from rufous as in the examples described by Mr. Allen. The example mentioned by that gentleman as having "the lower surface considerably varied with irregular patches and streaks of pale yellowish rufous" gives support to the opinion that further material will render it necessary to unite the next species with the present. If so, Dr. Coues's name must be retained, as it has priority over Gray's title.

III. *SCIURUS GRISEOFLAVUS*.

**Macroxus griseoflavus*, Gray, Ann. & Mag. Nat. Hist. 3rd series, xx. p. 427 (1867).

(*Sciurus leucops*, Allen, Mon. N.-Am. Rodent, p. 753, nec Gray.)

Length (in skin) about 13·50 inches, of tail-vertebræ 10·25 inches. Upper parts nearly uniform yellowish grey, the narrow black rings and minute whitish tips of the hairs merely obscuring the general tint produced by their broad pale-brown median bands; lower parts yellowish red, the hairs in one specimen obscurely ringed with black. Tail bushy, strongly washed with white; the hairs yellowish or pale brown, with two or three narrow and one broader black band succeeded by a long white tip.

Hab. Mexico (?); Guatemala.

Mr. Allen considers Gray's *M. griseoflavus* to be specifically identical with his *M. leucops* (*op. cit.* p. 753); and the original diagnosis certainly seems to give countenance to such a view. The typical specimens (five in number), however, are very different, and in my opinion are closely allied to the last species, of which I suspect it will eventually prove to be a southern race. More specimens, however, are required before they can be united; and provisionally I therefore accept *S. griseoflavus* as a distinct species.

It appears probable that this is Mr. Tomes's *S. ludovicianus* from Guatemala¹; and a Mexican specimen in the Copenhagen Museum, labelled "*Sc. affinis*, an sp. nov.? Reinh.," does not appear to be separable.

IV. *SCIURUS VARIEGATUS*.

Sciurus variegatus, Erxleben, Syst. Reg. An. p. 421 (1777, ex Hernandez).

**Sciurus aureogaster*, F. Cuvier, Hist. des Mamm. iii., livr. lix. (1829).

Sciurus leucogaster, F. Cuvier, Suppl. de Buff. i. Mamm. p. 300 (1831).

Sciurus albipes, Wagner, Abh. Bayer. Ak. ii. p. 101 (1837).

Sciurus ferruginiventris, Audubon & Bachman, P. Ac. Philad. 1841, p. 101.

Sciurus varius, Wagner, Suppl. Schreber Säugeth. iii. p. 168 (1843).

Sciurus socialis, Wagner, tom. cit. p. 170.

**Macroxus morio*, Gray, Ann. & Mag. Nat. Hist. 3rd series, xx. p. 424 (1867, nec Wagner).

**Macroxus maurus*, Gray, tom. cit. p. 425.

**Macroxus leucops*, Gray, tom. cit. p. 427.

(*Sciurus aureigaster* et *S. leucops*, Allen, Mon. N.-Am. Rodent. pp. 750, 753.)

Hab. Southern Mexico; Guatemala?

Average length about 10·50 inches, of tail-vertebræ 8·75 inches.

¹ Proc. Zool. Soc. 1861, p. 281.

Upper parts grey or reddish grey, the hairs black, tipped or ringed and tipped with white or red. Pelage somewhat soft, with a good deal of under-fur; lower parts deep red, orange, or white. Tail black, washed with white, the hairs usually rufous at their base, with black rings and white tips.

Under this name I feel myself obliged to bring together two Mexican Squirrels of which typical specimens are very different in appearance. Mr. Allen has kept them separate under the names of *S. aureogaster* and *S. leucops*, remarking that the difference in coloration leaves little doubt of their distinctness, but adding that "more abundant material may show that they are not specifically separable" (*op. cit.* p. 755). The colour-variation is not nearly so great as we shall find it to be in the next species; and after a careful examination of a great number of specimens, especially of the fine series in the Paris Museum, I have been unable to find a single distinctive character which is constant.

Typical specimens of the two forms may be thus described:—

1. The *aureogaster* type. Upper parts dark grey, the hairs black, finely tipped with white. Lower parts deep red, which is usually more or less washed over the grey on the shoulders and flanks.

2. The *leucops* type. Upper parts lighter grey, with a peculiar golden lustre, the hairs being finely ringed with bright rufous and tipped with white; nape and rump more strongly rufous. Lower parts bright red, orange, or white.

Many specimens, however, which have the general appearance of *aureogaster* show the rufous subterminal ring of *leucops* on some part of the dorsal surface; and in others we find the red nape and rump-patches gradually appearing. I am therefore compelled to return to the view long ago expressed by Isidore Geoffroy¹, and to regard them as varieties of the same species.

With regard to distribution, all the specimens which I have seen with authenticated localities are from Mexico; but Mr. Allen mentions one from Guatemala in the Washington Museum. Specimens in the British Museum are labelled as being from Columbia; but there can be little doubt that this is an error. *S. aureogaster* is stated by Prof. Sumichrast (as quoted by Mr. Allen) to be "the common species of *Sciurus* of the tierra caliente of the east coast" of Mexico; and both forms are found in the States of Oaxaca and Tehuantepec.

Turning to the question of synonymy, I must briefly explain why I have retained Erxleben's name for this species. Mr. Allen considers it to apply rather to the next species, but rejects it altogether, on the ground that it is based partly on Buffon's "Coquallin" (*S. niger*, L.), and partly on the "Cozticotequallin" of Hernandez. It is, however, primarily founded on the latter, Buffon's name being only quoted as a synonym; and Erxleben's diagnosis and description appear to me to be quite characteristic of the *leucops* form of the

¹ Voy. de la Vénus, Zool. pp. 156-163.

present species¹. By retaining this appropriate name, we are enabled to escape from F. Cuvier's barbarous term *aureogaster*, under which this beautiful animal has laboured in so many works. *S. albipes*, Wagner, afterwards re-named *S. varius* by its describer, is doubtfully referred to the next species by Mr. Allen; but the description, especially the character of the hairs being ringed with red, black, and white, appears to point certainly to identity with Gray's *S. leucops*. Wagner's *S. socialis* also, founded on a single example, seems also to be a synonym of the present species; for the characters of coloration by which he differentiates it from his *S. varius* are quite insufficient, and the small size may, as Mr. Allen suggests, be due to the immaturity of the specimen described.

V. SCIURUS HYPOPYRRHUS.

Sciurus hypopyrrhus, Wagler, Isis, 1831, p. 610.

**Sciurus nigrescens*, Bennett, P. Z. S. 1833, p. 41.

**Sciurus colliæi*, Richardson, Zool. Voy. 'Blossom,' p. 8, pl. i. (1839).

**Sciurus variegatoides*, Ogilby, P. Z. S. 1839, p. 117.

**Sciurus richardsoni*, Gray, Ann. Nat. Hist. x. p. 265 (1842, nec Bachman).

**Sciurus boothiæ*, Gray, List Mamm. Brit. Mus. p. 139 (1843).

**Sciurus griseocaudatus*, Gray, Zool. Voy. 'Sulphur,' p. 34, pl. xiii. (1844).

**Sciurus fuscovariegatus*, Schintz, Syn. Mamm. ii. p. 17 (1845, ex Gray).

**Macroxus adolphei*, Lesson, Desc. de Mamm. &c. p. 141 (1847).

**Macroxus pyladei*, Lesson, tom. cit. p. 142.

**Sciurus dorsalis*, Gray, P. Z. S. 1848, p. 138, pl. vii.

**Sciurus rigidus*, Peters, Monatsb. Ak. Berl. 1863, p. 652.

**Sciurus oculatus*, Peters, tom. cit. p. 653.

**Sciurus intermedius*, Verreaux, ap. Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 421 (1867).

**Macroxus nicoyana*, Gray, tom. cit. p. 423.

**Macroxus melania*, Gray, tom. cit. p. 425.

(*Sciurus boothiæ* et *S. hypopyrrhus*, Allen, Mon. N.-Am. Rodent. pp. 741, 746.)

Hab. Central America, from the Pacific coast of Mexico to the Isthmus of Panama.

Average length about 11.75 inches, of tail-vertebræ 10 inches. Pelage close-lying and rather glossy, with little underfur. Upper parts dark brown or black, often broadly ringed with rufous or white. Lower parts varying from deep red to creamy white, sometimes ringed with black. Tail black, generally washed with white, the hair rufous, pale brown or whitish at their base, with one or two black or brown rings and a white tip.

In uniting all the very variously marked Squirrels the names of which

¹ "*S. corpore supra nigro, albo et fusco variegato. * * * Magnitudo dupla S. vulgaris. Auriculæ imberbes. Corpus supra nigro, albo et fusco variegatum, ventre flavescens. Cauda supra corpus reflexa.*"

are given above, I have gone beyond Mr. Allen, who divides them into two species under the titles of *S. hypopyrrhus* and *S. boothiæ*. The series of specimens to which he had access left him strongly impressed with their distinctness; but he adds that further material may show that they intergrade. After a careful examination of the large series contained in various Museums, and especially of that at Paris, I am quite convinced that this is the case, and have even grave doubts of the propriety of keeping them distinct from the last species. But as I have not yet found specimens strictly intermediate between *S. variegatus* and *S. hypopyrrhus* in the character of the pelage and the annulation of the fur, it seems best to keep them distinct.

The opinion has been expressed above that the differences in comparative length of tail and ears, on which Mr. Allen lays most weight in separating *S. boothiæ* from *S. hypopyrrhus*, cannot be depended on; and I have been totally unable to detect any constant difference in general stoutness of form or breadth of muzzle. As to colour, the intergradations of the different varieties are quite complete, so that it is often difficult or impossible to say to which a given specimen is to be referred. Each variety, however, has its own type, and seems to predominate in its own immediate locality. The five principal phases known to me may be thus arranged:—

1. The *hypopyrrhus* type. Upper parts dark-grey, the hairs black, ringed with white or pale fulvous. Lower parts either concolorous, with the upper or washed with rufous. To this variety I agree with Mr. Allen in referring Bennett's *S. nigrescens*; and it is to the same form that the description of *Macroxus boothiæ* in Gray's memoir of 1867 refers, although the same author's *Sciurus boothiæ* of 1853 was founded on a young example of the white-bellied *colliaei* phase. The rufous-bellied specimens lead us directly into

2. The *rigidus* type. Upper parts usually marbled with fulvous and black, the hairs being glossy brown or black with a median band of yellowish brown. Lower parts bright rufous (*rigidus*), or varied with rufous and white, either symmetrically (*intermedius*) or asymmetrically (*nicoyanus*). In many specimens, as observed by Mr. Allen, there is a more or less marked tendency to the development of a pale grizzled lateral stripe placed high on the flanks and confining the dark dorsal area to a broad median band. From these we have every gradation into the rufous phase of

3. The *dorsalis* type. Upper parts with the median dorsal area black, flanks and lower parts white, fulvous, or rufous. In many individuals the hairs of the black dorsal area will be found to have concealed rings of white or fulvous; so that we have a further transition into

4. The *colliaei* type. Upper parts much as in the *rigidus* form, but usually less rufous; lower parts white (*colliaei*, *adolphei*) or pale fulvous (*variegatoides*, *griseocaudatus*, *pyladei*, *oculatus*). Usually the dark coloration of the back is extended onto the shoulders, hips, and limbs; but in others it is confined to the middle of

the back, as in the last phase, while the rufous-bellied phases lead us directly back into the *rigidus* form.

5. The *melania* type. Upper and lower parts uniform glossy dark brown, often with irregular patches of paler brown. This is a very peculiar phase, and I have not yet seen any direct intergradation with the other varieties; but uniformity of coloration is so abnormal among the Squirrels, that it seems impossible to doubt that Mr. Allen is right in regarding it as a melanism. The colour is exactly similar to that of the white-bellied *dorsalis* varieties, in which also the paler apparently faded patches are sometimes seen. It appears to be much rarer than any of the other forms described.

With regard to the synonymy, I may observe that I have been able to examine the types of all the "species" here united, excepting that of *S. hypopyrrhus*, which, however, has been well described by Wagler and Wagner; it appears to be a dark variety without the usual wash of white on the tail. That of *S. nigrescens* only differs in having the fur of the lower parts ringed like that of the back; it agrees well with specimens in the Paris and Berlin Museums. *S. colliæi* and *S. adolphei* are synonyms for the white-bellied form above described, from which I am also unable to distinguish *S. richardsoni* of Gray (not of Bachman), on which both *S. boothiæ* and *S. fuscovariegatus* were founded. *S. variegatoides*, *S. griseocaudatus*, *S. pyladei*, and *S. oculatus* are all intermediate links with more or less fulvous lower parts, leading to the phase with a red or red and white belly, on which the names *S. intermedius*, *S. rigidus*, and *Macroxus nicoyanus* have been bestowed.

Of the geographical distribution of the various races we can only judge from the comparatively few specimens of which the exact localities have been noted. The *hypopyrrhus* phase appears to be the most northern, the *colliæi* to obtain principally along the Pacific slopes, and the *dorsalis* to be the most southern. Each, however, appears to be found along with others in some part. Thus, I have seen specimens of *hypopyrrhus* type from Mexico, Honduras, and Guatemala, of *rigidus* from Guatemala, Nicaragua, and Costa Rica, of *dorsalis* from Nicaragua, Costa Rica, Veragua, and Panama, and of *colliæi* from the west coast of Mexico and Guatemala, Nicaragua, and Costa Rica. The only localities which I know for *S. melania* are Nicaragua and Veragua.

VI. SCIURUS STRAMINEUS.

Sciurus stramineus, Eydoux & Souleyet, Voy. de 'La Bonite,' Zool. i. p. 37, Atlas, pl. ix. (1841).

**Sciurus nebouxii*, Is. Geoffroy, Voy. de 'La Vénus,' Zool. p. 163, Atlas, pl. xii. (1855).

**Macroxus fraseri*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 430 (1867).

(*Sciurus hypopyrrhus*, Allen, Mon. N.-Am. Rodent. p. 747.)

Hab. Ecuador; Peru.

Average length about 12.50 in., of tail-vertebræ 12.50. Upper parts nearly uniform grizzled grey, rump and lower parts more or

less washed with rufous, the hairs blackish towards their base, with long white fulvous or rufous ends; feet blackish; tail black, washed with rufous and whitish; pelage very sparse and harsh, with almost no under-fur.

This curious Squirrel, which appears to be the sole representative of the genus in Western Peru, is rare in collections; and though the few specimens which have been sent to Europe differ little in colour, they have received the above names. Mr. Allen referred three specimens from Guayaquil to *S. hypopyrrhus* (tom. cit. p. 747); and certainly some varieties of that species bear a strong general resemblance to the present. But so far as can be judged from the small series in the Paris and British Museums, *S. stramineus* seems to be fairly entitled to specific recognition; and intermediate forms are hardly likely to be found, as no similar Squirrel appears to be known from any part of Columbia. It is only fair to Mr. Allen to add, that Gray's description of *M. fraseri* is so imperfect that it is not surprising that the American zoologist should have doubtfully referred it to *S. tephrogaster* (tom. cit. p. 763).

A remarkable peculiarity of this species is its tendency to the development of irregular tufts of pure white hairs, rather longer than the rest of the fur, and sometimes uniting in larger patches. These asymmetrical markings are present in the majority of the individuals examined.

A fine specimen of *S. stramineus* from Ecuador is now living in the Society's Gardens¹.

VII. SCIURUS VARIABILIS.

**Sciurus variabilis*, Is. Geoffroy, Mag. de Zool. 1832, pl. iv.

Sciurus langsdorffi, Brandt, Mém. Ac. St. Pétersb. 6^e sér. iii. p. 425, (1835).

Sciurus igniventris, Natterer ap. Wagner, Wieg. Arch. 1842, p. 360.

Sciurus pyrrhonotus, Natterer, loc. cit.

Sciurus tricolor, Pöppig ap. Tschudi, Faun. Peruan. p. 156, pl. xi. (1844-46).

Sciurus morio, Wagner, Abh. Bayer. Ak. v. p. 275 (1850, nec Gray),

**Sciurus gerrardi*, Gray, P. Z. S. 1861, p. 92, pl. xvi.

**Sciurus brunneo-niger*, Castelnau ap. Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 429 (1867).

**Sciurus fumigatus*, Gray, tom. cit. p. 428 (1867).

(*Sciurus gerrardi* et *S. variabilis*, Allen, Mon. N.-Amer. Rodent. pp. 766, 768.)

Hab. Panama; Venezuela; Columbia; Ecuador; Peru; Brazil; Bolivia.

Average length about 12 inches, of tail-vertebræ 11 inches. Upper parts red, either pure or more or less grizzled with black, lower parts white, fulvous, or light rufous, sharply defined from the dorsal colour-

¹ See above, p. 441.

ing; tail black, washed with bright-red orange, often very bushy. Pelage rather harsh and sparse, ears high and narrow.

Here, again, the greater amount of material at my disposal compels me to go beyond Mr. Allen in the identification of nominal species. Most of the above synonyms were brought together by him under the name of *S. variabilis*; but *S. gerrardi* and *S. ~~rufus-niger~~* were kept separate under the former title. The principal points on which he rested were the smaller size and shorter ears of *S. gerrardi*; but on examination of a sufficient series, I have not been able to find any constancy in the proportions of the ears, while the difference in size totally disappears, as is shown by the following series of measurements—9·50, 9·75, 10·00, 10·25, 10·75, 11, 11·50, 11·75, 12·00, 12·75, 13·00. The smaller specimens (*S. variabilis*, *S. gerrardi*, &c.) appear to prevail towards the north: but this is not constant; for a Santa-Martha example measures over 12 inches, while others from Brazil are under 10 in., although evidently adult. Nor is it constantly connected with any of the numerous varieties of coloration—rufous, grizzled, and melanistic specimens occurring of all sizes.

The range of these variations of colour is not nearly so great as in *S. hypopyrrhus*; and they seem to resolve themselves into three primary groups, namely:—

1. The *morio* type. Upper and lower parts black, only slightly ringed with rufous or fulvous, tail black, either entirely or slightly washed with red. Of this melanistic form no two specimens agree exactly in the proportion of red; and every step is present leading into

2. The *variabilis* type. Upper parts red, more or less varied with black—but the rufous tint prevailing, especially on the flanks; lower parts pure white, fulvous, or pale rufous; tail (either narrow or bushy) black, strongly washed with bright rufous or orange. Here we have an endless series of minor variations, from the very brilliant black and red specimens sent from the Rio Napo to the British Museum, and the bright rufous Columbian form, through more and more greyish red specimens, till we find ourselves in

3. The *langsdorffi* type. Upper parts reddish or yellowish grizzled, the hairs being pretty uniformly ringed with black and red or black and yellow; lower parts and tail as in the last.

Each of these styles appears to prevail in certain localities: thus the melanistic form has been found on the Upper Amazons by Mr. Bates and by Castelnau and Deville, the rufous type on the Rio Negro and Rio Madeira by Natterer, and the grizzled in North-western Brazil by Spix. But there seems to be no regularity in their distribution; and I have seen both grizzled and red specimens from Panama, Venezuela, Columbia, and North-eastern Peru.

The oldest name, and therefore the one here adopted, is *S. variabilis*, given in 1832 by Isidore Geoffroy to small red specimens from Columbia, and strictly synonymous with Gray's *S. gerrardi*; while *S. igniventris* and *S. pyrrhonotus* were MS. names of Natterer's, applied by Wagner to other varieties of the rufous type. *S. langs-*

brunneo-niger - ~~rufus-niger~~

dorffi and *S. tricolor* both refer to the forms in which the upper parts are more or less uniformly grizzled; while *S. morio*, *S. rufo-niger*, and *M. fumigatus*, are all more or less melanistic varieties. *brunneo*

VIII. SCIURUS GRISEOGENYS.

**Sciurus æstuans*, var. *hoffmanni*, Peters, Monatsb. Ak. Berl. 1863, p. 654.

**Sciurus hyporrhodus*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 419 (1867).

**Macroxus xanthotus*, Gray, tom. cit. p. 429.

**Macroxus griseogenus*, Gray, tom. cit. p. 429.

(*Sciurus æstuans*, var. *rufo-niger*, Allen, Mon. N.-Am. Rodent. p. 757.)

Hab. Ecuador; Columbia; Venezuela; Panama; Veragua; Costa Rica; Nicaragua.

Length about 9 inches, of tail-vertebræ 8 inches. One upper premolar. Upper parts dark olive, the hairs dusky, very minutely annulated with rufous or fulvous; lower parts bright orange or rufous; tail black, more or less washed with bright red or deep orange, the hairs reddish brown banded with black and tipped more or less broadly with rufous.

Mr. Allen, in his monograph, regards this Squirrel as a "variety" or geographical race of the next species, differing in its uniformly larger size and strikingly in the coloration of its tail. In a subsequent letter to me, he says:—"It would perhaps be just as well to recognize it as entitled to specific rank, although I still feel sure of their intergradation." That such connecting links may yet be found seems very probable; but I have not been able to find such in the very large series which I have examined, and am consequently compelled to keep them provisionally distinct.

Unfortunately Mr. Allen has identified this species with Pucheran's *S. rufo-niger*, which, as will be seen presently, is a much smaller and quite distinct species¹. Dr. Peters described it only as a variety of *S. æstuans*; and though specimens in the Berlin Museum are labelled "*Sciurus hoffmanni*," the name remains a manuscript one. Of Gray's three titles I have adopted *griseogenus* (more correctly *griseogenys*) as being simultaneous in date with the others, and as indicating the typical form. His *S. hyporrhodus* is founded on an example from Santa Fé de Bogotà, and is characterized by its long soft fur and hairy ears, peculiarities easily explained when we remember that that city stands at an elevation of over 8800 feet, and is overlooked by lofty mountains. *Macroxus xanthotus* is undoubtedly an immature animal, as is proved by the dentition of the type specimen. By some curious error Gray's account of this last has been printed after that of *M. brunneo-niger*, instead of after *M. griseogenus*; so that the remark, "very like the former" &c., naturally led Mr. Allen to refer the synonym to *S. gerrardi*.

S. griseogenys varies very little in colour: in some examples the

¹ Cf. *infra*, p. 669.

middle of the back is considerably darker than the flanks; and there is some variety in the exact tint of the red wash on the tail. I can confirm Mr. Allen's statement that this species (as well as *S. variabilis* and *S. æstuans*) have normally only one upper premolar. Dr. Peters states, it is true, that the type of his "var. *hoffmanni*" had two; but the first was minute and only attached to the gum; and I have not been able to find more than one, either in dried skulls or in spirit-specimens.

IX. SCIURUS ÆSTUANS.

Sciurus æstuans, Linnæus, Syst. Nat. i. p. 88 (1766).

Myoxus guerlingus, Shaw, Gen. Zool. ii. p. 171, pl. clvi. (1801).

Sciurus gilvigularis, Natterer ap. Wagner, Abh. Bayer. Ak. v. p. 283 (1850).

**Macroxus leucogaster*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 430 (1867, nec F. Cuv.).

**Macroxus irroratus*, Gray, tom. cit. p. 431.

**Macroxus flaviventris*, Castelnau ap. Gray, tom. cit. p. 432.

(*Sciurus æstuans*, var. *æstuans*, Allen, Mon. N.-Am. Rodent. p. 756, 1877).

Hab. Guiana; Brazil; Eastern Peru; Bolivia.

Average length about 7.25 inches, of tail-vertebræ 7 inches. One upper premolar. Upper parts olive, rather lighter and more fulvous than in the last species; lower parts fulvous, greyish, or white; tail black, more or less washed with pale fulvous, the hairs pale brown, banded with black and tipped with pale faded yellow.

I have little to add to Mr. Allen's critical notes on this well-known Squirrel. Gray states, in his description of his *M. leucogaster* (not to be confounded with F. Cuvier's species of that name¹), that the hairs of the lower parts are "white to the base;" this is not the case, though the dusky colour at the roots is little developed on the chest. *M. irroratus* must also be placed here, although the original description is such that Mr. Allen unhesitatingly referred it to the last species; and *M. flaviventer* is to me quite undistinguishable from the ordinary type of *S. æstuans*. *S. pusillus*, Geoffr., and *Macrotus kuhlii*, Gr., are considered by Mr. Allen to be the young of the present species; but I believe them to be quite distinct².

X. SCIURUS DEPPEI.

**Sciurus deppei*, Peters, Monatsb. Ak. Berl. 1863, p. 654.

**Macroxus tephrogaster*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 431.

**Macroxus tæniurus*, Gray, loc. cit.

**Macroxus medellinensis*, Gray, op. cit. ser. 4, x. p. 408 (1872).

(*Sciurus tephrogaster*, Allen, Mon. N.-Am. Rodent. p. 763 (1877)).

Hab. Mexico; Honduras; Guatemala; Columbia.

Average length nearly 9 inches, of tail-vertebræ 7.25 inches. Two upper premolars. Upper parts dark olive, often darker along the

¹ Cf. *antèa*, p. 660.

² Cf. *infra*, p. 670.

middle of the back; lower parts white, greyish white, or light fulvous; tail black, lightly washed with white, the hairs fulvous, with black bands and short pure white tips.

Mr. Allen was led to admit the specific validity of this Squirrel, on finding that it differed from the last two in having normally two well-developed upper premolars; and the specimens which I have been able to examine confirm his observation. He failed, however, to recognize this species in Dr. Peters's description of his *S. deppei*, which he doubtfully referred to the southern form of *S. carolinensis*¹. An examination of the types of *S. deppei*, *M. tephrogaster*, *M. tæniurus* and *M. medellinensis* convinces me that they are all strictly synonymous, the species presenting but little variation in coloration. In *S. deppei* and *M. tæniurus* the lower parts are washed with fulvous; in *M. tephrogaster* they are greyish white; while the types of *M. medellinensis* are smaller and have the middle of the back nearly black, exactly as in many specimens of *S. griseogenys*. Intermediate examples occur; and the whole range of variation between the extremes is comparatively trifling.

As already observed², *M. fraseri*, Gr., was so insufficiently described that Mr. Allen was led to identify it with the present species, which is about half its size and totally different in coloration.

XI. SCIURUS RUFO-NIGER. CHRYSOSURUS.

**Sciurus rufo-niger*, Pucheran, Rev. de Zool. 1845, p. 336 (see Gray)

**Sciurus chryosurus*, Pucheran, tom. cit. p. 337.

**Macroxus tephrogaster minor*, Gray, MS. (Mus. Brit.).

Hab. Columbia; Panama; Veragua.

Average length about 5.50 inches, of tail-vertebræ 3.75 inches. Two upper premolars. Upper parts dark olive, the hairs very minutely tipped with fulvous; breast bright rufous, rest of lower parts like the upper, but paler; tail nearly uniform with the back, the hairs reddish fulvous, barred with black and minutely tipped with pale yellow or white.

On examining the type of Pucheran's *S. rufo-niger* in the Paris Museum, I found that it was not identical with *S. griseogenys*, as Mr. Allen supposed, but rather allied to *S. deppei*; and I soon recognized in it a small Squirrel of which I had seen several specimens from Panama, and which I had begun to fear would require a new name. These examples prove to agree further with *S. deppei* in having two upper premolars, but differ in being more than one third smaller, in the colour of the lower parts (which are only paler than the upper, save on the breast), and in the tail being nearly uniform in colour with the back (the hairs having only very minute white or yellow tips). Specimens in the British Museum are labelled *M. tephrogaster minor*; but I cannot doubt the distinctness of the form. The type of *S. rufoniger* has the middle of the back nearly black; while that of *M. chryosurus* appears to be a variety, merely differing in the tail being more rufous.

¹ *Tom. cit.* p. 710.

² *Cf. antea*, p. 665.

XII. *SCIURUS PUSILLUS*. (Plate XLI.)

Sciurus pusillus, Geoffroy apud Desmarest, Mamm. p. 337, pl. lxxvii. fig. 2 (1820).

**Macroxus kuhlii*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. p. 433 (1867).

Hab. Guiana; Brazil.

Length about 4.50 inches, of tail-vertebræ 3 inches. Two upper premolars. Upper parts greyish olive, the hairs dusky, very minutely tipped with pale fulvous; lower parts only slightly paler; tail black, washed with whitish or pale yellow.

I was not able to ascertain the type of Geoffroy's *S. pusillus* in the Paris Museum; but there can hardly be a doubt of its identity with specimens standing under that name in the British museum, and with the types of Gray's *Macroxus kuhlii*. All these are supposed by Mr. Allen to be merely very young individuals of *S. æstuans*¹, in spite of Buffon's observations on the development of the reproductive organs in the type of *S. pusillus*². The British-Museum specimens, however, agree in size with Buffon's and Desmarest's descriptions, and are ~~not~~ quite adult, as shown by their skulls and teeth; moreover the two specimens examined differ from *S. æstuans* in the possession of two upper premolars. Their very small size and the nearly uniform greyish olive of both their upper and lower parts prevent their being confounded with any other species known to me. The type of *M. kuhlii*, collected in Brazil by Castelnau, merely differs in having a white spot at the root of each ear, and in the extreme tips of the hairs of the tail being white instead of pale fulvous. See p. 95

2. On a third Collection of Birds made by the Rev. G. Brown, C.M.Z.S., in the Duke-of-York Group of Islands and its vicinity. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 11, 1878.]

(Plate XLII.)

I have now the pleasure of submitting to the Society a third³ collection of birds made by our Corresponding Member the Rev. J. Brown, in the group of islands known generally as the Duke-of-York Islands, and on the adjacent islands of New Britain and New Ireland.

The collection was forwarded from Port Hunter, the missionary station in the Duke-of-York group, on the 24th of February last by a small trading-steamer bound for Hongkong. It contains a series

¹ *Tom. cit.* p. 759.

² *Hist. Nat. Suppl.* vii. p. 264.

³ For notices of two previous collections, see *P. Z. S.* 1877, p. 96, and 1878, p. 289.

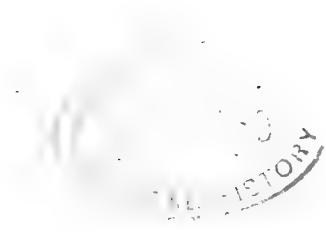


1
15

J. Gould del.

H. Hart sculp.

CARPOPHAGA MELANOCHROA



of birds obtained while coasting along in a boat amongst the islands of the group. In a letter of the same date Mr. Brown states that he was hoping to be able shortly to spend a week at Spacious Bay or some other place in New Britain, where he would be able to make a more extensive collection.

The present collection contains thirty-five skins referable to thirty species. The exact localities being marked in every case, I think it advisable to give a perfect list of the species. "Duke-of-York group" means one of the group of twelve islands which form together the land marked in our chart "Duke-of-York Island"¹.

		See P. Z. S.	Locality.	Date.
1.	<i>Cisticola ruficeps</i> ...	1877, p. 98	Duke-of-York group.	1, '78
2.	<i>Sauloprocta melaleuca</i>	" 99	" "	11, '77
3.	<i>Rhipidura setosa</i> ...	" 99	" "	
4.	<i>Monarcha verticalis</i>	" 99	" "	
5.	— <i>chrysomelas</i>	" 100	New Ireland.	
6.	— <i>alecto</i>	" 100	Duke-of-York group.	
7.	— <i>inornatus</i> .....	.....	" "
8.	<i>Artamus insignis</i>	" 101	Spacious Bay, N. B.	1, '78
9.	<i>Edoliosoma</i> , sp. inc. (♀).....	" 101	New Ireland.	11, '77
10.	<i>Lalage karu</i>	" 101	Duke-of-York group.	
11.	<i>Dicranostreptus megarhynchus</i> ...	" 101	New Ireland.	
12.	<i>Gracula krefftii</i>	" 104	Duke-of-York group.	
13.	<i>Alcedo moluccensis</i>	" 105	" "	11, '77
14.	<i>Halcyon albicilla</i>	" 105	" "	
15.	<i>Buceros ruficollis</i> .....	.....	Spacious Bay, N.B.	
16.	<i>Eurystomus crassirostris</i>	" 106	Duke-of-York group.	10, '77
17.	<i>Centropus ateralbus</i>	" 106	New Ireland.	
18.	<i>Cacomantis insperatus</i>	" 106	Duke-of-York group.	
19.	<i>Eudynamis pictus</i>	" 106	" "	
20.	<i>Geoffroiis heteroclitus</i>.....	.....	New Ireland.	
21.	— <i>cyaniceps</i>	" 106	New Britain.	
22.	<i>Trichoglossus subplacens</i>	" 108	Duke-of-York group.	10, '77
23.	<i>Carpophaga rubricera</i>	" 109	" "	
24.	— <i>vanwycki</i>	" 109	" "	
25.	— <i>melanochoa</i> , sp. nov.....	.....	" "
26.	<i>Edirhinus insolitus</i>	" 110	" "	10, '77
27.	<i>Macropygia browni</i>	" 110	" "	
28.	<i>Chalcophaps stephani</i>	" 111	" "	
29.	<i>Nycticorax caledonicus</i>.....	.....	" "
30.	<i>Megapodius eremita</i>	" 113	New Ireland.	

I now give some notes on the species new to the locality, or on which I have additional information to offer.

4. *MONARCHA VERTICALIS*, ScL. P. Z. S. 1877, p. 99, pl. xiv. fig. 1.

A second specimen of this interesting species has an oblong white spot at the extremity of the outer rectrix on both sides.

¹ Cf. footnote, P. Z. S. 1877, p. 98.

7. *MONARCHA INORNATUS* (Garnot); *Sci. P. Z. S.* 1877, p. 552.

This bird has not occurred in the former collections of Mr. Brown, but is a well-known and rather widely extended Papuan species.

15. *BUCEROS RUFICOLLIS*, Vieill.; *Temm. Pl. Col.* 577; *Sci. P. Z. S.* 1869, p. 122.

Apparently an adult female of this Hornbill from Spacious Bay, New Britain.

20. *GEOFFROIUS HETEROCLITUS*.

Psittacus heteroclitus, Hombr. et Jacq. *Ann. Sc. Nat.* xvi. p. 319.

Pionus heteroclitus, id. *Voy. au P. S. Atl.* t. 25 bis (♂).

Pione heteroclitus, Puch. *ibid. Zool.* iii. p. 103.

A fine male of this species from New Ireland agrees with the original figure and description of that sex. One of the Solomon-Islands skins referred to, *P. Z. S.* 1869, p. 122, appears to be the female of this species, the other to belong to the next.

21. *GEOFFROIUS CYANICEPS*, Pucheran.

A skin from New Britain marked "male," which has had the wings cut away, and has apparently been in a cage, is probably of the same species as that previously referred (*P. Z. S.* 1877, p. 107) to *Geoffroius cyaniceps*. This is decidedly smaller than *G. heteroclitus*, and has the top of the head of a pale greenish grey with the sides yellowish.

Dr. Salvadori, who examined the specimen in the previous collection of Mr. Brown, remarks that it comes very near the female of *G. simplex*, Müller. A better series of this bird is necessary before it can be made out decidedly.

25. *CARPOPHAGA MELANOCHROA*, sp. nov. (Plate XLII.)

Nigricanti-ardesiaca fere unicolor, alis cauda et dorso inferiore in plumbeum transeuntibus; alarum tectricibus omnibus marginibus angustissimis albis præditis; subalaribus et crisso castaneo tinctis; rostro nigro; pedibus purpureo-rubris.

Long. tota 15·5, alæ 9·5, caudæ rectr. med. 6·0, ext. 5·5.

Hab. Ins. Duke of York.

This fine Fruit-pigeon is quite new to me, and, I believe, undescribed, though I am not acquainted with *C. pistrinaria*, Bp.¹, of the Solomon Islands, to the neighbourhood of which it would appear to belong.

Mr. Brown's single specimen is marked "male; eyes bright scarlet; legs purple." As will be seen from the measurements, the tail is slightly rounded; there are fourteen rectrices, as is always, I believe, the case in *Carpophaga*. The under-surface of the tail is rather ashy white, that of the wings greyish black.

The uniform dark colour, varied only by the very narrow margins of the wing-coverts, will render this species easily recognizable.

¹ *Consp. Av.* ii. p. 36.



Fig 1

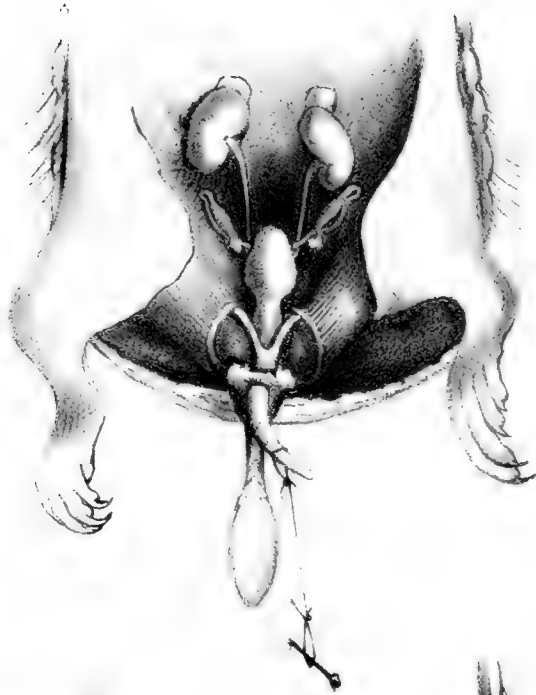


Fig 4

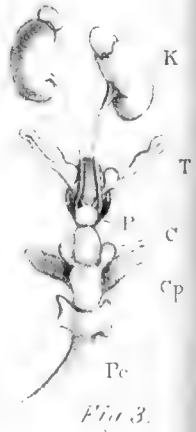


Fig 3

Fig 2

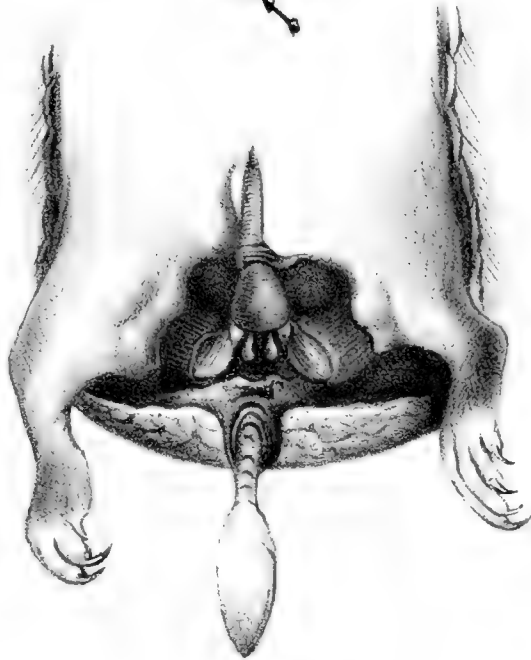
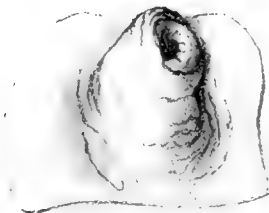


Fig 5



27. MACROPYGGIA BROWNI, Scl. P. Z. S. 1877, p. 110.

I am glad to receive a second example of this fine species from the Duke-of-York group.

Dr. Salvadori writes me that he suspects that *Turacæna crassirostris*, Gould (P. Z. S. 1856, p. 136), may be the young of *Macropygia browni*. I have examined Mr. Gould's typical specimen of the former species now in the British Museum; but although I believe it is, no doubt, the young of an allied species of *Macropygia*, I do not think it can belong to *M. browni*, as it is so much smaller in size.

29. NYCTOCORAX CALEDONICUS (Gm.); Gould, Handb. B. Austr. ii. p. 311.

An adult of this Night-Heron from the Duke-of-York group is marked:—"Irides yellow; legs dusky reddish pink; bare space about eyes lavender.—G. B."

30. MEGAPODIUS EREMITA.

Megapodius eremita, Hartl. P. Z. S. 1867, p. 830.

M. hueskeri, Cab. et Reich. J. f. O. 1876, p. 326; Scl. P. Z. S. 1877, p. 113.

M. rubrifrons, Scl. P. Z. S. 1877, p. 556.

Prof. Salvadori has recently examined the typical specimens of *M. eremita* from the Echiquier Islands, *M. hueskeri* from New Hanover, and *M. rubrifrons* from Admiralty Island, and pronounces them to be identical.

3. On the Male Generative Organs of *Chlamydophorus truncatus* and *Dasypus sexcinctus*. By M. WATSON, M.D., Professor of Anatomy, Owens College, Manchester.

[Received June 11, 1878.]

(Plate XLIII.)

1. CHLAMYDOPHORUS TRUNCATUS.

The anatomy of *Chlamydophorus truncatus* has formed the subject of elaborate monographs by Hyrtl¹, Macalister², and others³; and little remains to be said regarding such parts of the animal as have been fully investigated by these anatomists. On looking over their essays, however, I find that, with regard to the male generative organs, we possess almost no reliable information. Professor Hyrtl's specimen was a female; and although that anatomized by Professor Macalister was of the opposite sex, his reference to the male organs is sufficiently meagre to justify me in giving a detailed description of these from two male specimens of this rare mammal which have lately come into my hands.

¹ Denkschriften der kais. Akad. Wien, ix. 1855.

² Trans. Roy. Irish Acad. 1875, p. 219.

³ Harlan, Lond. Zool. Journ. 1825; Atkinson, Journ. of Anatomy, vol. v.

The specimen measured $4\frac{1}{2}$ inches in length, exclusive of the tail.

Penis.—The penis is large for the size of the animal, and, so far as one can judge from the examination of specimens preserved in alcohol, appears, in the natural condition, to be strongly curved, the convexity of the curve being directed forward, whilst the extremity of the penis is directed downward and backward toward the anus. The organ is slender, and tapers gradually from base to apex, measuring $\frac{5}{8}$ of an inch in length and $\frac{1}{16}$ of an inch in diameter. The base is surrounded by a small prepuce consisting of little more than a narrow ring of integument, and is entirely destitute of a frenum præputii. The presence of two powerful retractores penis, however, justifies us in concluding that in the *Chlamydochorus*, as in *Dasyypus sexcinctus*, the penis is, in the flaccid condition, retracted within this apparently rudimentary prepuce. The intermediate portion of the penis presents an appearance of irregularly disposed circular constrictions, apparently due to the annulated character of the integument, and corresponding exactly to that described below in the six-banded Armadillo. The glans penis is not distinguishable as a separate portion from the rest of the organ; and the absence of it, together with that of the bulb, would appear to indicate that a corpus spongiosum is altogether wanting, as it apparently is in the Armadillo, the penis in that animal being formed exclusively by the two corpora cavernosa. I could not distinguish any patch of transverse ridges on the ventral aspect of the organ, such as is seen in that of *Dasyypus sexcinctus*; but the small size of the parts, combined with their immersion in alcohol, may have obliterated these (under any circumstances) very minute elevations.

Internal Organs.

Kidney.—The kidneys are large in comparison with the size of the animal, and are situated in the lumbar region. Each is almost globular in form, measuring $\frac{3}{8}$ of an inch in length and $\frac{2}{8}$ in breadth, and is surmounted by a suprarenal capsule of large size and pyramidal form. The ureter measures $\frac{9}{16}$ of an inch in length, and enters the bladder close to the orifice of the urethra, being crossed on its inner side from before backward by the corresponding vas deferens.

Bladder.—The bladder, globular in form, small, and provided with walls of considerable thickness, lies altogether in front of the transverse ligament which unites the two pubic bones together, and which corresponds in position to the pubic portion of the brim of the pelvis in the majority of mammals. The viscus is partly invested by peritoneum, which forms a well-marked inferior ligament attaching it to the middle line of the anterior abdominal wall. In the specimen examined the bladder was contracted, and measured $\frac{1}{4}$ of an inch in length and the same in greatest breadth. The urethral orifice is on a level with the base of the viscus.

Urethra.—The urethra is divisible into two portions—an intrapelvic or muscular, and an extrapelvic or spongy portion. The intrapelvic portion, from the neck of the bladder to the point of entrance of the Cowperian ducts, measures $\frac{3}{8}$ of an inch in length. Its

walls are thick, being surrounded by a layer of circularly disposed muscular fibres. Resting upon the upper surface of the proximal half of this portion of the urethra is the prostate gland, the posterior border of which is attached to the tube. On slitting open the canal, no trace of a vesicula prostatica could be distinguished; but it is well to bear in mind that the small size of the parts, together with the immersion of these for some time in alcohol, may have served to prevent the recognition of what, under any circumstances, must be a very minute organ. Professor Macalister¹ refers to the presence of a Weberian organ, of which, however, he gives no description, merely stating that it is "long, and not distinctly bifid;" but inasmuch as he makes no mention of a prostate gland, it appears to me to be not improbable that he may have mistaken that gland for the organ in question, an error which need occasion no surprise when the small size of the parts is taken into consideration. If the Weberian organ be present, it certainly does not project beyond the wall of the urethra. The extrapelvic or spongy portion of the urethra lies within the penis and measures $\frac{7}{8}$ of an inch in length. At its commencement it receives the ducts of Cowper's glands, whilst at its termination it opens upon the summit of the rounded extremity of the penis.

Testicles and vasa deferentia.—Professor Macalister² states that the testicles lie within the "wide abdominal ends of the inguinal canals;" but this was certainly not the case in my specimen. In it the testicles were situated immediately posterior to the kidneys, and in close relation to the superior abdominal wall, to which each was closely attached through the reflection of the peritoneum. The testicle of the right side was posterior in position to that of the left. The gland itself was of the same size and form as a canary-seed, and, together with the epididymis, measured $\frac{1}{4}$ of an inch in length. The latter was of large size as compared with the testicle, to the outer side of which it was attached at both its anterior and posterior extremities. The anterior extremity, or globus major, is continuous with the testicle, the separation between them being indicated by a slight constriction. From this it passes forward for $\frac{1}{16}$ of an inch, and, suddenly curving upon itself, turns backward to the same extent, and becomes constricted to form the body of the epididymis. The latter extends along the outer side of the testicle as far as its posterior extremity, where it again expands into a glandular mass, or globus minor, which, however, is of larger size than both limbs together of the globus major. From this body the vas deferens passes off. The entire testicular mass is placed obliquely, its anterior extremity being directed obliquely forward and outward, the posterior, which is in contact with the lateral aspect of the apex of the bladder, in the opposite direction. The vas deferens measures $\frac{1}{8}$ of an inch in length, and crosses the ureter in its course backward. The two vasa at their termination are almost in contact, and disappear from view by sinking into the anterior border of the prostate gland, the substance of which they traverse in their course to the

¹ *Loc. cit.*² *Loc. cit.*

urethra. As Professor Macalister observes, the vasa are not convoluted, neither do they present any trace of lateral diverticula or vesiculæ seminales.

Prostate gland is well developed, and forms a quadrilateral mass of lobulated glandular tissue lying upon the upper surface of the intrapelvic urethra. It measures $\frac{1}{3}$ of an inch in length, and the same in breadth, and is attached by its posterior border to the urethra, its anterior border, which is free, extending between the vesical openings of the ureters. The vasa deferentia sink into the latter in their course to the urethra. Prof. Macalister does not refer to this gland.

Cowper's glands.—These, which are not mentioned by Macalister, are two in number. Each lies in close relation to, and slightly under cover of, the inner side of the crus penis. They are regularly pyriform; and each measures $\frac{1}{6}$ of an inch in length. Their ducts pass forward, and open at once into the commencement of the spongy portion of the urethra.

Penis.—The penis is formed by the junction of the two crura exclusively, the third element or corpus spongiosum being entirely absent. The crus penis of each side is attached to the ramus of the ischium, as well as to the posterior half of the free border of the pubic bone, the latter bone not uniting with its fellow of the opposite side. Each measures $\frac{1}{2}$ an inch in length, and lies along the inner side of the adductor muscle of the thigh. The two crura unite opposite the anterior border of the pubic bones, and together form, as it were, a bridge, underneath which the rectum passes backward to the anus. In consequence of the absence of a corpus spongiosum, the penis is devoid of both bulb and glans. The penis itself measures $\frac{7}{8}$ of an inch in length, of which the basal $\frac{2}{3}$ are concealed by the integument, the remainder being free.

Muscles of penis.—Of these there are three on each side of the middle line:—(1) The *ischio-cavernosus* is strong and covers the crus. Its fibres are attached posteriorly to the ischium, whilst anteriorly they are inserted into the crus behind the junction of the latter with its fellow. A small portion of the crus between this and the next muscle is uncovered by muscular fibres. (2) *Bulbo-cavernosi*. These two muscles are apparently continuous across the middle line, and together form an investment of transversely arranged muscular fibres which covers the lower surface of the basal portion of the penis. No median raphé could be distinguished between them. (3) *Retractoress penis*. These are placed on the dorsal aspect of the organ. Each is a delicate ribbon-like muscle which, arising from the upper wall of the pelvic cavity, crosses the outer side of the depressor caudæ muscle, and passing down parallel to the crus penis, and along the dorsal aspect of that organ, is inserted into the corpus cavernosum immediately behind the tip of the penis. These muscles doubtless act in the same manner as in *Dasyptus*, and serve to retract the penis within the rudimentary prepuce. Beyond the statement that the crus penis is invested by muscular fibres, Prof. Macalister gives no account of the muscles just described.

2. DASYPUS SEXCINCTUS.

If now we compare the male organs of *Chlamydophorus* with those of *Dasypus sexcinctus*, we shall find that the resemblance between them is very striking. A full description of the male organs of *D. sexcinctus* after that already given of those of *Chlamydophorus truncatus* would be superfluous, seeing that the one would to a large extent be a mere repetition of the other; and I shall therefore confine myself to the indication of some points of interest in the anatomy of *Dasypus* which appear to have been overlooked¹. The penis is enormous, and in a specimen measuring 13 inches in length, exclusive of the tail, is 4 inches long. It closely resembles that of *Chlamydophorus* in form, its extremity being simple and not bifid as in the allied genus *Tatusia*. The integumental covering of the penis is annulated in character, the annulation extending from the base to the extremity of the organ on its dorsal or abdominal aspect, but interrupted on its lower surface toward the tip of the organ by a cutaneous patch presenting an altogether different appearance. This patch, which is situated immediately behind the extremity of the penis, is oval in form, and measures $1\frac{1}{4}$ inch in length. Its surface is characterized by the presence of numerous closely placed transverse ridges of a hard and corneous nature. These ridges give to the patch somewhat of the appearance of a fine file, and, in the absence of a distinct glans, in all probability fulfil the function of the recurved spines so frequently seen on the latter in many mammals. The prepuce is very small, and, when the penis is fully extended, disappears entirely, being stretched so as to form the cutaneous covering of the latter. In the flaccid condition, however, and when the organ is retracted, the penis is withdrawn entirely within the prepuce and almost concealed from view. Improbable as it may appear that an organ of the length of the penis can be really retracted within so small a prepuce, I am in a position to know that such is the case, having examined two specimens, in one of which the penis was exerted, as in fig. 4, whilst in the other it occupied the position shown in fig. 5. The retraction is accomplished by two retractor muscles, which, arising from the lower surface and outer border of the sacrum, pass forward along the whole length of the dorsum penis even to the tip, fibres being inserted into every part of that surface. These muscles, which exactly repeat those of *Chlamydophorus*, when contracting, have the effect of throwing the penis into a series of spiral curves, its extremity being bent inwards, as shown in fig. 5, so as to complete the concealment of the organ under its sheath. That these muscles are really the agents in producing this retraction is proved by the fact that the *concavity* of the terminal curve of the penis is formed by the *dorsal* aspect of the organ, on which these muscles are placed, whilst the *convexity* of the curve is formed by its *ventral* surface which is readily distinguished by the presence of the file-like patch already referred to. The penis is formed, as in *Chlamydophorus*,

¹ I have been unable to consult Prof. Alexandrini's monograph of *Dasypus*, in Mem. Accad. d. Sci. Bologna, tom. vii. 1856.

by the junction of the two crura alone, and possesses neither bulb nor glans. With regard to the other muscles of the penis, these closely resemble those already described in *Chlamydophorus*, with this difference, that the single mass formed by the bulbo-cavernosi muscles in the latter are here represented by two distinct and powerful fleshy bands which envelop the under surface of each crus previous to its junction with its fellow. The testicle differs in position in *Dasypus* from that which it occupies in *Chlamydophorus*, being attached to the inguinal region of the anterior abdominal wall in the former, whilst in the latter it lies behind the kidney. The globus major in *Dasypus* is closely applied to the anterior extremity of the testicle, and does not form the loop-like arrangement seen in *Chlamydophorus*. The vasa deferentia in both are non-convoluted; nor is there any trace of vesiculæ seminales in either. In both, a prostate and Cowper's glands are present, the former being traversed by the vasa deferentia in their course to the urethra, whilst the latter, although occupying the same position, are relatively considerably smaller in *Dasypus* than in *Chlamydophorus*. The bladder and urethra are similar in both genera, the only difference being that the walls of the intrapelvic portion of the latter are much more muscular in *Chlamydophorus* than in *Dasypus*, and that in the latter a well-marked caput gallinaginis, of a pyramidal form, is present, which is not represented in the former. In neither is there any trace of a vesicula prostatica.

It will thus be seen that in respect of the male sexual organs the resemblance between *Chlamydophorus* and *Dasypus sexcinctus* is very striking—a resemblance which, in respect of other organs, has been already pointed out by Prof Garrod¹. As shown by that anatomist, *Chlamydophorus* agrees also with *Tolypeutes* and *Xenurus* in the absence of vesiculæ seminales and the simple condition of the glans penis, in both of which respects it differs from *Tatusia*. The presence of Cowper's glands constitutes a further element of agreement between *Chlamydophorus* on the one hand, and *Dasypus* and *Xenurus* on the other. These glands are also present, according to Dr. Murie², in *Tolypeutes*; but whether in *Tatusia* I cannot say, as with regard to the latter we possess no precise information. So far, then, as the observations above recorded go, they tend to strengthen the conclusions already arrived at by Mr. Garrod upon other grounds with regard to the close relationship which exists between *Chlamydophorus* and *Dasypus*. Professor Macalister, as the result of his elaborate investigation into the muscular anatomy of the Edentata, arrives at the conclusion that “the position of *Chlamydophorus* will be seen to be plainly among the Dasypodidæ, and very close to *Tatusia*.” The arrangement, however, of the sexual organs, including the nipples, together with that of the alimentary canal, which in *Dasypus* and *Chlamydophorus* is provided with two colic cæca, these last being absent in the other genera above referred to³, appear rather to point to a closer relationship between *Chla-*

¹ P. Z. S. 1878, p. 222.

² Trans. Linn. Soc. vol. xxx.

³ See Prof. Garrod's paper.

mydophorus and *Dasypus* than between *Chlamydophorus* and *Tatusia*.

I am indebted to Dr. Young for the preparation of the accompanying illustrations.

EXPLANATION OF PLATE XLIII.

- Fig. 1. Male generative and urinary organs of *Chlamydophorus truncatus*, seen from the front. From above downwards are seen the suprarenal capsules, the kidneys and ureters, the testicles, the bladder and urethra, and the penis. The penis is hooked back to show the retractor muscles on its dorsal aspect.
2. Male organs of *Chlamydophorus truncatus*, perineal view. From above downwards are seen:—the penis, its basal portion being covered by the fibres of the bulbo-cavernosi muscles; below this the Cowperian glands lying in the interspace between the crura penis, these last being covered by the fibres of the ischio-cavernosi muscles.
3. Male organs of *Chlamydophorus* dissected, and seen from behind. K, kidney and suprarenal capsule; T, testicle; P, prostate gland; C, Cowper's gland; Pe, penis; C p, crus penis.
4. Penis of *Dasypus sexcinctus*, showing the file-like structure on the lower aspect of its extremity.
5. Penis of *Dasypus sexcinctus* retracted within the prepuce.

4. Note on Points in the Anatomy of Levaillant's Darter (*Plotus levaillanti*). By A. H. GARROD, M.A., F.R.S.

[Received June 14, 1878.]

In a former communication¹ I had the opportunity of bringing before the Society several facts with reference to the anatomy of *Plotus anhinga*, and of confirming Mr. Macgillivray's account of its most peculiar proventriculus. Several specimens of the species have since passed through my hands which differ in no way from that first described.

On the 9th of March last the Society obtained for the first time, by purchase, a male specimen of Levaillant's Darter (*Plotus levaillanti*) from Senegal. It unfortunately died on the 7th of this month (May) from peritonitis, the result of a perforating ulcer in the stomach.

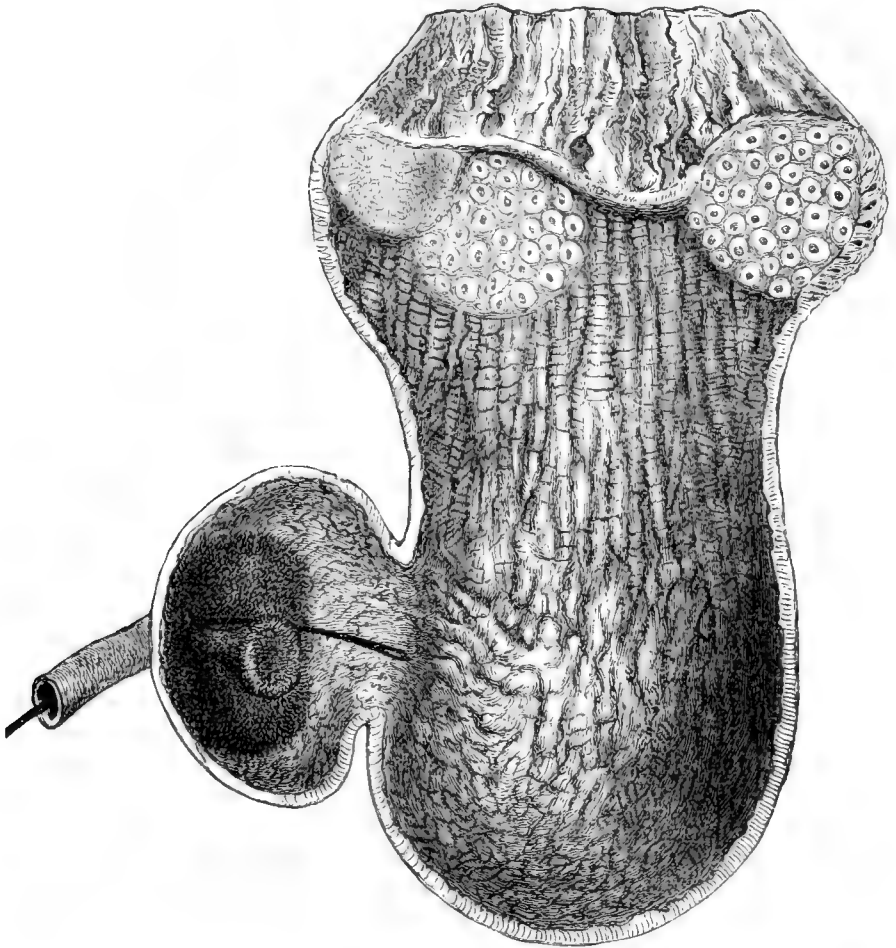
The severity of the peritonitis caused all the abdominal viscera to be agglutinated into a single mass, and rendered them particularly soft. Nevertheless I was able to disentangle most of the alimentary canal for examination; and it has proved of more than ordinary interest, as the following description will serve to show.

The tongue, as a free organ, is obsolete. The œsophagus is capacious, without any crop. The œsophageal epithelium ceases abruptly by a transverse line where the gastric portion of the canal commences, below which it is replaced by the tough yellow epithelium so characteristic of the situation.

The proventriculus is composed of two circular areas of deep glands, which latter are of considerable size and do not come into con-

¹ P. Z. S. 1876, p. 335.

tact, being situated laterally upon opposite sides of the gullet. These areas are flat, except at their upper margins, where a small transverse ridge is developed, which may be the slight foreshadowing of the special cavity developed in *Plotus anhinga* for the reception of the secretion of the gastric glands. But in *P. levillanti* it is to be noticed that there are two gland-surfaces, whilst in *P. anhinga* it will be remembered there is but one gland-cavity.



View of the inner surface of the posterior wall of the stomach of *Plotus levillanti*, with the œsophagus slit up anteriorly so as to show the whole of its proventricular surface, with the two gland-areas and the U-shaped elevation on its anterior wall (on the left of the figure), as well as the pyloric infundibuliform plug.

The calibre of the œsophagus must be somewhat diminished by the presence of a curious U-shaped ridge upon the mucous membrane of its anterior wall, which is situated between the antero-lateral margins of the gland-areas, and has a small pit in the part

corresponding to the surface between the limbs of the U, apparently not glandular in nature. All these structures are covered with the tough gastric epithelium, which ceases just above them.

The first true gastric cavity is larger than the second, though not much so. In the second the peculiar hairy covering of its pyloric portion is largely developed, and in a different manner from what it is in *P. anhinga*, where, as I have shown in my paper on the anatomy of that bird, it forms a kind of sieve to prevent large solid particles from entering the duodenum. In *P. levaillanti* a more elaborate arrangement obtains; the hairy epithelium surrounding the pyloric orifice, near the lower margin of the gastric surface of which it is developed, is produced into a considerable conical hair-covered process, projecting into the second stomach, and evidently acting as a valve to close the pylorus when necessary. In general appearance it much resembles the operculum of the Cheilostomatous Polyzoa, and is very striking at first sight, the hirsute conical plug when retracted, fitting exactly into the equally hirsute conical pyloric end of the second stomach-cavity. All the rest of the second stomach is lined with a non-hirsute epithelium, which ceases abruptly where it meets the hairy surface. I can find no trace of this operculum in *Plotus anhinga*, upon re-examination.

The small intestine measured two feet, and the large three inches; but they may have been contracted by the inflammation of their surfaces. Two minute cæca were clearly seen, one a little larger than the other. In *P. anhinga* there is no indication of a second cæcum.

As in *P. anhinga*, *P. levaillanti* possesses but one carotid artery, the left. In their myology the two species agree in every respect, as far as I can see. In *P. levaillanti* the ambiens is large, grooving the patella, the femoro-caudal is present without an accessorius, as is the semitendinosus. There is a slip from the biceps of the arm, which traverses the patagium; and the temporal muscles run back beyond the skull, being separated by a median fibrous raphé, which is *not* ossified into a separate bony style. The great pectoral muscle is formed of two layers.

Donitz's bridge is ossified, as in the specimen described by the author after whom it is named: it is developed on the ninth, and not on the eighth cervical vertebra, as I predicted would be the case.

The lower larynx is indistinguishable from that of *P. anhinga*.

It is interesting to notice that the Manatee and Dugong have special gastric gland-structures, the method of arrangement of which differs in exactly the same way as does that of the two species of *Plotus* under consideration, the peculiar flat gland-area found in *Halicore* and *Plotus levaillanti* being converted into a glandular cavity in *Manatus* and *Plotus anhinga*.

5. On the Gravid Uterus and Placenta of *Hyomoschus aquaticus*. By Professors A. H. GARROD, M.A., F.R.S., and WILLIAM TURNER, M.B., F.R.S.

[Received June 11, 1878.]

(Plate XLIV.)

An adult female of *Hyomoschus aquaticus* having come into our hands, it was with no small pleasure that on eviscerating it we found it far advanced in pregnancy; for it enables us to give an account of the placenta, the nature of which has, till now, only been surmised from what is found in *Tragulus*.

In his valuable memoir on the Tragulidæ¹, M. Alphonse Milne-Edwards briefly describes and also figures the fœtus with the placenta of *Tragulus stanleyanus*. He makes no mention of the uterus, of which, in an allied species, John Hunter tells us² that it "soon divides into two horns, which are pretty large and not long, having none of the buttons for the cotyledons."

In his paper on the visceral anatomy of *Hyomoschus aquaticus*³, Prof. Flower describes the female generative organs in the following words:—"The vagina was 5 inches in length; the uterus 3·5 inches to the point of bifurcation, sharply bent back on itself near the upper end, and terminated in a pair of rather short, closely curled cornua."

In our gravid specimen the single hairless fœtus which, from tip of nose to end of tail, measures 8·5 inches, the tail being an inch long, is lodged on the left side.

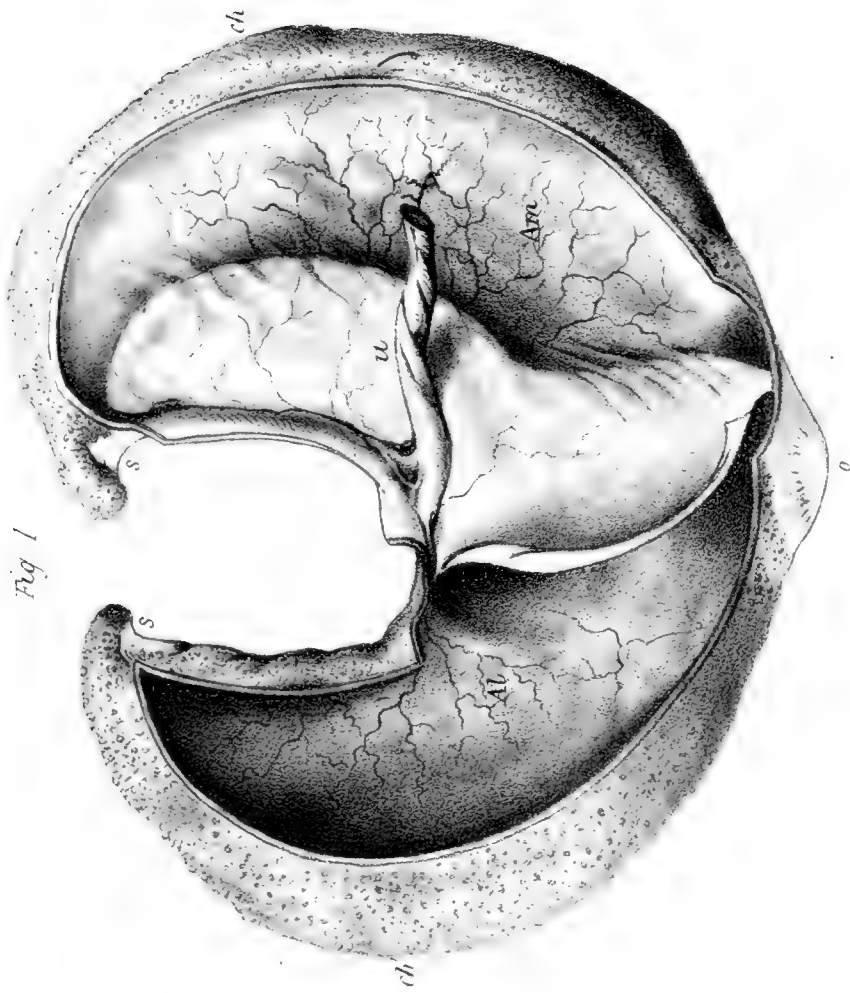
The uterus consists of two horns communicating with a common corpus uteri. The horns are united together in the greater part of their extent, not more than about 1·5 inch of the tip of each horn being free. The line of union is marked externally by a groove, and internally by a broad partition, the septum uteri, which extends longitudinally backwards and terminates in a well-defined semilunar free border, behind which the two horns are fused together into the common corpus uteri. The free ends of the cornua are curled backwards, and together with the Fallopian tubes and ovaries are situated upon the anterior part of the superior wall of the uterus. Owing to the fœtus being developed in the left horn, this cornu is much more dilated than the right; but the latter is considerably more capacious than in the non-gravid uterus. The corpus uteri communicates by a constricted os with a passage which may perhaps be regarded as a cervix, though some might look on it as only the specially modified anterior end of the vagina. This part of the genital passage is $1\frac{3}{4}$ inch long and very much constricted. Its mucous lining is longitudinally folded; and the folds are at intervals so projecting as to give the appearance of transverse constrictions. The passage and the os

¹ Annales des Sciences Naturelles, 5th series, vol. ii. 1864, pp. 49-167.

² 'Essays and Observations,' edited by Prof. Owen, 1861, vol. ii. p. 135.

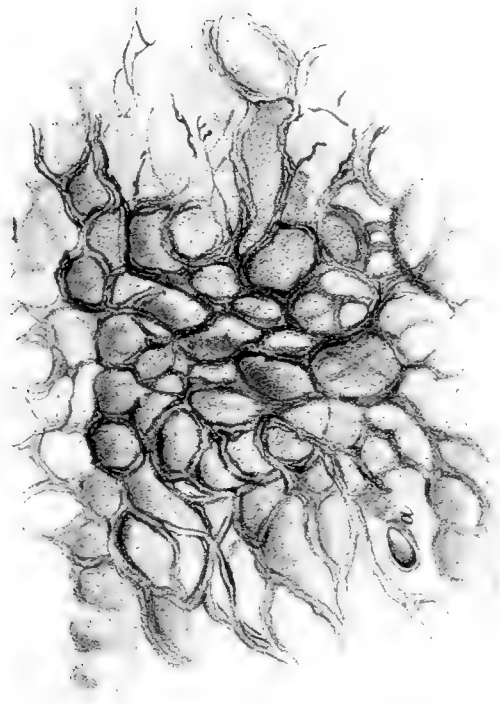
³ P. Z. S. 1867, p. 960.

Fig 1



J. Smit lith

Fig 2



M & N Hamel del.

ANATOMY OF HYOMOSCHIDA



are blocked up by a whitish viscid mucus. Behind the most posterior transverse constriction the vagina undergoes a considerable dilatation, and the mucous lining exhibits faint longitudinal folds.

The uterine walls are slightly thinner than those of the human stomach. The cavity of the two cornua and of the corpus uteri is lined by a well-defined mucous membrane, from which the fœtal chorion can readily be separated. This mucous membrane forms the maternal portion of the diffused placenta characteristic of *Hyomoschus*. The mucosa of both cornua is not elevated into folds, except in close proximity to the openings of the corresponding Fallopian tubes; and the mucous lining of the corpus uteri is longitudinally folded only in proximity to the os uteri. The free surface of the mucous membrane, both in the cornua and corpus and on both surfaces of the septum uteri, is soft and velvety and pitted with multitudes of minute depressions just visible to the naked eye. These depressions are the crypts in which the villi of the chorion are lodged when the chorion is *in situ*. The crypts are distributed with almost equal regularity over the surface of the mucosa in the several divisions of the uterus; but on the more convex part of the impregnated left cornu the mucosa is not quite so thick, so that the crypts are shallower, and over a limited area the free surface of the mucous membrane is almost, if not quite, free from crypts. We did not, however, see any depressed circumscribed smooth areas surrounded by crypts such as one of us has described elsewhere¹ in the Pig and Lemurs, or polygonal areas occupied by crypts and bounded by ridges free from crypts, such as are to be seen in the gravid uterus of the mare. In the regular diffusion of the crypts over the surface of the mucosa, the gravid uterus of *Hyomoschus* much more closely resembled what has been described in *Orca gladiator*² than it did the uterine mucosa of the Pig, Mare, and Lemurs.

We then carefully stripped portions of the mucous membrane off the subjacent muscular coat, and soaked them in glycerine for some days, in order to render the membrane as translucent as possible. When the mucosa thus prepared was examined microscopically, the openings of the uterine glands on the surface of the membrane could be seen. Sometimes these openings were found on the slender raised folds of mucosa separating adjacent crypts from each other; at other times they opened into the crypts, and at other times on smoother portions of the membrane where the crypts were shallower or almost absent; but in no case were the mouths of the glands specially localized in smooth circumscribed areas of the mucosa, as is the case in the Pig and in the Lemurs. The gland-orifices were directed obliquely to the plane of the free surface of the membrane; and it was not uncommon to see an epithelial plug projecting through the mouth.

Additional views of the relation of the glands to the crypts were obtained by making vertical sections through the mucosa. This

¹ Turner, Lectures "On the Comparative Anatomy of the Placenta," Edinburgh, 1876, and Trans. Roy. Soc. London, 1876.

² Turner, Trans. Roy. Soc. Edinburgh, 1871.

membrane consisted of a gland layer and a crypt layer. The gland layer was next the muscular coat, and consisted of elongated tubular glands, somewhat tortuous and occasionally bifurcating. In the vertical sections the glands were cut across so that the tubes were sometimes transversely, at others obliquely, at others longitudinally divided, and here and there the stem of a gland could be seen passing obliquely through the crypt-layer to open on the surface in the manner already described. The glands were lined by a columnar epithelium, and possessed a central lumen. The glands were neither so numerous nor so distinct, neither did they bifurcate so frequently as do the utricular glands in the Pig and the Cetacea.

The crypt layer contained the numerous depressions already referred to for the lodgment of the villi of the chorion. The epithelium lining the crypts had, as a rule, disappeared; so that it was only in exceptional localities that it could be seen *in situ*, where it appeared to consist of cells, the type form of which was columnar, though modifications of that shape occurred. The subepithelial connective tissue contained a large proportion of corpuscles, some of which were fusiform, others polygonal, others of the rounded form of white blood-corpuscles. This tissue was more compact where it formed the walls of the crypts; but deeper in the mucosa, as it approached the glandular layer and the muscular coat, it had an areolated character. The vessels of the uterus were not injected; but there can be no doubt that, if they had been so, the walls of the crypts would have been seen to contain an abundant freely anastomosing network of capillaries, such as exist in the corresponding crypts in the Cetacea, the Mare, the Pig, and the Lemurs. In sections through the wall of the uterus, that had been stained with hæmatoxylin, a well-defined band, coloured with the blue pigment, marked the junction of the deep surface of the mucous membrane and its glands with the muscular coat. This band in all probability was the muscularis mucosæ. In *Hyomochus*, as in other animals possessing a diffused placenta, the uterine glands have no relation, as regards numbers or termination, to the crypts. The crypts are infinitely more numerous than the glands, and are not to be regarded as formed by a dilatation of their mouths, but are new formations during pregnancy, due to hypertrophy and folding of the mucous membrane so as closely to adapt it to the irregular villous surface of the fetal chorion.

The chorion extended from the tip of the left uterine cornu, through the corpus uteri, to the tip of the right uterine cornu. The left horn of the chorion, which contained the foetus, was longer and much more capacious than the right horn. The tip of each horn of the chorion was in close relation to the orifice of each Fallopian tube; and close to the tip the free surface of the chorion was over a very limited area smooth and non-villous. That part of the chorion situated in the corpus uteri, immediately opposite the os uteri, presented a circular non-villous surface about the size of a shilling. This surface, though without villi, was folded so as to adapt it to the corresponding folds of the uterine mucosa in the same locality. A portion of

the chorion corresponding to the more convex part of the gravid uterine cornu was thinly covered with villi, and, indeed, in one or two very limited areas was non-villous—these bare or thinly covered patches being in contact with those portions of the uterine mucosa (already described) where the crypts are either shallow or absent. In all other localities the free surface of the chorion was as thickly studded with villi as the uterine mucosa was with crypts; so that it furnished an excellent and characteristic example of a diffused placenta. In the absence of villi from those parts of the chorion which were situated in relation to the three uterine orifices, *i. e.* the os uteri and the two Fallopian tubes, the chorion of *Hyomoschus* corresponded with what one of us has elsewhere described in *Orca*, the Narwhal, and the Mare.

The villi were arranged in small tufts, separated from each other by very narrow intervals. The tufts varied in size; and the villi of which they were composed were short and branched, usually in the form of filamentous processes. The basal substance of each villus and of the chorion itself consisted of a delicate corpusculated connective tissue. The epithelium on the free surface of the chorion was partly shed; but considerable patches of it were seen in many localities.

The amnion formed a capacious bag, which extended to within half an inch of the tip of the left horn of the chorion. It occupied the rest of this horn and the part of the chorion situated in the corpus uteri, but did not extend into the right horn of the chorion.

The sac of the allantois occupied the whole of the right horn of the chorion, extending as far as its tip; and its wall was in close apposition by its attached surface with the deep surface of the chorion. The sac of the allantois was also prolonged into the left horn of the chorion to within half an inch of its tip: but in other respects its distribution in this horn was limited; for instead of being in contact with the whole extent of the deep surface of the chorion, it formed only a circumscribed tubular prolongation attached to that part of the chorion which was opposite the belly of the fœtus. The remaining part of the deep surface of the chorion in this horn was in contact with the attached surface of the amnion, which membrane extended as far as the edge of the non-villous circular spot opposite the os uteri. The amnion was also prolonged over the tubular prolongation of the allantois which extended into this horn. The amnion enveloped the umbilical cord up to the abdominal wall of the fœtus. The amniotic investment of the cord was studded with numbers of small stunted whitish sessile corpuscles, which did not, however, project from the free surface of the amnion, where it was in contact with the chorion and allantois. These bodies resembled in form and size the bodies projecting from the umbilical cord in the Cetacea. They had not, however, the yellowish-brown colour of the corresponding corpuscles in *Orca* and the Narwhal, but like them they were developed in relation to the deep surface of the amnion and caused an elevation of that membrane by their growth.

The umbilical cord was $3\frac{1}{4}$ inches long. It contained two arteries and two veins; and a slender tubular prolongation of the sac of the

allantois could just be traced into the chorionic end of the cord. Some injection was passed into the vessels of the cord, which filled the principal vessels of the chorion; but as the specimen had been for some time in spirit before the injection was made, it did not enter the vessels of the villi. Slender vessels, however, traversed the non-villous spot opposite the os uteri, and some also were seen subjacent to the amnion where it was in contact with the wall of the tubular prolongation of the allantois situated in the left horn of the chorion.

EXPLANATION OF PLATE XLIV.

- Fig. 1. Fœtal membranes of *Hyomoschus aquaticus*, opened into and fœtus removed; reduced from natural size. *Ch.* Villous chorion of the fœtal horn. *Ch¹*. Villous chorion of the opposite horn. *Al.* Sac of allantois in the non-fecundated cornu, the communication of which with the tubular prolongation in the fœtal horn is seen to the right of the letters. *Am.* Sac of the amnion; the letters are placed on the amnion where it is in contact with the chorion. *U.* The umbilical cord; the letter is placed on the amnion where it is in contact with the allantois. *o.* The non-villous surface of the chorion opposite the os uteri. *S. S.* The smooth non-villous parts of the chorion in relation to the Fallopian tubes.
2. Magnified view of the free surface of the uterine mucous membrane of *Hyomoschus*, showing the crypts in which the villi of the chorion are lodged. At *a* the mouth of one of the uterine glands is shown.

The drawings have been kindly made for us by Mr. J. D. Dunlop.

6. Descriptions of new Asiatic Hesperidæ.

By F. MOORE, Assistant Curator, India Museum, London.

[Received June 11, 1878.]

(Plate XLV.)

ISMENE SUBFASCIATA, n. sp.

Male. Upperside dark velvety umber-brown; costal edge of fore wing slightly ochreous; cilia of both wings ochreous. Underside paler: fore wing with a pale pink triangular costal patch before the apex; posterior border ochreous, adorned with a large hairy tuft: hind wing with a transverse pink fascia across middle of the wing. Eyes red. Legs beneath and anal tuft ochreous.

Expanse 2 inches.

Hab. Ceylon (*In coll. Sir W. H. Gregory and Dr. Thwaites*).

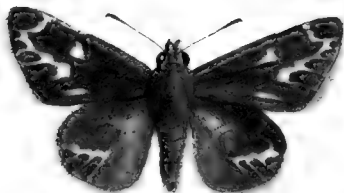
Allied to *I. aria*, Moore, from which it may be distinguished by the markings on the underside.

CALLIANA, n. g.

Wings ample, broad. Fore wing trigonal; cell long, broad; costal vein extending to one third from apex; subcostal vein curved at end of the cell, first, second, third, and fourth branches arising at equal distances before end of cell, fifth from its end, the three former ter-



4



1



9



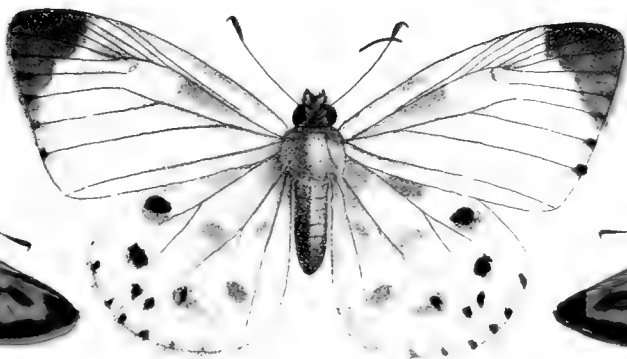
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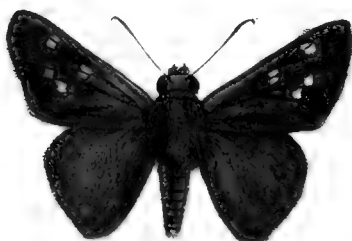
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3



8



13

NEW ASIATIC HESPERIDÆ.

Mistern Bros lith.



minating before the apex, fourth at the apex, and fifth below it; discocellulars angled close to the upper end; upper radial from the angle, lower from their middle; median vein three-branched, widely apart, the upper from lower end of cell, middle and lower branches at equal distances, the lower from near base of cell; submedian slightly recurved. Hind wing broadly ovate; subcostal two-branched, second before end of cell; discocellulars slightly angled; radial from their angle; median three-branched, middle branch from immediately before end of cell. Body small, robust, abdomen short. Palpi short, thick, pilose, ascending, third joint short, conical. Antennæ slender. Legs pilose.

CALLIANA PIERIDOIDES, n. sp. (Plate XLV. fig. 2.)

Male. Upperside creamy-white, glossy; fore wing with the apex broadly vinous-brown, the end of the median veins also with a vinous-brown-speckled spot: hind wing with a curved upper discal decreasing series of five purple-black spots, the upper one large and situated between the costal and subcostal veins; the end of the veins also with a small vinous-brown-speckled spot. Underside white; fore wing with the costal base, a patch beyond end of the cell, and the outer border pale vinous-brown: hind wing with a short black narrow streak at end of costal border, four large subbasal and a curved discal series of seven purple-black spots, a marginal series of broad vinous-brown spots, one at end of each vein. Thorax and abdomen white; collar, top of head, palpi, and tip of abdomen pale ferruginous; tip of palpi and antennæ black; legs pale ferruginous above, purple-brown beneath.

Expanse $2\frac{5}{8}$ inches.

Hab. ? N.É. Bengal (*A. Grote*). In coll. F. Moore.

HESPERIA NAROOA, n. sp. (Plate XLV. fig. 4.)

Male and Female. Upperside dark olive-brown: fore wing with two prominent semidiaphanous yellowish well-separated spots at end of the cell, a subapical series of three smaller spots, and an oblique discal series of five spots: hind wing with two very small discal spots in male, three in female. Underside dark olive-brown; fore wing marked as above: hind wing with a prominent white spot at upper end of the cell, and a curved discal series of four spots. Body olive-green.

Expanse $1\frac{9}{12}$ inch.

Hab. Bombay (*Wilkinson*); Ceylon (*Mackwood*). In coll. F. Moore and F. M. Mackwood.

Allied to *H. contigua*, Mabille; markings similar, but both sexes one third less in size.

HESPERIA KUMARA.

Hesperia kumara, Moore, Catal. Lep. E.I. C. i. p. 255 (1857).

Female. Upperside dark olive-brown; fore wing with a transverse discal series of seven yellowish semidiaphanous spots from before the apex; cilia pale brownish-yellow. Underside deep ochreous-brown:

fore wing marked as above, the lowest spot being yellow: hind wing with a single discal indistinct yellow spot between the two lower median branches. Palpi and body brown; tarsi ochreous.

Expanse $1\frac{5}{8}$ inch.

Hab. Canara (*S. N. Ward*). In coll. India Museum, London.

This species is also found in Ceylon, the male differing from the female above and beneath in the first upper and lowest discal spots being obsolete.

HESPERIA SERIATA, n. sp.

Allied to *H. kumara*. Male differs from the same sex of that species in the discal row of spots being slightly smaller, and in having an additional lower small spot (which is present only in the female of *H. kumara*). Underside greenish brown; fore wing marked as above, the lowest spot suffused.

Expanse $1\frac{5}{8}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

HESPERIA BEVANI, n. sp.

Male. Upperside dark olive-brown; cilia pale brownish-cinereous; fore wing with a single small, pale white, semidiaphanous spot at upper end of the cell, three contiguous subapical spots, another below these, and two larger spots below obliquely on the disk, a small spot also very indistinctly visible on middle of submedian vein: hind wing without spots. Underside greyish olive-brown; spots slightly more prominent than above: hind wing with a discal series of five small somewhat indistinct white spots.

Expanse $1\frac{2}{8}$ inch.

Hab. Salween, Moulmain (*Lieut. Bevan*). In coll. F. Moore.

A male specimen of this species from Calcutta, collected by the late Mr. Atkinson, is in the collection of Dr. O. Staudinger.

HESPERIA BADA, n. sp.

Allied to *H. mangala*.

Male and Female. Upperside dark brown, base of wings olive-brown; cilia pale cinereous-brown: fore wing with two (in some specimens three) contiguous subapical small white semidiaphanous spots, and three spots below obliquely on the disk, the upper one the smallest: hind wing with a discal irregular linear series of three or four white semidiaphanous spots, more or less indistinct. Underside greyish-brown; both wings marked as above, the spots on the hind wing being more prominent.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{10}$ inch.

Hab. Ceylon. In coll. F. Moore.

Also in the collection of Dr. O. Staudinger from Malacca.

HESPERIA FARRI, n. sp.

Male and Female. Upperside ferruginous-brown, base of both wings olive-brown; cilia yellowish-cinereous: fore wing with two pale yellow semidiaphanous spots at end of the cell, and a discal recurved

series of seven spots, the four upper and the seventh smallest, the upper three being contiguous and obliquely before the apex, the sixth below end of the cell and the largest. Underside greyer-brown in the female: fore wing marked as in male, except that the lowest spot is more diffused: hind wing without spots.

Expanse, ♂ $1\frac{4}{8}$, ♂ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Farr*); Cherra Punji (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

HESPERIA TOONA, n. sp.

Allied to *H. eltola*, Hewits. Exot. Butt. Hesp. pl. 4. f. 40.

Male. Differs in the fore wings being slightly more elongate, the hind wing more convex exteriorly, and the anal angle less lobed; markings above similar, those on the fore wing narrower, the spot between the median branches elongated and extending to their basal angle; those on the hind wing very small, the outer spot crossed by a vein. Underside brownish-ochreous; base of fore wing slightly dusky-ochreous; markings as above.

Expanse $1\frac{5}{12}$ inch.

Hab. N.E. Bengal (*A. Grote*). In coll. F. Moore.

HESPERIA SUBGRISEA, n. sp. (Plate XLV. fig. 5.)

Allied to *H. gremius*, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 271, pl. 3. f. 7).

Male. Differs above in having the three oblique discal spots smaller, the lowest appearing only as a few greenish-grey scales, the upper subapical series of two and a single spot at upper end of the cell very minute. Underside less grey in colour, the fore wing marked as above; hind wing with an indistinct black cell-spot and a discal series of spots.

Expanse $1\frac{4}{8}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

PITHAURIA, n. g.

Fore wing elongated, narrow; apex pointed; exterior margin very oblique; hind margin short; hind wing convex externally, lobular at anal angle. Head and thorax very broad, robust; abdomen not so long as hind wing. Antennæ with a slender club and very long whip-like tip. Venation similar to *Pamphila*.

PITHAURIA MURDAVA. (Plate XLV. fig. 13.)

Hesperia murdava, Moore, P. Z. S. 1865, p. 784.

Hab. Darjiling.

HALPE, n. g.

Allied to *Pamphila* (*P. sylvanus*). Antennæ with a more slender club and longer hook at tip. Fore wing shorter; exterior margin more convex; the discal oblique series of raised scales in male shorter and broader. Head and thorax smaller; abdomen slender. Veins similar, the lower median branch being nearer end of the cell.

HALPE CEYLONICA, n. sp. (Plate XLV. fig. 9.)

Upperside dark brown; base of wings and body olive-brown; fore wing with two contiguous subapical small white spots, two oblique discal small conical spots with deeply excavated outer border, and a smaller spot at upper end of the cell; the male with an oblique discal streak composed of broad raised darker brown scales; cilia brownish-cinereous, alternated with dark brown. Underside dark brown, speckled with ochreous scales; fore wing with white spots as above, and a small spot also below the discal series; an upper submarginal row of indistinct pale ochreous spots; hind wing with a broad transverse median and a maculated discal greyish-ochreous band. Palpi, body beneath, and legs greyish-ochreous.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{2}{8}$ inch.

Hab. Ceylon. In coll. F. M. Mackwood and F. Moore.

HALPE BETURIA.

Hesperia beturia, Hewitson, Descr. Hesp. p. 36 (1868).

Hab. Calcutta district (*Atkinson and Farr*); Andamans (*Rœpstorff*).

HALPE LUTEISQUAMA.

Pamphila luteisquama, Mabilie.

Hab. Luzon.

HALPE DOLOPIA.

Hesperia dolopia, Hewitson, Descr. Hesp. p. 27 (1868); Exot. Butt. Hesp. pl. 6. f. 60, 61.

Hab. Darjiling (*Atkinson*).

HALPE RADIANS, n. sp. (Plate XLV. fig. 1.)

Male. Upperside luteous-brown, basal hairy scales yellow. Cilia cinereous-white: fore wing with a pale yellow constricted spot at end of the cell, and an irregular transverse continuous discal band of spots with their lower angles continued outward along the veins; hind wing with a yellow streak at end of the cell, and a short discal band with outer rays. Underside paler, minutely speckled with yellowish-white; fore wing as above, the hind margin being also broadly yellow; hind wing with a subbasal spot, all the veins, and two (a median and a discal) transverse sinuous bands pale yellow. Palpi, body beneath, and legs yellowish-white.

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

Hab. Dhurmsala, N.W. Himalaya. In coll. F. Moore.

PAMPHILA PALMARUM, n. sp. (Plate XLV. figs. 6 & 7, ♀ ♂.)

Differs from typical Java specimens of *P. augias*, Linn., in its much larger size, the *male* having the markings above paler yellow and broader, the impressed oblique discal streak on the fore wing being obsolete, the outer border of the discal band much less sinuous, and the yellow colour not extending along the veins to the exterior margin of the wing.

Female. Paler brown above, the yellow bands on the upperside also paler, less prominent, and there being no yellow along the costal border of fore wing, and no median streak from base of the hind wing. Underside pale vinous-brown, this colour pervading the upper portion of the discal on the fore wing and the entire discal band on the hind wing.

Expanse, ♂ $1\frac{4}{8}$, ♀ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Grote and Atkinson*). In coll. F. Moore and Dr. Staudinger.

“Larva feeds on the date and cocoa-nut palms” (*Atkinson*, MS. note).

PAMPHILA BAMBUSÆ, n. sp. (Plate XLV. figs. 11 & 12, ♂ ♀).

Allied to *P. augias*, Linn., from typical Java specimens of which it differs in its somewhat broader and less pointed wings. Markings above similar, but more defined, the borders of the wings blacker, the basal yellow streak on hind wing confined to a terminal spot at the end of the cell, and the abdominal border black. On the underside the markings are also more clearly defined and the interspaces blacker.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{4}{8}$ inch.

Hab. Calcutta (*Frith and Atkinson*). In coll. F. Moore and Dr. Staudinger.

“Larva feeds on the bamboo” (*Atkinson*, MS. note).

PAMPHILA SUBOCHRACEA, n. sp.

Upperside glossy luteous olive-brown; cilia yellowish-cinereous. *Male.* Fore wing with two pale semidiaphanous spots at end of the cell, three contiguous spots obliquely before the apex, three upper discal spots, below which is a narrow white oblique streak or brand: hind wing with three small yellow upper discal spots, the two lowest small. *Female.* Fore wing with a lower or fourth discal spot, and a small dot below the third spot; the spots angled outward: hind wing as in male. Underside greenish-ochreous, brown on hind border of fore wing and anal lobe; marginal line brown and prominent: fore wing with the lower spot diffused and white: hind wing with the upper discal white spot large and quadrate; four spots below in a slightly linear position, the upper spot indistinct; a white spot also at upper end of cell, and a smaller indistinct spot above it.

Expanse, ♂ $1\frac{3}{8}$, ♀ $1\frac{5}{8}$ inch.

Hab. Calcutta (*Atkinson*). In coll. Dr. Staudinger.

Allied to *P. mathias*, Fabr., but of larger size and more prominently marked.

PAMPHILA BRAHMA, n. sp. (Plate XLV. fig. 8.)

Male. Upperside deep ochreous-brown, basal area ochreous. Cilia cinereous-yellow: fore wing with a black-bordered white streak obliquely below the cell, a semidiaphanous yellowish-white constricted spot at end of cell, a small subapical streak of three spots, and two large discal spots, the one above hind margin being ochreous: hind

wing with an indistinct cell-spot and a discal series of three pale yellowish, semidiaphanous spots. Underside greenish-ochreous; costal base of fore wing ochreous-red, hind margin broadly dusky black and centred by a white streak; markings as above, but less distinct.

Female brown above, with less ochreous at base, the spots more prominent. Underside as in male.

Expanse $1\frac{3}{8}$ inch.

Hab. Masuri, 7000 feet, N.W. Himalaya. In coll. Major Lang and F. Moore.

Nearest allied to *P. subhyalina*, Ménétr., from China.

PAMPHILA SIVA, n. sp.

Male. Allied to preceding (*P. brahma*). Darker brown above, the base of fore wing and large lower discal spot only being ochreous, upper semidiaphanous spots brighter yellow, the one between the lower median branches broader; spots on hind wing prominent. Underside brighter greenish-ochreous, base of costa not ochreous red; spots on hind wing clear white, very prominent and with dark border.

Expanse $1\frac{3}{8}$ inch.

Hab. Khasia hills (*G. Austen*). In coll. F. Moore.

ASTICTOPTERUS OLIVASCENS, n. sp.

Allied to *A. unicolor*, Brem. (Ménétr. Catal. Mus. Pet. Lep. i. t. 5. f. 6), from Pekin and Hong Kong, but of larger size. Upperside uniform glossy olive-brown. *Female* with a white, semidiaphanous, narrow subapical spot crossed by the fourth and fifth subcostal branches. Underside: *male* uniformly brown; hind wing sparsely grey-speckled: *female* with subapical spot on fore wing as above, the exterior margin grey-speckled; hind wing with three ill-defined, sparsely grey-speckled, transverse bands. Palpi, body, and legs beneath grey.

Expanse $1\frac{6}{10}$ inch.

Hab. Salween, Moulmain (*Lieut. R. C. Bevan*); Darjeeling (*Atkinson and Dr. Staudinger*). In coll. F. Moore.

CYCLOPIDES SUBVITTATUS, n. sp.

Male and Female. Upperside dark vinous-brown; extreme edge of both the costa and cilia chrome-yellow. *Female* with an oblique subapical small chrome-yellow streak, composed of three connected spots crossed by two branches of subcostal vein. Underside: fore wing vinous-brown, with the costal vein, subcostal veins along their marginal end, and a narrow outer marginal band chrome-yellow: hind wing chrome-yellow, with partly interrupted black streaks between the veins.

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

Hab. Salween district, Moulmain (*Lieut. R. C. Bevan*). In coll. F. Moore.

Note. Also in Mr. Atkinson's collection, labelled Darjiling.

CYCLOPIDES SUBRADIATUS, n. sp.

Male and Female. Allied to *C. subvittatus*. Differs in being larger, the fore wing above having a very indistinct yellow streak, which is composed of two well-separated spots only. Underside brighter-coloured, and the streak between the veins more clearly defined.

Expanse-1 to $1\frac{1}{8}$ inch.

Hab. Khasia hills (*Godwin-Austen*). In coll. F. Moore.

ISOTEINON ATKINSONI, n. sp. (Plate XLV. fig. 10.)

Male. Upperside dark glossy olive-brown; cilia brownish cinereous, with a brown inner line and indistinct bars: fore wing with a small yellow semidiaphanous spot at end of the cell, three smaller contiguous spots obliquely before the apex, and two contiguous spots obliquely on the disk. Underside speckled with ochreous-green: fore wing marked as above: hind wing with a median discal curved series of eight small prominent white spots, and a spot at end of the cell.

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

Hab. Darjiling (*Atkinson*). In coll. Dr. Staudinger.

ISOTEINON KHASIANUS, n. sp.

Male. Upperside glossy ochreous-brown; cilia brownish-cinereous, with a brown inner line and indistinct bars: fore wing with a small silky-white semidiaphanous spot at end of the cell, three contiguous spots before the apex and two on the disk. Underside rufous-brown: fore wing marked as above; a small tuft of black hairs on middle of hind margin: hind wing grey-speckled, a small white spot at end of the cell, and a median discal curved series of white dots, each surrounded by dark brown.

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

Hab. Khasia hills (*Godwin-Austen*). In coll. F. Moore.

A specimen of what I believe to be the female of this species is in the collection of Dr. Staudinger, but without a locality (though probably Indian). It differs from the male above described in having the spots on the fore wing slightly larger, the cell-spot transversely elongated, and in there being an additional spot below the two on the disk. It is also greyer on the underside; the hind margin on the fore wing has a very pale border; and the hind wing has no perceptible white dots.

ISOTEINON MASURIENSIS, n. sp. (Plate XLV. fig. 3.)

Male and Female. Upperside bluish purple-brown. Cilia white, alternated with brown: fore wing with a large semidiaphanous white quadrate spot at end of the cell, two contiguous elongated spots below it (and in the male a smaller spot below these), three very small spots before the apex. Underside dark brown, numerously speckled with ochrey-brown scales: fore wing marked as above: hind wing with a discal series of three small indistinct white spots, one being

between the subcostal branches, the others between the upper median branches. Body and legs beneath speckled with ochreous-green.

Expanse $1\frac{1}{8}$ inch.

Hab. Masuri, N.W. Himalaya. In coll. Major Lang and F. Moore.

“On clover, June, 7000 feet” (MS. note).

THANAOS STIGMATA, n. sp.

Male and Female. Upperside glossy olive-brown: fore wing with a short black bar or brand of raised scales obliquely above middle of hind margin, and a very indistinct upper discal slightly curved row of six small pale spots; cilia whitish-cinereous, with slight brown bars. Underside paler; costal border of fore wing, veins, and basal interspaces of hind wing speckled with greenish-grey; fore wing with whitish discal maculated band as above, but more distinct, a spot at end of the cell, and a marginal row of lunules less distinct; hind wing with a distinct whitish cell-spot and a submarginal and marginal lunular band. Female without the raised bar, and the discal band above less distinct.

Expanse, ♂ 1 inch, ♀ $\frac{9}{10}$ inch.

Hab. Masuri (7000 feet), N.W. Himalaya. In coll. Major Lang and F. Moore.

“Common in clover-fields” (*Lang*).

THANAOS INDISTINCTA, n. sp.

Upperside uniform olive-brown; cilia edged with cinereous: fore wing with a very indistinct grey-speckled submarginal and marginal line: hind wing with indistinct grey-speckled veins, basal interspaces, and two outer indistinct lunular bands. Palpi and body greyish-white beneath.

Expanse $\frac{8}{10}$ inch.

Hab. Salween, Moulmain (*Lieut. R. C. Bevan*). In coll. F. Moore.

THANAOS OBSOLETA, n. sp.

Allied to *T. stigmata*. Differs above in the absence of the short black oblique bar or brand on the fore wing; the maculated band being slightly more prominent. Underside similarly speckled, the bands on hind wing not lunular, but composed of a slightly broader series of spots; some spots also present around the cell-spot.

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

Hab. Cherra Punji, Assam (*Atkinson*). In coll. Dr. Staudinger.

EXPLANATION OF PLATE XLV.

- Fig. 1. *Halpe radians*, n. sp., p. 690.
2. *Calliana pieridoides*, n. sp., p. 687.
3. *Isosteinon masuriensis* ♂, n. sp., p. 693.
4. *Hesperia narooa* ♂, n. sp., p. 687.
5. — *subgrisea* ♂, n. sp., p. 689.

- Fig. 6. *Pamphila palmarum* ♂, n. sp., p. 690.
 7. — *palmarum* ♀, n. sp., p. 690.
 8. — *brahma*, n. sp., p. 691.
 9. *Halpe ceylonica*, n. sp., p. 690.
 10. *Isofeinon atkinsoni*, n. sp., p. 693.
 11. *Pamphila bambusæ* ♂, n. sp., p. 691.
 12. — *bambusæ* ♀, n. sp., p. 691.
 13. *Pithauria murdava*, p. 689.

7. List of Lepidopterous Insects collected by the late R. Swinhoe in the Island of Hainan. By F. MOORE, Assistant Curator, India Museum, London.

[Received June 11, 1878.]

RHOPALOCERA.

DANAIDÆ.

DANAIS LIMNIACE.

Papilio limniace, Cram. Pap. Exot. i. pl. 59. f. D, E.

DANAIS AGLEA.

Papilio aglea, Cram. Pap. Exot. iv. pl. 377. f. E.

DANAIS PLEXIPPUS.

Papilio plexippus, Linn. S. N. i. 2, p. 767.

DANAIS CHRYSIPPUS.

Papilio chrysippus, Linn. S. N. i. 2, p. 767.

EUPLŒA FELDERI.

Euplœa felderi, Butler, P. Z. S. 1866, p. 275.

Allied to *E. layardi*, Druce, P. Z. S. 1874, pl. xvi. f. 1, from Siam; differing above in having all the spots on the fore wing larger, those on the hind wing being smaller, and the inner row nearly obsolete towards the anal angle.

SALPINX MINORATA, n. sp.

Male. Upperside dark brown: fore wing glossed with blue; two small narrow bluish-white streaks beyond the cell, a less distinct streak above the submedian vein, a submarginal series, and a marginal row of indistinct speckled spots: hind wing with pale canescent subbasal patch and two marginal rows of small indistinct white spots. Underside paler brown: fore wing with three purplish-white discal spots, a smaller costal spot, and two marginal series of white dots: hind wing with two marginal series of white dots.

Expanse $2\frac{5}{8}$ inches.

Hab. Hainan. In coll. H. Druce.

Allied to *S. hluyi*, Moore, but of much smaller size; it is also distinct from *S. hobsoni*, Butler, P. Z. S. 1877, p. 811, from Formosa.

SATYRIDÆ.

LETHE EUROPA.

Papilio europa, Fabr. Syst. Nat. p. 500.

ZOPHOESSA MUIRHEADI.

Lasiommata muirheadi, Felder, Wien. ent. Monats. vi. p. 28.

MELANITIS ISMENE.

Papilio ismene, Cram. Pap. Exot. i. pl. 26. f. A, B.

MYCALESIS PERSEUS.

Papilio perseus, Fabr. Syst. Ent. p. 488.

MYCALESIS RUNEKA.

Mycalesis runeka, Moore, Cat. Lep. E.I. C. i. p. 234.

MYCALESIS CHARAKA.

Mycalesis charaka, Moore, P. Z. S. 1874, p. 566.

YPHTHIMA PANDOCUS.

Ypthima pandocus, Moore, Cat. Lep. E.I. C. i. p. 235; Hewits. Trans. Ent. Soc. 1865, p. 290, pl. 18. f. 12.

YPHTHIMA ZODIACA.

Ypthima zodiaca, Butler.

ELYMNIAS HAINANA, n. sp.

Male. Upperside brownish purple-black: fore wing with narrow bright blue marginal spots: hind wing with outer border broadly ferruginous.

Female. Dark ferruginous-brown; disk of both wings indistinctly brighter ferruginous; narrow marginal spots on fore wing pale purple; small whitish submarginal spots on hind wing. Underside with the basal portion numerously covered with dark brown strigæ, the outer borders paler and with less and narrower strigæ; the apical grey patch on fore wing prominent; and costal spot on hind wing small but distinct.

Expanse $2\frac{6}{10}$ inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

Allied to the Bornean species *E. nigrescens*, Butler, P. Z. S. 1871, p. 520.

PAPILIONIDÆ.

PAPILIO PAMMON.

Papilio pammon, Linn. S. N. i. 2, p. 746, ♂.

P. polytes, Linn. ib. p. 746, ♀.

PAPILIO HELENUS.

Papilio helenus, Linn. S. N. i. 2, p. 745.

PAPILIO ACHATES.

Papilio achates, Cram. Pap. Exot. pl. 182. f. A, B.

PAPILIO MALAYANUS.

Papilio malayanus, Wallace, Trans. Linn. Soc. 1865, p. 59.

PAPILIO SWINHOEI, n. sp.

Allied to *P. nomius*, Esper, from S. India. Differs on the upper-side in the fore wing having the costal bands broader, the submarginal row of spots smaller and narrower; the hind wing is also shorter, the upright black bands broader, the two pale spots beneath them widely separated, and the marginal lunules much narrower. On the underside the hind wing has the discal red maculated band more heavily margined with black.

Expanse, ♂ $2\frac{6}{8}$, ♀ 3 inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

PAPILIO AXION.

Papilio axion, Felder, Verh. zool.-bot. Ges. xiv. p. 305 (1864).

P. euryphilus, Hübner, Samml. exot. Schm.

PAPILIO MEGARUS.

Papilio megarus, Westw. Arc. Ent. ii. pl. 79. f. 2.

PAPILIO SATURATA, n. sp.

Distinguished from Indian specimens of *P. panope* by its intense and uniform dark colour throughout the upperside, being of a much darker tint than any specimens from India; the marginal spots on the fore wing small but very prominent. In the hind wing there is an outer marginal series of broad quadrate ochreous spaces, a submarginal row of very narrow brown-speckled ochreous angular lunules, and an inner row of acutely angular, scarcely perceptible ochreous marks. Underside also very dark-coloured; the base of fore wing black-tinted; quadrate ochreous spots on outer margin of hind wing very broad; submarginal lunules white.

Expanse 4 inches.

Hab. Hainan. In coll. H. Druce.

MORPHIDÆ.

CLEROME EUMEUS.

Papilio eumeus, Drury, Ill. Exot. Ent. i. pl. 2. f. 3.

NYMPHALIDÆ.

ATHYMA LEUCOTHOË.

Papilio leucothoë, Linn. S. N. i. 2, p. 780.

NEPTIS HAINANA, n. sp.

Near to *N. eurynome*, Westw. (Donov. Ins. of China, 2nd edit. p. 66, pl. 35. f. 4), from China. Differs above in its more compactly

disposed maculated bands, the fore wing having the discoidal streak comparatively broader and its terminal portion more elongated at the point ; in the hind wing the subbasal band is straighter and of equal width throughout, the submarginal band being narrower. The underside is of a much paler orange-yellow colour, and the bands less black-bordered, being similar in both these respects to the Assam species *N. kamrupa*, Moore.

Expanse, ♂ $2\frac{1}{4}$ inches.

Hab. Hainan. In coll. H. Druce.

NEPTIS RIHODONA, n. sp.

Allied to *N. hordonia*, Stoll ; differs above in the bands being broader, those on the hind wing considerably so, in the male these latter also having a prominently waved outer border. Both wings in the male have a well-marked outer marginal band.

Expanse, ♂ $1\frac{6}{8}$, ♀ 2 inches.

Hab. Hainan. In coll. H. Druce.

ERGOLIS ALTERNUS, n. sp.

Nearest allied to the typical *E. ariadne* from Java. Differs in its more deeply excavated margins, the upperside being of a more yellowish-ferruginous colour between the discal and marginal bands ; the broad basal portion, the median discal band, and marginal band of a deeper dusky ferruginous, the discal band also being distinctly and darker maculated. Underside with broad dark dusky chestnut-brown suffused bands.

Expanse 2 inches.

Hab. Hainan. In coll. H. Druce and F. Moore.

CYRESTIS THYODAMAS.

Cyrestis thyodamas, Boisd., Cuv. Règ. An., Ins. ii. pl. 138. f. 4. Identical with Indian specimens.

CYRESTIS COCLES.

Papilio cocles, Fabr. Mant. Ins. ii. p. 7 ; Donovan, Ins. Ind. pl. 23. f. 2.

JUNONIA LEMONIAS.

Papilio lemonias, Linn. S. N. i. 2, p. 770.

JUNONIA LAOMEDIA.

Papilio laomedia, Linn. S. N. i. 2, p. 772 ; Drury, Ill. Exot. Ent. pl. 5. f. 3.

JUNONIA CENONE.

Papilio cœnone, Linn. S. N. i. 2, p. 770 ; Cramer, Pap. Exot. i. pl. 35. f. A-C.

One specimen from Ho Ching Shang, agreeing in size with those from India, but smaller than the Chinese.

JUNONIA ALMANA.

Papilio almana, Linn. S. N. i. 2, p. 769; Cramer, Pap. Exot. i. pl. 58. f. F, G.

SYMPHÆDRA PARDALIS, n. sp.

Allied to *S. dirtea*, Fabr. Differs in the male having somewhat shorter wings, the fore wing more convex on the costa, the outer margin being slightly concave, and the antennæ are shorter and less robust. Distinguished on the fore wing above by the broad greenish grey marginal band, which is uniformly coloured and extends to the apex; the band on the hind wing is also comparatively broader, the submarginal spots larger, and irrorated with greenish-grey anally. The underside is more uniformly ferruginous, but with the spots paler.

Female with the spots above of a greenish-yellow tint.

Expanse, ♂ $3\frac{1}{8}$, ♀ $3\frac{5}{8}$ inches.

Hab. Hainan. In coll. H. Druce.

DIADEMA AVIA.

Papilio avia, Fabr. Ent. Syst. iii. 1, p. 111.

Papilio iacintha, Drury, Ill. Exot. Ent. ii. pl. 21. f. 1, 2.

ATELLA PHALANTA.

Papilio phalanta, Drury, Ill. Exot. Ent. i. pl. 21. f. 1, 2.

P. columbina, Cram. Pap. Exot. iii. pl. 238. f. A, B.

MESSARAS ERYMANTHIS.

Papilio erymanthis, Drury, Ill. Exot. Ent. i. pl. 15. f. 3, 4.

CETHOSIA BIBLIS.

Papilio biblis, Drury, Ill. Exot. Ent. i. pl. 4. f. 2.

PIERIDÆ.

NYCHITONA XIPHIA.

Papilio xiphia, Fabr. Spec. Ins. ii. p. 43.

P. nina, Fabr. Ent. Syst. iii. 1, p. 194.

CATOPSILIA GNOMA.

Papilio gnoma, Fabr. Syst. Ent. App. p. 808.

TERIAS ÆSIOPE.

Terias æsiope, Ménétr. Cat. Lep. Mus. Petr. p. 85, pl. 2. f. 3.

TERIAS SUBDECORATA, n. sp.

Upperside deep yellow: fore wing with a moderately broad blackish border, the inner margin of which forms a slightly sinuous curve in the male, but a more angled curve in the female: hind wing with a slight speckled spot at end of the veins. Underside similarly but more prominently marked, as in *T. æsiope*, Ménétr.

Expanse, ♂ $1\frac{6}{8}$, ♀ $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. H. Druce.

TERIAS ATTENUATA, n. sp.

Male. Upperside with a very narrow black border, its inner margin but very slightly sinuous; costal margin blacker than in the other species: hind wing with a very narrow indistinct speckled border. Underside with markings similar to *T. æsiope*, but smaller and narrower.

Expanse $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. F. Moore.

TERIAS ARCUATA, n. sp.

Male. Allied to *T. subdecorata*. Differs above in having a more regularly curved inner margin to the black border of the fore wing, a nearly continuous speckled border on hind wing, and in the markings beneath being nearly obsolete.

Expanse $1\frac{7}{8}$ inch.

Hab. Hainan. In coll. F. Moore.

TERIAS HAINANA, n. sp.

Male and Female. Allied to *T. drona*, Horsf., from Java. Differs on the fore wing in the marginal band being narrower and slightly broken at its termination on posterior angle; the hind wing has the band very narrow and sinuous, being nearly obsolete at the anal end in the female; cilia pinkish. Underside paler yellow; two prominent small black spots at end of the cell on fore wing and dusky speckled markings on hind wing.

Expanse $1\frac{4}{10}$ inch.

Hab. Hainan. In coll. H. Druce.

A distinct species from *T. vagans*, Wallace, P. Z. S. 1866, p. 357.

THESTIAS SESIA.

Papilio sesia, Fabr. (Donov. Ins. China, pl. 31. f. 2).

Papilio evippe, Drury, Ill. Ins. pl. 5. f. 2, ♂.

Papilio pyrene, Cram. ii. pl. 125. f. C, ♂.

APPIAS ZELMIRA.

Papilio zelmira, Cram. iv. pl. 320. f. C, D, ♀.

APPIAS AMASENE.

Papilio amasene, Cram. Pap. Exot. i. pl. 44. f. A.

APPIAS COPIA.

Pieris copia, Wallace, Trans. Ent. Soc. 1867, p. 340.

One specimen (male) from Ho Ching Shang.

APPIAS INORNATA, n. sp.

Allied to *A. vacans*, Butler, from Sikkim.

Male. Upperside with the markings similar to *A. hippo* (Cramer, pl. 195. f. B, C). *Female* as in *A. vacans*, having the costal border of fore wing, and outer borders of both wings only, black. Underside of male with the apical spot on fore wing and the hind wing deep

yellow, the former absent and the latter paler in the female; outer border of hind wing narrow, and of a golden-brown colour.

Expanse $2\frac{1}{4}$ inches.

Hab. Hainan. In coll. H. Druce.

This is quite a distinct species from the Formosan (*A. formosana*), described by Mr. Wallace in P. Z. S. 1866, p. 356.

SYNCHLOË CANIDIA.

Papilio canidia, Sparrm. Amœn. Acad. vii. p. 504 (1768).

P. gliciria, Cramer, pl. 171. f. E, F.

THYCA PASITHOË.

Papilio pasithoë, Linn. S. N. i. 2, p. 755.

P. dione, Drury, Ill. Exot. Ent. ii. pl. 8. f. 3, 4.

ERYCINIDÆ.

SOSPITA SATURATA, n. sp.

Form of outline as in *S. lydda*, Hewits. Exot. Butt. iii. *Sosp.* pl. fig. 13, from Hong Kong. Upperside dark purple-brown, basal half darkest: hind wing with very indistinct small black white-bordered apical and anal spots. Underside brighter; pale bands distinct, the discal band broad, nearly straight on fore wing, and its inner border darker-coloured; three small white-bordered black apical and two anal spots on hind wing.

Female brighter-coloured.

Expanse $1\frac{6}{8}$ inch.

Hab. Hainan. In coll. H. Druce and F. Moore.

ZEMEROS CONFUCIUS, n. sp.

Z. confucius, Wallace, MS.

Male. Smaller than Javan or Indian specimens of *Z. flegyas*. Markings above similar; the subapical spots larger and indistinct, two only being visible above, these being white and prominent beneath.

From *Z. albipunctata*, Butler, from Malacca, it may be distinguished by the much less prominent and smaller number of subapical spots both above and beneath, and in the inner series of spots on both wings being white-bordered as in *Z. flegyas*.

Expanse $1\frac{4}{10}$ inch.

Hab. Hainan. In coll. H. Druce.

LYCÆNIDÆ.

MILETUS CHINENSIS.

Miletus chinensis, Felder, Verh. zool.-bot. Ges. xii. p. 488 (1862).

LUCIA DILAMA, n. sp.

Male. Similar to *L. epius* (Westw. Gen. D. L. p. 502, pl. 76. f. 5) from India. Underside of a browner grey, the transverse zig-

zag markings less defined, and the white interspace beyond the end of the cell much wider.

Expanse 1 inch.

Hab. Hainan. In coll. H. Druce.

PITHECOPS NIHANA, n. sp.

Upperside dusky brown; cilia white: fore wing with a slight white brown-speckled longitudinal central patch, and hind wing with a similar streaky subapical patch. Underside white: fore wing with a submarginal series of six very narrow, dusky, short, recurved marks, and a marginal series of narrow dusky lunules bordered within by an indistinct lunular line: hind wing with a moderately large black costal spot before the apex, and a smaller spot on abdominal margin; a series of very indistinct dusky submarginal and marginal streaks.

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

Hab. Hainan. In coll. H. Druce and F. Moore.

POLYOMMATUS LAIUS.

Papilio laius, Cramer, Pap. Exot. iv. pl. 319. f. D, E.

POLYOMMATUS VARUNANA.

Polyommatus varunana, Moore, P. Z. S. 1865, p. 772, pl. 41. f. 6.

POLYOMMATUS SIMILIS, n. sp.

Allied to *P. argia*, Ménétr. Cat. Lep. Mus. Petr. p. 125, pl. x. f. 7. from Japan. Differs above in being of a pale lilac-blue, the margin of the fore wing less dusky, and the hind wing with the marginal spots scarcely perceptible (both these characters in *P. argia* are very prominent). On the underside the colour is of a brownish-grey; markings similar, but those of fore wing less prominent, the spots on the hind wing having the centre of the same tint as the ground-colour of the wing.

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

Hab. Hainan. In coll. H. Druce and F. Moore.

LAMPIDES BÆTICUS.

Papilio beticus, Linn. S. N. i. 2, p. 789.

LAMPIDES KANDARPA.

Lycæna kandarpa, Horsf. Cat. Lep. E.I. C. 1829, p. 82.

APHNÆUS LOHITA.

Amblypodia lohita, Horsf. Cat. Lep. E.I. C. 1829, p. 106.

ILERDA BELENA.

Heliophorus belenus, Hübner, Zutrage, f. 785 (1832).

MAHATHALA, n. g.

Wings broad: fore wing somewhat short, exterior margin nearly erect and slightly scalloped; third subcostal branch bifurcate: hind

wing short; costa abbreviated, lobed at the base, concave towards the end, the apex produced and pointed upward; exterior margin slightly concave below the apex, and very convex in the middle; anal angle lobed; a spatulate tail extending from end of lower median vein; palpi long, stout, apical joint broad laterally; antennæ thickened to apex.

Differs from typical *Amblypodia* (*A. narada*, Horsf.) in the entirely different form of wings; the fore wing having the third branch of the subcostal vein bifurcate instead of trifurcate, as in male of *A. narada*.

MAHATHALA AMERIA.

Amblypodia ameria, Hewits. Cat. Lyc. B. M. p. 14, pl. 8. f. 85.

HALPE BETURIA.

Hesperia beturia, Hewits. Desc. *Hesp.* p. 36 (1868).

HESPERIDÆ.

HESPERIA GREMIUS.

Hesperia gremius, Fabr. Ent. Syst. Suppl. p. 433; Butler, Cat. Fabr. Lep. B. M. p. 271, pl. 3. f. 7.

H. divodasa, Moore, P. Z. S. 1865, p. 791.

HESPERIA MATHIAS, Fabr. Ent. Syst. Suppl. p. 433; Butler, Cat. Fabr. Lep. B. M. p. 275, pl. 3. f. 8.

The specimens from Island of Ho Ching Shan.

HESPERIA MANGALA, Moore, P. Z. S. 1865, p. 792.

HESPERIA QUINIGERA, n. sp.

Male and Female. Upperside olive-brown; cilia pale cinereous-brown: fore wing with five small pale semidiaphanous spots, two only being subapical, and three obliquely discal: hind wing with a single indistinct pale semidiaphanous spot. Underside pale ochreous-brown; fore wings marked as above.

Expanse, ♂ $1\frac{2}{10}$, ♀ $1\frac{4}{10}$ inch.

Hab. Hainan. In coll. H. Druce and F. Moore.

GEGENES HAINANUS, n. sp.

Male. Allied to the European species *G. nostradamus*, but smaller in size, also much paler above and less grey beneath.

Expanse $1\frac{1}{8}$ inch.

Hab. Hainan. In coll. H. Druce.

PAMPHILA CONFUCIUS.

Pamphila confucius, Felder, Wien. ent. Monat. 1862, p. 29.

ISMENE ARIA.

Ismene aria, Moore, P. Z. S. 1865, p. 784; Hewits. Exot. Butt. iv. *Hesp.* pl. 2. f. 24.

CYCLOPIDES CAMERTES.

Cyclopides camertes, Hewits. Desc. *Hesp.* p. 43 (1868).

HETEROCERA.

BOMBYCES.

SYNTOMIDÆ.

RHAPHIDOGNATHA HAINANA.

Artona hainana, Butler, Journ. Linn. Soc. xii. p. 357.

CHALCOSIIDÆ.

PIDORUS GLAUCOPIS.

Phalæna glaucopis, Drury, Exot. Ins. ii. p. 11, pl. 6. f. 4.

CHALCOSIA NYMPHA, n. sp.

Male. Fore wing silvery-white; a circular purple-black spot in middle of the cell, and a speckled spot obliquely below it; apical band purple-black, traversed with white spots: hind wing with a black-streaked pale blue apical band, the extreme margin and cilia being white. Head and collar crimson; body metallic green; antennæ black; legs grey.

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

Hab. Hainan. In coll. F. Moore.

Allied to *C. diana*, Butler, P. Z. S. 1877, p. 815, from Formosa.

EUSCHEMA MILITARIS.

Phalæna militaris, Linn. S. N. i. 2, p. 811.

LITHOSIIDÆ.

UTETHESIA PULCHELLA.

Phalæna pulchella, Linn. S. N. i. 2, p. 884; Guér.-Mén. Icon. Règ. An. pl. 88. f. 8.

BOMBYCIDÆ.

ARISTHALA, nov. gen.

Fore wing elongate, trigonate, falcate; costa moderately arched at the end; apex convex; exterior margin oblique, concave below the apex, slightly produced and angled in middle; posterior margin nearly straight, angle acute; costal and subcostal with its first and second branches running close together along the extreme margin, third branch trifurcate at nearly equal distances, the two upper ascending to the costa, the first before the second to the apex, the third to below the apex; discocellulars bent inward at the middle, upper shortest; upper radial as a subcostal branch beyond the cell, lower radial from angle of discocellulars; a discoidal veinlet emitted within the cell parallel to lower radial; median vein three-branched at equal distances, upper from end of the cell; a submedian and internal vein close to the margin. Hind wing elongated, narrow, apex

and exterior margin very convex; anal angle concave in male, angled in female; abdominal marginal long, nearly straight, fringed; two subcostal branches emitted beyond the cell; discocellulars very oblique, bent outward; one radial from their angle; median three-branched, two upper from end of cell; a submedian and internal vein. Body stout, with a dorsal crest and anal lateral tuft; antennæ short, bipectinate to near end; palpi very small; legs very hairy and tufted to end of tarsi.

This genus is allied to *Ocinara* and *Ernolatia*, Walker, to *Trilocha*, Moore, and to *Bombyx* (*B. mori*, Linn.).

ARISTHALA HAINANA, n. sp.

Female. Fore wing dark ferruginous; posterior border brighter ferruginous; discal area speckled with buff and purple-brown scales; an oblique curved subbasal and two discal sinuous darker lines; a small bright-coloured ferruginous spot at end of the cell; exterior border speckled with chalybeous-white: hind wing yellowish-ferruginous, with short basal, median, and narrower discal purple-brown bands; a subanal lunular white streak bordered above with purple-brown. Thorax dark ferruginous; abdomen greyish-ferruginous; head, legs, and body beneath brighter ferruginous. Underside bright ferruginous: fore wing palest at base: exterior border dusky and white-speckled; one blackish transverse discal line: hind wing with outer curved discal line, two discocellular spots, and indistinct median fascia; anal angle speckled with dusky-brown and white.

Expanse 2 inches.

Hab. Hainan. In coll. F. Moore.

A closely allied species of this genus, from which the generic characters of the male have been taken, is found in the Sikkim Himalayas.

LIPARIDÆ.

PANTANA AMPLA.

Pantana ampla, Walker, Cat. Lep. Het. B. M. iv. p. 820.

PYRALES.

LEPYRODES GEOMETRALIS.

Lepyrodes geometralis, Guén. Spec. Gén. Lép. Delt. et Pyr. p. 278.

Tabular List showing Geographical Distribution.

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
DANAIDÆ.						
Danais limniace	*	..	*	*		
— aglea	*					
— plexippus	*	*	*	*		
— chrysippus	*	*	*	*		
Euplœa Felderi	*				*	
Salpinx minorata	*					
SATYRIDÆ.						
Debis europa	*	*	*	..	*	*
Zophoessa muirheadi	*	..	*			
Melanitis ismene	*	*	*	*	*	*
Mycalesis perseus	*	*	*
— runeka	*	*	*
— charaka	*		*
Ypthima pandocus	*	
— zodiaca	*	*	
Elymnias hainana	*					
PAPILIONIDÆ.						
Papilio pammon	*	*	*			
— helenus	*	..	*			
— achates	*	*	*	
— malayanus	*	*	*	
— swinhoei	*		
— axion	*	*
— megarus	*	*
— saturata	*					
MORPHIDÆ.						
Clerome eumeus	*	..	*			
NYMPHALIDÆ.						
Athyma leucothœ	*	*	*	*	*	*
Neptis hainana	*					
— rihodona	*					
Ergolis alternus	*					
Cyrestis thyodamas	*	*	*
— cocles	*	..	*	*		
Junonia lemonias	*	*	*	*	*	*
— laomedea	*	..	*	*	*	*
— œnone	*	..	*	..	*	*
— almana	*	*	*	..	*	*
Symphædra pardalis	*					
Diadema avia	*	..	*	..	*	
Atella phalanta	*	..	*	*	*	*

Tabular List (continued.)

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
NYPHALIDÆ (continued).						
Messarar erymanthis	*	*	*	*		
Cethosia biblis	*	..	*	..	*	*
PIERIDÆ.						
Nychitona xiphia.....	*	..	*	*	*	*
Catopsilia gnoma.....	*	*	*			
Terias æsiope	*	*	*			
— subdecorata	*					
— attenuata	*					
— arcuata.....	*					
— hainana	*					
Thestias sesia	*	..	*			
Appias zelmira.....	*	..	*	..	*	*
— amasene	*	..	*			
— copia.....	*	*
— inornata	*					
Synchloë canidra	*	..	*	..	*	*
Thyca pasithoë.....	*	..	*			
ERYCINIDÆ.						
Sospita saturata	*					
Zemeros confucius	*					
LYCÆNIDÆ.						
Miletus chinensis	*	..	*			
Lucia dilama	*					
Pithecops nihana	*					
Polyommatus laius	*	..	*	..	*	*
— varunana	*	*	*	..	*	*
— similis	*					
Lampides bœticus	*	..	*	..	*	*
— kandarpa	*	*		..	*	*
Aphnæus lohita	*	*	*	*
Ilerda belena	*	*	
Mahathala ameria	*	*
HESPERIDÆ.						
Hesperia gremius.....	*	*	*
— beturia	*	*
— mathias	*	*	..	*	*	*
— mangala	*	*
— quinigera	*					
Gegenes hainanus.....	*					
Pamphila confucius.....	*					
Ismene aria	*	*	*
Cyclopides camertes	*	*	*

Tabular List (continued).

	Island of Hainan.	Island of Formosa.	China.	Siam.	Malay Peninsula.	N.E. India.
BOMBYCES.						
<i>Rhaphidognatha hainana</i>	*					
<i>Pidorus glaucopis</i>	*	..	*	*
<i>Chalcusia nympha</i>	*	..	*	..	*	*
<i>Euschema militaris</i>	*	..	*	..	*	*
<i>Utethesia pulchella</i>	*	*	*	..	*	*
<i>Aristhala hainana</i>	*	..	*			
<i>Pantana ampla</i>	*	..	*			
PYRALES.						
<i>Lepyrodes geometralis</i>	*	*	*	..	*	*

8. Contributions to the Ornithology of the Philippines.—
No. X. On the Collection made by Mr. A. H. Everett
in the Island of Bohol. By ARTHUR, Marquis of
TWEEDDALE, F.R.S., President of the Society.

[Received June 14, 1878.]

The island of Bohol lies between Leyte and Zebu, and is situated about seventy miles N.W. of Mindanao. It has a length of about forty miles and a breadth of thirty miles. After leaving Leyte, Mr. Everett stopped for a week at Talibon, on the north coast of the island, and then left for Palawan, while his brother proceeded to the interior of the island to collect. There he found a country covered with grass 12 feet high, and with no forest except on the tops of a few hills. Birds were scarce; and he had to return stricken with fever. The collection obtained in North Bohol contains representatives of 47 species; and although all belong to previously known birds, seven of them have not been hitherto recorded as being inhabitants of the Philippines. These are:—

Cisticola cursitans.

Alauda wattersi.

Terekia cinerea.

Limicola platyrhyncha.

Limosa lapponica.

Tringula albescens.

Streptopelia interpres.

The rest of the species are generally distributed throughout the archipelago, with perhaps the exceptions of *Lanius nasutus*, which appears to be a northern form, and *Orthotomus frontalis* and *Loriculus hartlaubi*, which are southern species.

1. LORICULUS HARTLAUBI (7) ?

[Bohol, ♀, October.]

Only one example of a female, and not in full dress. It agrees with individuals of true *L. hartlaubi* in a similar stage of plumage, but has the maxilla shorter by one tenth of an inch.

2. HALIASTUR INTERMEDIUS (17).

[N. Bohol, ♂ ♀, October.]

3. BUTASTUR INDICUS (20).

[N. Bohol, ♀, October : iris golden-yellow ; bill black ; cere and base of bill bright chrome-yellow ; legs and feet dirty chrome-yellow ; nails black.]

4. MEROPS PHILIPPINUS (35).

[N. Bohol, ♂, October.]

5. ALCEDO BENGALENSIS (38).

[N. Bohol, ♀, October.]

6. SAUROPATIS CHLORIS (47).

[N. Bohol, ♂ ♀, October.]

7. CACOMANTIS MERULINUS (57).

[N. Bohol, ♂, October : iris light red ; bill black ; base of mandible reddish ; nails black ; feet and legs waxy Naples-yellow.]

The above note pertains to the adult. Two other examples are in rufous and brown-banded plumage.

8. CENTROCOCCYX VIRIDIS (64).

[N. Bohol, ♂ ♀, October.]

The male is immature ; the female adult.

9. LANIUS NASUTUS (70).

[N. Bohol, ♂ ♀, October and November.]

10. LANIUS LUCIONENSIS (72).

[N. Bohol, ♂ ♀, October and November.]

11. ARTAMUS LEUCORHYNCHUS (73).

[N. Bohol, ♂ ♀, October and November.]

12. LALAGE DOMINICA (76).

[N. Bohol, ♂, November.]

13. LEUCOCERCA NIGRITORQUIS (83).

[N. Bohol, ♂ ♀, October.]

14. HIRUNDO JAVANICA.

Hirundo javanica, Sparrm. Mus. Carls. t. 100.

[N. Bohol, ♂ ♀, October.]

15. *BRODERIPUS ACORRHYNCHUS* (90).

[N. Bohol, ♀, October and November.]

16. *IXUS GOIAVIER* (99).

[N. Bohol, ♀, October.]

17. *PRATINCOLA CAPRATA* (104).

[N. Bohol, ♂, November. Locust in gizzard.]

18. *CISTICOLA CURSITANS*.

Prinia cursitans, Franklin, P. Z. S. 1831, p. 118; Dresser, B. of Europe, parts lxi., lxii.

[N. Bohol, ♂, October: iris yellow-brown.]

Four examples identical with Indian individuals, but distinct from the Negros example referred to *anteà*, p. 285. no. 31.

19. *ORTHOTOMUS FRONTALIS*.

Orthotomus frontalis, Sharpe, Ibis, 1877, p. 112, t. ii. f. 1; T. L. S. ser. 2, Zool. i. p. 336. no. 85.

[N. Bohol, ♂ ♀, October.]

20. *BUDYTES VIRIDIS* (114).

[N. Bohol, ♂ ♀, November.]

21. *CORYDALLA LUGUBRIS* (117).

[N. Bohol, ♂ ♀, October and November.]

22. *CYRTOSTOMUS JUGULARIS* (123).

[N. Bohol, ♀, October.]

23. *CORVUS PHILIPPINUS* (125).

[N. Bohol, ♂ ♀, November.]

Female smaller than the male.

24. *CALORNIS PANAYENSIS* (128).

[N. Bohol, ♂ ♀, October.]

25. *MUNIA JAGORI* (132).

[N. Bohol, ♂, October.]

26. *ALAUDA WATTERSI*.

Alauda wattersi, Swinhoe, P. Z. S. 1871, p. 389.

[N. Bohol, ♂, October.]

A single example of the genus *Alauda*, which most nearly agrees with the South-Formosan race of *A. calivox*, separated under the above title by Mr. Swinhoe. The occurrence in the Philippines of any member of the genus has not before been recorded.

27. *OSMOTRENON VERNANS* (135).

[N. Bohol, ♂ ♀, October.]

28. *TURTUR DUSSUMIERI* (147).

[N. Bohol, ♂ ♀, October and November.]

29. *CHARADRIUS FULVUS* (159).

[N. Bohol, ♂ ♀, October.]

30. *EUDROMIAS GEOFFROYI* (161).

[N. Bohol, ♂ ♀, October and November.]

31. *EUDROMIAS MONGOLICUS* (163).

[N. Bohol, ♂ ♀, October and November.]

32. *ÆGIALITIS DUBIA* (162).

[N. Bohol, ♀, October.]

33. *ÆGIALITIS CANTIANA*.

[N. Bohol, ♀, October.]

34. *ÆGIALITIS PERONII*.*Charadrius peronii*, Temminck, Schlegel, Mus. P.-Bas, Cursor, p. 33.*ÆGIALITIS*, sp.?

[N. Bohol, ♂, November.]

35. *STREPSILAS INTERPRES*.*Tringa interpres*, Linn. S. N. i. p. 248.

[N. Bohol, ♂, November. ♀, November: iris chocolate; nails and bill black; legs and feet dirty orange.]

New to the Philippines.

36. *LIMOSA LAPPONICA*.

[N. Bohol, ♂, November.]

37. *RHYACOPHILUS GLAREOLA* (182).

[N. Bohol, ♂, November: iris dark brown; bill and nails black; legs and feet yellow-green.]

38. *TRINGOIDES HYPOLEUCOS* (183).

[N. Bohol, ♂ ♀, October and November.]

39. *TOTANUS INCANUS*.*Scolopax incanus*, Gm. S. N. i. p. 658.

[N. Bohol, ♂ ♀, November: iris chocolate-brown; legs and feet dirty chrome; nails black; bill dark dull grey, base yellow.]

40. *TEREKIA CINEREA*.*Scolopax cinerea*, Guldenstadt, N. Comment. Ac. Sc. Imp. Petropol. xix. p. 473, t. 19 (1775).

[N. Bohol, ♂ ♀, October.]

New to the Philippines.

41. LIMICOLA PLATYRHYNCHA.

Tringa platyrhyncha, Temm. Man. d'Orn. p. 398 (1815).

[N. Bohol, ♀, October.]

The specimens have been submitted to Mr. Dresser, who is of opinion that they belong to this species and not to *L. sibirica*.

42. TRINGA ALBESCENS.

Tringa albescens, Temminck, Pl. Col. 41, f. 2.

[N. Bohol, ♂ ♀, October and November.]

New to the Philippines.

43. GALLINAGO SCOLOPACINA (187).

[N. Bohol, ♂, November.]

44. BUBULCUS COROMANDUS (194).

[N. Bohol, ♀, October.]

45. HERODIAS GARZETTA (195).

[N. Bohol, ♂, October.]

46. DENDROCYGNA VAGANS (203).

[N. Bohol, ♂ ♀, October and November.]

47. STERNA BERGII.

Sterna bergii, Licht. Verz. d. Doubl. Berl. Mus. p. 80.

[N. Bohol, ♂ ♀, November.]

9. On a new Species of Starling. By O. FINSCH,
Ph.D., C.M.Z.S.

[Received June 17, 1878.]

This species, which I propose to name after General Poltaratzky, Governor of Semipalatinsk, is easily distinguishable from our common Starling by having the back green instead of purplish-violet, and the underparts below the neck of a deep purplish-violet instead of green as in the remaining species.

I found this Starling breeding on Lake Marka-Kul, in the Chinese High Altai, about 5000 feet above the sea-level. A careful comparison of it with the rich series of *Sturni* in the British Museum has convinced me that it belongs to a distinct species hitherto confounded with *St. vulgaris* and its allies. The British Museum contains fifteen specimens of the same bird from North-Western India, Persia, and Baluchistan. Specimens from the two last-named localities are marked *St. unicolor* and *St. vulgaris* by Mr. Blanford. The single specimen of a Starling brought home by Mr. Seebohm from the Yenisey belongs also to this species. It is the *St. humei*, Gould (1877), but not of Brooks (1876), and most probably also the *St. vulgaris* of Radde and Schrenck from Eastern Siberia. The

group to which our common Starling belongs contains the following species:—

St. vulgaris, L.; *St. indicus*, Hodgs. (Nepaul); *St. humei*, Brooks (= *nitens*, Hume, = *ambiguus*, Hume); *St. purpurascens*, Gould; and *St. poltaratskyi*, mihi (= *humei*, Gould).

All these species are well marked, and distinguishable even in winter plumage and in the young state, as I intend to show in a more extended description of them.

10. On new Species of Coleopterous Insects (Geodephaga and Longicornia) taken by Dr. Stoliczka during the Forsyth Expedition to Kashgar in 1873-74. By H. W. BATES, F.Z.S.

[Received June 17, 1878.]

The following are preliminary diagnoses of new genera and species of Coleoptera, of the groups above mentioned, taken during the mission of Sir T. Douglas Forsyth to the Amir of Kashgar in 1873-4. Complete descriptions will hereafter appear in the general work on the results of the expedition, now in course of publication at Calcutta.

GEODEPHAGA.

CICINDELA STOLICZKANA.

C. burmeisteri (Fischer) *affinis, sed minor*. *Nigra; corpore subtus, pedibus antennarumque basi chalybeo-violaceis; elytris lunula humerali et apicali fasciaque mediana, lata, abbreviata, recta flavo-albis; thorace brevi, lateribus fere rectis, supra subtilissime granulatim strigoso; elytris minute, haud confertim granulatis; palpis nigris, albo-setosis; labro albo, convexo, antice medio rotundato producto, unidentato; corpore subtus pedibusque sparsim albo-pilosis.*

Long 6-7½ lin.

North of the Kuen-lun. Exact locality not given.

CARABUS STOLICZKANUS.

C. caschmirensi (Kollar) *affinis*. *Maxime elongatus et angustus, niger subnitidus; thorace late subcordato-quadrato, angulis posticis retrorsum productis, acutis; elytris angustis, post medium perparum rotundato-dilatatis, dorso tuberculorum triplici serie, inter se carina unica separatis; menti dente verticaliter exstante, valde compresso.*

Long. 14-15 lin.

Murree.

DICHIROTRICHUS ALTICOLA.

Oblongus, supra testaceo-fulvus, capite (maculis rufis exceptis),

thoracis macula discoidali alteraque elytrorum postico-discoidali nigro-ceneis; palpis apice acuminatis; capite et thorace grosse subsparsim punctatis, hoc postice angustato, angulis posticis oblique rotundatis, margine postice arcuato; elytris striatis, interstitiis medio leviter culminatis, biserialim punctatis; corpore subtus nigro; antennis fuscescentibus. ♂. Tarsi duo antichi articulis 1^o-3^{um} ovatis, 4^o bilobo.

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

Pamir, between Sirikol and Panga.

HARPALUS CÆRULEATUS.

Elongato-oblongus, glaber; thorace transversim quadrato, postice distincte angustato, lateribus arcuatis, angulis posticis rotundatis, basi utrinque late subcrebre punctato, margine basali bisinuato; elytris apice fortiter sinuatis, supra striatis, interstitiis planis, impunctatis, tertio unipunctato.

♂ *supra capite thoraceque nigris, politis; elytris cæruleis, subviolaceis, nitidis; antennis nigris, articulo basali rufo; corpore subtus nigro, pectore medio pedibusque rufopiceis; abdomine minus nitido. Immaturus toto corpore castaneo-rufo, elytris violaceis.*

♀ *nigro-vel rufo-castanea, raro obscure nigra; elytris opacis, interdum violaceo tinctis, apice fortius (sicut in H. æneo ♀) sinuatis.*

Long. $5\frac{1}{2}$ -6 lin.

Yangi Hissar.

HARPALUS MELANEUS.

H. calceato (Dufts.) forma coloreque similis, at thorace fere impunctato, angulisque posticis obtusis. Oblongus, modice elongatus, niger nitidus, elytris ♀ opacis; antennis et palpis nigris, articulis omnibus apice piceo-rufis; thorace transversim quadrato, postice leviter angustato, angulis posticis obtusis, lateribus antice modice arcuatis, basi utrinque vage vix punctato, fovea lineari impresso; elytris apice paullulum sinuatis, supra convexis, simpliciter striatis, interstitiis modice convexis, tertio unipunctato.

Long. 6 lin.

Sind valley; Murree; near Leh.

HARPALUS TURCULUS.

Oblongus, niger, ♂ nitidus, ♀ sericinitens; antennis articulo primo rufo, palpis apice flavis; capite modice angusto, lævi; thorace quadrato, antice prope angulos rotundato-angustato, postice lateribus exacte parallelis, elytris multo angustiore, angulis posticis rectis, supra impunctato; elytris utroque sexu apice fortiter subrecte sinuatis, supra subtiliter striatis, interstitiis planis, tertio unipunctato; metasterno grosse sparsim punctato.

Long. 4 lin.

No locality. Probably near Yarkand.

HARPALUS INDICOLA.

Elongato-oblongus, angustior, nigerrimus, ♂ magis, ♀ minus niti-

da, palpis et antennis fulvis; thorace quadrato, lateribus leniter arcuatis, postice longe angustato, angulis posticis obtusis, basi tota subsparsum punctata et paulo rugosa, fovea utrinque obliqua; elytris convexis, apice modice sinuatis, supra striatis (♂ fortius), interstitiis vix convexis, tertio puncto conspicue impresso; sternis et ventre lateribus grosse haud profunde punctatis.

Long. 5 lin.

Murree.

HARPALUS MASOREOIDES.

Parvus, niger subsericeus, lævis, partibus oris antennisque flavo-testaceis, pedibus magis rufescentibus; thorace transverso, elytris vix angustiore, antice gradatim paullulum angustato, angulis posticis rotundatis, lævi, foveola basali utrinque oblonga, marginibus rufescentibus; elytris oblongis, apice late obtusis, leviter sinuatis, supra striatis, striis minutissime punctulatis, interstitiis vix convexis, marginibus reflexis et epipleuris piceo-rufis.

Long. $2\frac{1}{2}$ lin.

Pamir, between Sirikol and Panga.

HARPALUS LIODES.

Ovatus, latus, modice convexus, niger, ♂ sericinitens, ♀ sericiopacus, antennis palpisque piceo-rufis, illis nigro maculatis, tarsis piceo-rufis; capite lato, lævigato, oculis minus prominulis; thorace valde transverso, antice angustato, postice multo latiore, angulis posticis rectis, fere impunctato; elytris ovatis, apice paullulum sinuatis, supra subtiliter striatis, interstitiis planis, tertio minute unipunctato.

Long. $5-5\frac{1}{2}$ lin.

No locality. Probably near Yarkand.

HYPOLITHUS PERLUCENS.

Piceo-niger, læte iridescens, glaber, antennis, palpis et pedibus fulvo-testaceis; capite lævissimo, post oculos angustato, fovea frontali lineari versus oculum curvata; thorace quadrato, lateribus leniter fere æqualiter arcuatis, angulis posticis valde obtusis, margine postico late sinuato, supra limbo toto crebre subtiliter punctulato, polito, marginibus rufescentibus; elytris fortiter striatis, interstitiis paullulum convexis, politissimis, tertio (prope striam secundam) multipunctato.

Long. $4\frac{1}{2}$ lin. ♀.

Jhelam valley.

HYPSINEPHUS, nov. gen.

A genere Selenophoro differt pedibus elongatis, validis, tarsisque ♂ articulis dilatatis cordatis, primo basi gracili, apice subito dilatato, 4^{to} breviter bilobo. Mentum edentatum; elytra interstitiis alternis pluripunctatis.

HYPISINEPHUS ELLIPTICUS.

Piceo-niger vel castaneus; partibus oris, antennis pedibusque fulvo-testaceis; thorace quadrato, elytris angustiore, lateribus postice explanatis, angulis posticis obtusis, supra impunctato; elytris elongato-ovatis, striatis, interstitio tertio punctis quinque parvis, quinto versus basin duobus, septimo versus apicem pluribus impressis.

Long. 6 lin.

Pangong valley.

AMARA BAMIDUNYÆ.

A. triviali (Dufts.) *affinis. Ovata, subtus viridi-cænea, supra cænea, antennis articulis 2 basalibus rufis; pedibus nigro- vel cæneo-piceis; thorace quam in A. triviali brevior, basi impunctato; elytris striis subtilibus, apice haud profundius impressis, distincte punctulatis, interstitiis planis.*

Long. $3\frac{1}{2}$ –4 lin.

Pamir, between Sirikol and Panga.

AMARA AMBIGENA.

Breviter ovata, nigro-cænea polita, ventris apice rufo, palpis, antennis basi, pedibus elytrorumque epipleuris rufis; elytris interdum castaneis; thorace brevi, antice gradatim rotundato-angustato, apud basin elytris paulo angustiore, margine basali flexuoso, angulis posticis subacutis, foveolis basi utrinque duabus latis, sparsim grosse punctatis; elytris brevibus, punctulato-striatis, interstitiis planis; menti dente elongato triangulari, apice anguste fisso.

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

Between Tanktze and Chagra, Pangong valley.

LEIOCNEMIS HIMALAICA.

Elongato-ovata, rufo-picea, supra cæneo tineta; partibus oris, antennis pedibusque flavo-testaceis; thorace brevi, transverso, lateribus fere æqualiter arcuatis, antice paulo magis postice angustato, angulis posticis obtusis, lateribus paullulum explanatis, foveolis basalibus grosse sparsim punctatis, interiore rotundata, exteriori vage impressa, carinaque obsoletissima; elytris acute et simpliciter striatis, interstitiis planis.

♂. *Tibicæ intermediæ subtus medio sinuatæ, deinde paullo dilatatæ et denticulatæ.*

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

Ladakh.

LEIOCNEMIS TARTARIÆ.

Oblongo-ovata, modice convexa, nigra, polita, supra cænescens; partibus oris, antennis pedibusque piceo-rufis; thorace valde transverso, lateribus fortiter arcuatis, antice et postice fere æqualiter angustato, angulis posticis distinctis sed obtusis, basi utrinque foveis duabus modice impressis, fortiter punctatis; elytris punctulato-striatis, interstitiis planis; prosterno apice late rotun-

dato, marginato; meso- et metasternis punctatis; menti dente lato, magno, bifido.

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

Between Yangi Hissar and Sirikol.

LEIOCNEMIS FRIVOLA.

Parva, oblonga, subtus rufo-castanea, supra nigro-cænea vel cænea, elytris interdum castaneis cæneo tinctis; partibus oris, antennis pedibusque rufo testaceis; thorace transversim quadrato, lateribus leniter arcuatis, postice minus quam antice angustato, mox ante basin paullulum sinuato, angulis posticis fere rectis, foveis basalibus grosse punctatis; elytris punctulato-striatis; menti dente bifido, plano.

Long. $2\frac{1}{2}$ lin.

No locality. Probably near Yarkand or eastern slopes of Pamir.

AMATHITIS BADIOLA.

A. rufescenti (Dej.) proxime affinis, at angustior corporeque infra nigro. Subtus nigra, supra capite thoraceque rufo-castaneis (illo obscuriore); elytris subfusco-badiis, interdum cæneo-nitidis, striis obscurioribus; oculis multo minus quam in A. rufescente prominulis; thoracis angulis posticis vix rectangularibus (sed apice acutis), basi tota discrete punctata, carina vix elevata; elytris punctulato-striatis, interstitiis planis; menti dente prominulo, triangulari.

Long 4 lin.

North of Kuen-Lun. One example ticketed "Sanju."

AMATHITIS KUENLUNENSIS.

Valde elongatus, pallide ferrugineus, antennis pedibusque gracilibus, illarum articulo 3^o cæteris multo longiore; thorace elytris multo angustiore, late cordato, lateribus antice fortiter arcuatis, postice sinuatim angustato, angulis posticis acutis, supra impunctato, foveis basalibus latis, vagis, carinaque prope angulum indistincte elevata; elytris elongato-ovatis, apice paulo sinuatis, striis lævibus, modice impressis.

Long. 5 lin. ♀.

Sanju.

BRADYTUS COMPACTUS.

Breviter oblongo-ovatus, latus, subcæneo-niger, convexus; capite brevi et crasso, oculis parum convexis, epistomatis margine antico transversim sulcato; thorace elytris haud angustiore, postice modice angustato, angulis posticis acutis, foveolis basalibus parvis, punctatis, carinaque obsoleta; elytris simpliciter striatis, interstitiis planis; palpis, antennis pedibusque rufo-piceis; menti dente magno, apice inconspicue emarginato.

Long. 4 lin.

Murree.

CURTONOTUS PAMIRENSIS.

Elongato-oblongus, angustus, rufo-castaneus, supra olivaceo-cæneus,

thoracis elytrorumque marginibus reflexis rufescentibus; capite lævi, mox pone oculos angustato; thorace transversim quadrato, ante basin subfortiter constricto, ibique lateribus parallelis et margine laterali haud interrupto, angulis posticis rectis, basi grosse subsparsum punctato, foveis utrinque linearibus; elytris striatis, striis (versus apicem exceptis) punctatis.

♂ tibiis intermediis post medium angustatis et subacute breviter bidentatis.

Long. $4\frac{1}{2}$ –5 lin.

Pamir, between Sirikol and Panga.

BEMBIDIUM (PERYPHUS) PAMIRENSE.

Oblongum, depressum, capite thoraceque viridi-vel aurato-cæneis, politis; elytris fulvo-testaceis, vitta suturali (ante apicem abbreviata) fasciaque pone medium, interdum quoque margine et apice cæneo-fuscis; antennis, palpis pedibusque flavo-testaceis; thorace breviter cordato, antice fortiter rotundato, basi rugato, angulis posticis rectis, fovea utrinque profunda carinulaque obliqua; elytris striato-punctatis, interstitiis planis.

Long. $2\frac{1}{4}$ lin.

Pamir, between Sirikol and Panga.

BEMBIDIUM (PERYPHUS) PUNCTULIPENNE.

Subdepressum, cæneo-nigrum, politum, mandibulis piceo-rufis; thorace antice leniter rotundato, postice usque ad angulos angustato, his fortiter reflexis, obtusis, margine basali utrinque prope angulum valde obliquo, supra basi et margine rugulosis, fovea oblonga; elytris punctato-striatis, striis 1^o–4^{um} solum impressis, 6^a et 7^a obsolete, interstitiis planis, minutissime sparsim punctatis.

Long. vix 2 lin.

No locality. Pamir or near Yarkand?

MOLOPS PILIFERUS.

Niger, nitidus; thorace late cordato, post medium subsinuatim angustato, angulis posticis rectis, antice juxta marginem lateralem punctis decem longe piliferis lineatim dispositis; elytris elongato-ovatis, convexis, prope apicem fortiter sinuatis, supra exarato-striatis, striis 7^a et 8^a valde approximatis, 7^{ma} continuo punctatis, punctis longe piliferis, interstitiis dorsalibus planis, 3^o et 5^o apice pilifero-punctatis.

Long. 6–7 lin.

Murree.

ANCHOMENUS LADAKENSIS.

A. parumpunctato (Linn.) proxime affinis, sed gracilior, thorace longiore, etc. Supra subfusco-cupreus, capite thoraceque magis cæneis, interdum toto viridi-cæneus; femoribus nigro-piceis, tibiis tarsisque rufopiceis; antennis piceo-fuscis, articulo basali rufo; thorace subquadrato, lateribus leniter arcuatis, angulis posticis rotundatis, ibique margine explanato-reflexo, toto limbo alutaceo;

elytris elongatis, parallelis, acute striatis, interstitiis planis, tertio 5-punctato.

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

Between Tangtze and Chagra, Pangong valley; also Pamir, between Sirikol and Panga.

ANCHOMENUS POLITISSIMUS.

A. fuliginoso (Panz.) forma subsimilis, nigro-æneus, politissimus, capite breviter ovato, oculis vix prominulis; palpis art. ult. acuminatis; thorace postice angustato, angulis posticis oblique rotundatis, margine prope angulum valde reflexo; elytris versus apicem valde sinuatis, supra obsolete striatis, disco utrinque haud conspicue bipunctato; pedibus æneis, tibiis rufo-testaceis.

Long. $2\frac{1}{2}$ lin.

Murree.

COLPODES OVALICEPS.

Minus elongatus, nigro-chalybeus, nitidus; elytris ampliatis, ovatis; capite parvo, ovato, oculis haud prominulis; menti dente apice sulcato-emarginato; thorace ovato, quam caput dimidio latiore, margine laterali æqualiter explanato, subreflexo, angulis posticis subrotundatis; elytris convexis, late ovatis, apice vix sinuatis, humeris rotundatis striatis, interstitiis planis, tertio tripunctato; metasterni episternis brevibus; antennis, palpis pedibusque rufo-piceis, femoribus nigris.

Long. 5 lin.

Murree.

METABLETUS TARTARUS.

M. truncatello (Linn.) paullo major, magis elongatus, subcæoeniger, nitidus, antennis et pedibus fusco-piceis; thorace quam in M. truncatello magis angustato, angulis posticis obtusioribus, deinde usque ad basin magis obliquis; elytris elongatis, apice obtuse subsinuatum truncatis, obsolete striatis, impunctatis.

Long. $1\frac{3}{4}$ lin.

Between Yangi Hissar and Sirikol.

CYMINDIS GLABRELLA.

C. andræ (Ménétr.) affinis, at gracilior, oculis minus prominulis, elytrisque fusco-castaneis flavo marginatis. Gracilis, glaberrima, castaneo-rufa, abdomine margine picescente, capite obscuriore, partibus oris, antennis, pedibus elytrorumque margine fulvotestaceis; capite angusto, sparsim punctulato; thorace quam caput haud latiore, anguste cordato, lateribus postice leviter sinuatis, angulis posticis fere rotundatis, subpunctulato-striatis, interstitiis sparsim punctulatis.

Long. $4-4\frac{1}{3}$ lin.

Ladakh.

LONGICORNIA.

PRIONUS CORPULENTUS.

♀ *magna, elongata, nigro-castanea, supra omnino coriacea vix nitida; thorace parvo, utrinque acute trispinoso; elytris versus basin parallelis, compressis, deinde modice dilatato-rotundatis, apice late obtusis; pectore toto dense fulvo-hirto; abdomine politissimo; antennis 12-articulatis, grosse punctatis, articulis 3^o-11^{um} serratis.*

Long. 24 lin.

Murree.

HESPEROPHANES CRIBRICOLLIS.

Cylindricus, fulvus, pubescentia incumbente cinereo-fulva apud elytra maculatim vestitus; thorace rotundato, elytris multo angustiore, inaequali, lateribus medio subtuberoso, supra crebre alveolato-punctato; scutello cinereo; elytris omnino discrete punctatis, haud conspicue bicarinatis, apice gradatim angustatis, subacuminatis.

Long. 8-9 lin.

Murree.

TRINOPHYLUM, nov. gén.

Gen. Hesperophani affine, sed femoribus abrupte clavatis, oculisque minus fortiter granulatis. Corpus elongatum, subdepressum, breviter suberecte pubescens, crebre punctatum. Caput brevissimum: tubera antennifera haud elevata; palpis brevissimis. Thorax rotundatus, inermis. Elytra apice obtusa. Acetabula antica extus haud elongata. Prosternum angustum; mesosternum latum, subconvexum; metasterni episterna elongata, angusta, postice attenuata. Antennæ filiformes, corpore paullo breviores, articulo 4^{to} paulo abbreviato.

TRINOPHYLUM CRIBRATUM.

Castaneo-fuscum, subnitidum, omnino suberecte fusco-pubescens, crebre sed discrete punctatum; thorace supra antice et postice paullo depresso, linea dorsali lævi; elytris lineis duabus indistinctis, lævibus.

Long. 6½ lin.

Murree.

LEPTURA RUBRIOLÆ.

L. sanguinolentæ (Linn.) affinis. Nigra, subtus sparsim fulvo-pilosa, thoracis plaga magna discoidea elytris que rufo-opacis; capite et thorace reticulato-punctatis, illo paullo post oculos subito et fortiter constricto; thorace medio haud conspicue dilatato, modice convexo, angulisque posticis modice productis; elytris subcrebre punctulatis, apice recte truncatis, angulisque breviter dentatis. ♀.

Long. 6 lin.

Murree.

CLYTANTHUS IGNOBILIS.

Cl. 4-punctato (Fabr.) *proxime affinis*. *Nigro-fuscus, tomento cinereo-flavo vestitus; elytris utrinque maculis 5 nigris, quam in Cl. 4-punctato majoribus, scilicet 1 curvata post scutellum, 1 parva humerali, 1 antico-discoïdali, 1 mediana majore transversa et 1 huic proxima longitudinali oblonga.*

Long. 6 lin.

Murree.

11. On a new Species of *Notauges* (*N. hildebrandti*, Cab.).

By Dr. G. HARTLAUB.

[Received June 17, 1878.]

The Museum of Natural History of Bremen has been enriched of late with a fine adult specimen of a new typical *Notauges*, discovered by the famous traveller Mr. Hildebrandt, in Eastern Africa. The exact place where he collected this interesting bird is "Tkanga in Ukamba."

Mas ad. *capite, gutture, dorso, tergo, uropygio, supracaudalibus, tectricibus alarum minoribus margineque alari chalybeis, nitore purpurascente; collo postico late et circumscripte æneo-virescente; alis duabus seriebus macularum holosericeo-nigrarum bifasciatis; tectricibus alarum majoribus viridi-æneis; remigibus primariis in pogonio externo æneo-cærulescentibus, obscure maculatis, interno nigris; tectricibus minoribus in pogonio externo unicoloribus æneo-virentibus; pectore, abdomine, cruribus et subcaudalibus cinnamomeo-rufis; subalaribus majoribus rufis, minoribus chalybeis; rectricibus cærulescenti-æneis, minus distincte undulatis; rostro et pedibus nigris; iride aurantiaco-rubra.*

Long. 19 centim., rostr. a fr. 18 mill., al. 123 mill., caud. 83 mill., tars. 30 mill.

The steel-blue colour of the head is less brilliant on the crown; there appear some rufous feathers on the uropygium; and some of the upper tail-coverts have a slight rufous terminal edging; the first primary is of a uniform blackish colour.

In *Notauges superbus* (Abyssinia, Shoa) the colouring is very different: the upper parts are brown-green, the vent and under tail-coverts are white, and there are other differences.

Mr. Hildebrandt told me that during his many excursions in East Africa he never met with *Notauges albicapillus*, Blyth. This is certainly one of the rarest birds, the Calcutta specimen collected by Speke and Burton being as yet the only one known.

12. Description of a new Batrachian from Southern India, belonging to the family Phryniscidæ. By Lieut.-Col. R. H. BEDDOME, C.M.Z.S.

[Received June 17, 1878.]

MELANOBATRACHUS, gen. nov.

Toes cylindrical, not dilated at the ends; no maxillary or vomerine teeth; ear imperfectly developed, no parotids; sacral vertebra dilated; toes webbed; body slender, elongate, uniform in width; muzzle short, obtuse; fingers and toes short, metatarsus with a slightly swollen inconspicuous tubercle.

MELANOBATRACHUS INDICUS, n. sp.

Body with nearly parallel sides as in *Ansonia*; no canthus rostralis, no sign of a tympanum or cavum tympani; cleft of mouth extends nearly as far back as the eyelid, the space between the nares $\frac{1}{10}$ of an inch; fingers 4, free, short, the third double as long as the others; toes 5, slightly webbed, the fourth much longer than the third. Eustachian tubes closed, tongue rounded and free behind, surface of the head and body tubercled, arms smooth, the humerus short, hind limbs tubercled, the thigh shorter than the calf; belly and sides smooth. Colour black, with minute white dots on the back and larger ones on the belly, the thighs near their junction with the body are girt with a brilliant scarlet band, $\frac{1}{4}$ inch in breadth, either continuous all round or interrupted above; and there are sometimes a few scarlet blotches on the anterior portion of the belly between the fore legs and sometimes on the lower portion of the humerus (the scarlet colour of these markings fading to cream-colour in spirits). Length of body $1\frac{1}{4}$ to $1\frac{3}{8}$ inch, length of hind limb to end of fourth toe $1\frac{1}{2}$ to $1\frac{3}{4}$ inch.

Hab. The Anamallays and the Ghat range to the south of those mountains, very rare, in moist evergreen forests of 4000 feet elevation, under old rotten logs. The specimens found were all in quite a torpid state and curled up almost into a ball, but became very active when put in spirits.

Dr. Anderson, who has kindly prepared the skeleton of one of these Batrachians, informs me that its osteology much more resembles that of *Bufo* than *Rana*; the skull is short and broad, and the frontals and parietals have considerable lateral extension; it is also edentulous, and there are no vomerine eminences; a careful examination of the sternum does not reveal the existence of any omosternum; clavicles are present. Dr. Anderson was not able to detect any tympanum under the skin; nor could he trace a tympanic cavity. He mentions that the stem of the stapes is not developed, and moreover that he could not detect any Eustachian openings in the mouth.

There are only from 8 to 9 vertebræ in *Bufo melanostictus*; and the

first vertebra, which has considerable length and breadth, is marked on its under surface by a prominent ridge which does not occur in the above-mentioned Indian toad.

The transverse processes of the sacral vertebra are dilated as in *Bufo*.

13. On *Gazella granti*. By Sir VICTOR BROOKE,
Bart., F.Z.S.

[Received June 17, 1878.]

Some years ago (*vide* P. Z. S. 1872, p. 601. pl. xli.) I had the pleasure of bringing before the Society's notice a species of *Gazella* which I supposed to be new, and upon which I conferred provisionally the name *Gazella granti*. My original description of the species was based on small water-colour sketches of the head and flat skins of a male and female obtained by Capt. Speke and Col. Grant in Ugogo, which were executed by them previous to the dispatch of the specimens to England. When writing my first notice, I believed that these specimens had been lost, there being no record of their arrival at the Society's rooms, where Capt. Speke had expressed a wish that they should be kept until his return; but Col. Grant has since informed me that they reached England safely and are still preserved along with some other objects of natural history collected by Capt. Speke, in Capt. Speke's father's house.

In 1875 Dr. Kirk presented to the Society (*vide* P. Z. S. 1875, p. 527, pl. lix.) the first living specimen of the species which had ever been exhibited in Europe. Unfortunately the animal, a very young female, arrived in very delicate health, and died shortly afterwards. It is now preserved in the British Museum (spec. 75. 12. 29. 4), whither it was transferred after Mr. Sclater's exhibition of it to the Society. It was not, however, till towards the end of last year that the first specimen of an adult male of this magnificent gazelle came under my personal observation. The animal was shot by Mr. Charles Arkwright, about 8 miles from the village of Tubugwe, which is situated, as nearly as Mr. Arkwright could ascertain, about 50 miles N.E. of Ugogo. It was one of a herd composed of about 20 individuals, amongst which there was one other old male. Mr. Arkwright has most kindly intrusted his valuable trophy to my care; so that I am enabled to exhibit it to the Society this evening, and to base upon it and upon the young female in the British Museum a fuller and more accurate description of the species than was possible at the time of my original notice.

GAZELLA GRANTI.

1863. *Antilope soemmerringii?* Speke, P. Z. S. 1863, p. 3, sp. 15.

1872. *Gazella granti*, Brooke, P. Z. S. 1872, p. 601, pl. xli.

1873. *Gazella granti*, Brooke, P. Z. S. 1873, p. 550.

1875. *Gazella granti*, Sclater, P. Z. S. 1875, p. 535.

General colour very rich fawn tinged with purple, the neck and

body in certain lights mottled like watered silk ; this pattern is gained by indefinitely bounded bands of darker hair. Central facial band¹ darker than the neck and body, and strongly tinged with rufous on the forehead. A large black patch above the nostrils. Light facial streaks very definite, white. Dark facial streak black, extending

Fig. 1.

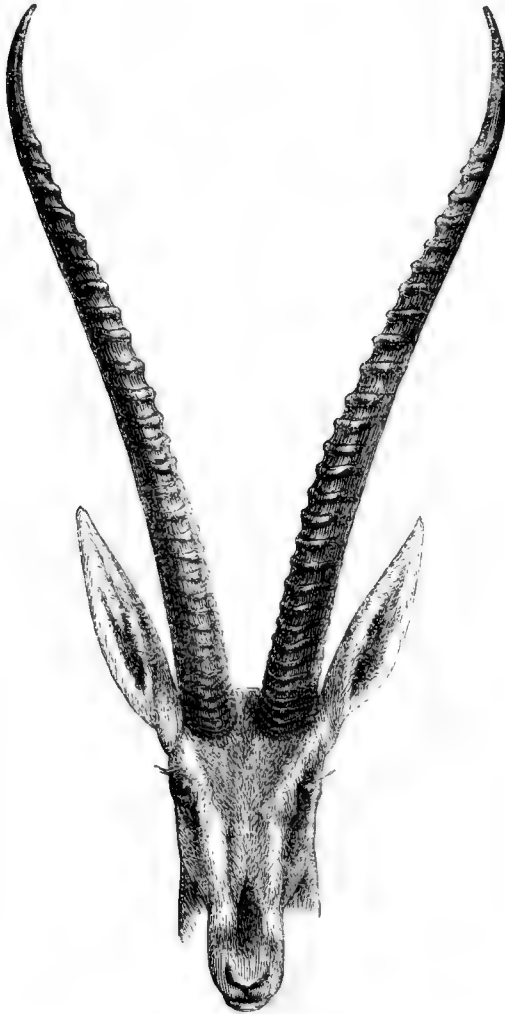
*Gazella granti.*

from the base of the horn to the eye, which it almost encircles, and from the eye to above the corners of the mouth. Posterior to the eye is a small white patch. External surface of the ear-conchs streaked with dark brown. Dark lateral and pygal bands distinctly marked ; the former grizzled, the latter very broad and jet-black.

¹ For a detailed definition of the terms used in this description, *vide* P. Z. S. 1873, p. 536.

Lower two thirds of the tail black, the upper third white. The tip of the tail is tufted; for the remainder of its length it is furnished with coarse hairs which project at right angles to its axis. Chin, lower surface of the head, breast, belly, inside of limbs and rump white, the white of the rump extending forwards in an angle into the darker colour of the body. Knee-brushes of moderate length,

Fig. 2.



Gazella granti.

grizzled. Horns of great length in both sexes, much compressed from side to side, marked by strong annulations which completely surround the horn for the proximal half of its length, but become obsolete on the posterior surface of its distal or upper half. The horns diverge at first gradually, then more boldly, their tips con-

verging and giving to the set of the horns a remarkably perfect lyrate form.

The skull is in every respect typically Gazelline.

Dimensions of Mr. Arkwright's head and horns (figs. 1 and 2, pp. 724, 725).

	English Inches.	Metre.
Length of horns round the curve	24.0	0.610
Length of horns in a straight line	23.0	0.580
Circumference of horns at base	6.6	0.170
Distance between the tips.....	13.0	0.330
Length of ears	6.5	0.165

Dimensions of the young female in the British Museum, of which the dentition is d. i. $\frac{0}{3}$, d. c. $\frac{0}{1}$, d. m. $\frac{3}{3}$, m. $\frac{1}{1}$.

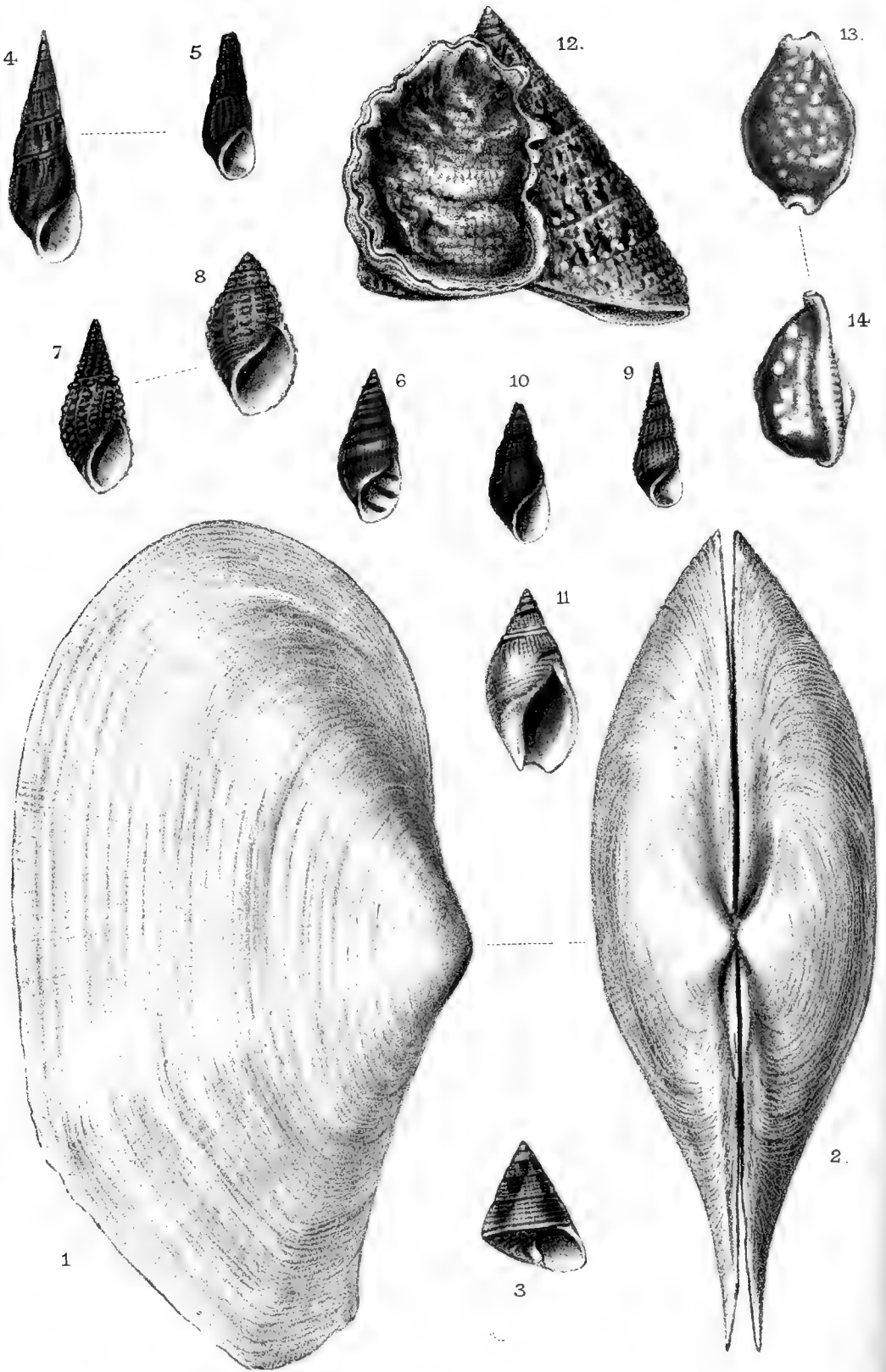
	English Inches.	Metre.
Height at shoulder	28.0	0.710
Length of horns	7.5	0.190
Length of ears	5.5	0.140
Length of tail.....		
Length of tail, exclusive of hair	6.5	0.165

The horns of the adult female shot by Capt. Speke and Col. Grant in Ugogo measured 15 inches round the curve.

Comparison with allied Species.

Gazella granti belongs, as pointed out in my former description, to the group of long-limbed large Gazelles which are distinguished by the white of the rump projecting in an angle into the fawn-colour of the back and sides (*vide* P. Z. S. 1873, p. 537, B'). The allied species are *G. sœmmerringi*, *G. mohr*, and *G. dama*. From all these it differs in the very much greater size, and in the form of the horns. It is also peculiar in the presence of the dark lateral band, which is wanting in the three above-named species, and in the remarkably definite black pygal band, which is only shown in very young specimens of *Gazella sœmmerringi*, is absent entirely in *Gazella dama*, and only indefinitely shown in *Gazella mohr*. In the watered-silk mottling of the neck and back *Gazella granti* differs from all other known Gazelles.





C. Berjeau lith

Mintern. Bros & Co.

14. Descriptions of two new Species of Shells from China and Japan. By CARL BOCK, F.G.S. &c.

[Received June 18, 1878.]

(Plate XLVI.)

TELLINA WROBLEWSKYI. (Plate XLVI. figs. 1, 2.)

Shell subovate, slightly inequilateral, gaping at both ends, marked with coarse and rather distant concentric lines of growth, covered with fine radiating striæ, pellucid at intervals, with concentric opaque layers, the posterior region also being somewhat opaque. Colour bluish white stained with grey, especially at the posterior end. The latter portion is $\frac{1}{9}$ longer than the anterior, acuminate produced, and terminates in a somewhat obtuse angle. Anterior margin rounded, ventral but slightly arcuate, almost rectilinear near the middle; posterior dorsal slope deeply excavated, the valves being strongly carinate from the umbo towards the posterior extremity, with a deep excavation between the keel and the extreme margin. Cardinal teeth 2 in the left valve, 1 in the right. Anterior muscular impression very elongated near the margin, posterior irregularly quadrate. Ligament situated on a narrow ledge of the posterior dorsal slope, marked off by an incised line, and extending from the umbo nearly 20 millims. In both valves (principally towards the umbones) there are rather large and irregular pittings. Pallial sinus very deep, forming a subacute angle, which extends anteriorly beyond the umbo.

Breadth 112 millim., length 61 millim., diameter, with the valves closed, 39 millim.

Hab. China.

The magnificent species here described is one of the largest of the family (Tellinidæ), and resembles in outward appearance certain species of the genus *Anatina*.

I propose to associate with this beautiful shell the name of Dr. Wroblewsky of Copenhagen.

TROCHUS (THALOTIA) YOKOHAMENSIS. (Plate XLVI. fig. 3.)

Shell imperforate, acutely pyramidal, dull white, marked at intervals with irregular dark brown blotches, and the base ornamented with brown lines radiating from the centre (where they are paler, almost orange) to the periphery. Whorls 7, quite flat, spirally ridged; ridges crenulate or subgranular through being crossed by oblique raised striæ or lirulæ; on the upper whorls there are about six ridges, and on the last, which is acutely angled at the middle, they are about fourteen in number, that at the carina consisting of two or three small approximated ones, and hence broader than the rest. Aperture slightly oblique, subquadrate, upper half above the carina shallowly sulcate, lower portion smooth; columella white, callous, terminating in an oblique slight truncation. Greatest diameter 15 millim., length 18.

Hab. Yokohama, Japan.

15. Descriptions of five new Shells from the Island of Formosa and the Persian Gulf, and Notes upon a few known Species. By EDGAR A. SMITH, F.Z.S.

[Received June 18, 1878.]

(Plate XLVI.)

MELANIA FORMOSENSIS. (Plate XLVI. figs. 4 & 5.)

Shell elongate, subulate, olivaceous yellow, purer yellow beneath the whorls, marked with longitudinal, undulating, more or less interrupted and broken flammules of a dark brown colour, at the top of the whorls forming conspicuous blotches, and at the base of the body-whorl with a broad blackish-brown band. Whorls 13, a little constricted at the upper part and submarginated and somewhat convex beneath, the first 9 or 10 obliquely costate and deeply transversely sulcate, the lowermost sulcus at the suture being particularly wide, forming a canaliculation, the last three whorls only spirally sulcate and striated by obliquely flexuous lines of growth; sulci narrower than the interstices, about 10 in the penultimate whorl and 24 in the last. Aperture ovate, acute superiorly, within of the same colour as the exterior, but clouded by a white enamel, the brown flammulation and spiral basal band being visible; columella white, oblique, but slightly arcuate.

Length 33 millim., diameter $9\frac{1}{2}$; aperture $9\frac{1}{2}$ long, 5 wide.

Var. In this variety the longitudinal plicæ extend as far as the penultimate whorl, and are even partially developed on the last.

Hab. Formosa (*Dickson*).

This species, which I feel much pleasure in naming after Mr. Matthew Dickson, has been liberally presented to the Museum by him, together with the other *Melanias* here described, and a numerous series of insects.

MELANIA DICKSONI. (Plate XLVI. fig. 6.)

Shell elongate, acuminate, shining, olivaceous yellow, purplish brown at the apex, with or without spiral brown bands. Whorls 8 or 9, moderately convex, the six upper ones almost smooth, only finely striated longitudinally by lines of growth, and also transversely, the last two with a few faint transverse keels or ridges. Aperture ovate, acuminate above, occupying nearly $\frac{2}{3}$ of the entire length, white within, the brown bands of the exterior (when present) also visible. Lip thin, almost even, not prominent or sinuated; columella rather thickly callous in the umbilical region, and united to the lip above by a very thin callosity.

Length 21 millim., diameter 8; aperture $8\frac{1}{2}$ long, 5 wide.

Hab. Formosa (*Dickson*).

This is a very remarkable species, and looks more like a North-American than an Eastern form.

The brown transverse bands are present in five out of the six spe-

cimens presented to the Museum by Mr. Dickson. There are two on the penultimate whorl, one at its base, and one a little above the middle. On the body-whorl there are three, the two upper ones being continuous with those on the preceding volution, and the third at the base.

MELANIA OBLIQUIGRANOSA. (Plate XLVI. figs. 7 & 8.)

Shell elongately ovate, acuminate above, of a dirty yellowish colour, and usually coated with a black earthy deposit; spire acutely conical, with straight outlines; whorls 9-10, turreted, quite flat, obliquely plicated and spirally ridged, with nodules at the point of contact of the plicæ with the ridges; on the whorls of the spire the ridges are four in number, the granules on the uppermost one a little larger than those on the three lower ones. Body-whorl almost flat above the middle; at that point and beneath somewhat convex, encircled by 11 or 12 transverse ridges, whereof 5 or 6 of the upper ones are granuliferous, the rest either uninterrupted or displaying an indication of oblong granulations. Aperture pyriform, acute superiorly, within of nearly the same colour as the exterior, but coated with a thin smooth callous deposit occupying about $\frac{2}{5}$ of the entire length of the shell; columella considerably arcuated, at the middle white, united above to the lip by a very thin enamel on the whorl; lip thin, sinuated above and prominent below the middle.

Length 25 millim., diameter 8; aperture 10 long, 5 wide.

Var. *monstrosa*. Shell ovate; spire short; aperture more than half as long as the shell.

Hab. Formosa (*Dickson*).

This species may be recognized among the several allied forms from the Philippine Islands and other places by its very rectilinear acute spire and perfectly flat whorls. The uppermost series of granules is at a little distance beneath the sutural line; and from this circumstance the whorls have a turreted appearance. The nodules of this series are larger and fewer in number than those of the other series, and consequently do not quite regularly terminate the obsolete plicæ, upon which the other three granules are situated in an oblique direction. Some of the granules have a squarish form, others are transversely somewhat oblong; and most of them have the upper and lower margins rather straight, with the lateral edges less defined, but gradually blending off into the transverse ridges.

The colour of this species is pretty constantly uniform; one specimen, however, is marked with a few reddish dots towards the base, and these are most conspicuous within the aperture.

MELANIA TUBERCULATA, Müller. (Plate XLVI. fig. 9.)

Hab. Formosa (*Dickson*).

The shell here figured appears to be inseparable from this remarkably variable and widely distributed species.

MELANIA SUBPLICATULA. (Plate XLVI. fig. 10.)

Shell rather small, elongate, acuminate, eroded or truncate at the

apex, olive-brown, more or less coated with a black earthy deposit. Whorls probably about 9 in number, the remaining four or five slightly convex, spirally sulcate, and longitudinally sculptured with coarsish flexuous lines of growth; ridges between the sulci about 10 in the penultimate whorl and 18 in the last, those near the base separated by wider sulci than above. Aperture oval, acuminate superiorly and very slightly effuse at the base, occupying about $\frac{1}{3}$ of the supposed entire length of the shell, sordid bluish within; lip very thin, broadly sinuated above and somewhat prominent below the middle. Columella whitish, moderately arcuate.

Supposed total length 23 millim.; actual length of five remaining whorls 19, diameter $7\frac{1}{3}$; aperture $7\frac{1}{3}$ long, $4\frac{1}{3}$ wide.

Hab. Formosa (*Dickson*).

This species resembles *M. dolorosa*, Gould, to some extent; however, it is distinguishable on account of more elongated whorls and coarser spiral sulci. Some of the lines of growth here and there are well marked, and give the whorls a sublicated appearance.

BULLIA PERSICA. (Plate XLVI. fig. 11.)

Shell ovate-acuminate superiorly, greyish or lavender-colour, whitish at the upper part of the whorls, with the callous band at their base white, bordered below by a brown line at the suture; and the base or cauda of the last whorl is also white. Whorls 6, the first two smooth, convex, the rest spirally sulcated, the ridges between the sulci 8 in number in the upper whorls and about 16 in the last, whereof 12 are above and 4 below the acute ridge or keel, which winds round the lower portion of the whorl. Of these ridges the four immediately below the suture are more or less white, granulous through being crossed by oblique sulci, which only extend from the suture a short distance. Aperture deep brown within, with a paler or white border at the outer lip and over the basal sinus, and a little longer than the spire. Columella moderately arched, and coated with a thinnish white enamel. Basal sinus rather broad and deep.

Length 24 millim., diameter 10; aperture 12 long, 7 broad.

Hab. Bushire, Persian Gulf.

Two specimens of this very interesting species have recently been presented to the Museum by Mr. A. S. Betts. The peculiar form and colouring, the granular ridges at the upper part of the whorl, and the brown aperture with the white margin to the labrum and basal sinus are the most obvious distinguishing characters of the species.

OSTREA, sp., adhering to *Trochus (Polydonta) maculatus*, Linn. (Plate XLVI. fig. 12.)

This is a remarkable instance in which a shell has assumed, to a certain extent, the sculpture of another to which it has adhered. This assumption or mimicry of the surface of other shells and foreign substances has already been noticed in other species of *Ostrea* and other genera, and is common to most forms of the genus *Myochama*. The same process which effects so remarkable a change in the normal

aspect of the latter, namely the moulding of the edges of the upper valve by the animal to the surface of the substance to which the shell is attached, no doubt, was employed by the Oyster here figured; for I do not think that this alteration of outward appearance has been in any way effected by contact of the tentacular cirri which proceed from the edge of the mantle of the *Trochus*, because if this were the case some alteration in colour would have been expected.

The lower valve is white both externally and within, and, being thin, does not conceal the granular surface of the *Trochus* upon which it rests. The upper valve is olive-green within, and smooth, with the exception of the pear-shaped muscular scar and a few small granules scattered all round the margin. The exterior is dark lilac, with six obscure brownish rays, most observable towards the margin, and terminating at the digitations or prolongations at the edge.

The lamellated surface, so common to the upper valves of most Oysters, is almost altogether obliterated, and only here and there traces of it are noticeable. The exterior is rather smooth, sub-angular, the indistinct granules arranged in series corresponding to those on the *Trochus*; and the suture dividing the last and the penultimate whorls, and a depression or sulcus round the middle of the former, are also reproduced. The specimen is in the collection of Mr. Carl Bock.

CYPRÆA PEASEI, Sowerby. (Plate XLVI. figs. 13 & 14.)

Cypræa peasei, Sowerby, Thesaurus Conchyl. iv. pl. 311. figs. 167, 168.

Hab. Mauritius. Coll. Carl Bock.

The shell here figured appears to be a monstrous growth of this species. The alteration of form and the obtuse ridges on the dorsal surface are suggestive of certain forms of the genus *Ovulum*.

CONUS PASTINACA.

Much uncertainty and confusion exists with regard to the determination of this Lamarckian species. The original description of it is so brief that it is absolutely impossible ever to know with certainty what species Lamarck really had before him, more especially as the actual type (which has been lost) was never figured by him, nor does he refer to any previously published figure. The shell described and delineated by Kiener (Coq. Viv. pl. 26. fig. 2) certainly cannot be the true *C. pastinaca*. The species there represented (unknown to me) is decidedly distinct. The character of the spire does not at all agree with Lamarck's description, which is as follows:—"spira obtusa, immaculata, submucronata;" and again in French: "à spire non tachée." Kiener's shell has a rather concave elevated spire and fulvous blotches upon it.

Reeve's idea of *C. pastinaca*, figured (Conchol. Icon. i. pl. 46. fig. 257, copied by Sowerby, Thesaurus Conchyliorum, iii. pl. 201. fig. 353) from a specimen in the British Museum, is also an erroneous one. This shell I have very carefully examined, and unhesi-

tatingly pronounce it to be a bleached example of *C. virgo*; for in form and sculpture it is absolutely identical with certain specimens of that species, and differs only in colour. This variation may be due to bleaching; or it may possibly be an albino form. The purple base, which is so constant a character in this species, is traceable in a faint degree in Reeve's shell. He does not refer to this in his description; yet in the figure it has been represented by the artist.

The species figured by Weinkauff in Kuster's *Conchilien-Cabinet*, pl. 32. figs. 1 and 2, apparently is the same as or very closely allied to that depicted by Reeve.

In order to come to some decision in the matter, I communicated with Dr. Brot, of Geneva, asking him for information respecting Lamarck's species, as his types in Delessert's collection have recently been obtained by the museum of that city. Unfortunately, it appears that Lamarck's Cones are not marked as in other genera, but placed on tablets bearing the designation L. According to a catalogue of Delessert's collection, Dr. Brot informs me that there ought to be five specimens of *C. pastinaca*; but only four are now to be found; the fifth (possibly that figured by Kiener) had disappeared before the collection reached Geneva. Of the remaining four, three existed in Lamarck's cabinet. None of these, however, has the dimensions indicated by that author. Two are considered by Dr. Brot small specimens of *Conus quercinus*; for they are ornamented (indistinctly, however) with the fine thread-like brown lines which are characteristic of that species. The third shell he considers a diminutive specimen of that figured by Kiener; for it so resembles the figure, that at first he thought that it had been enlarged for Kiener's plate. Finally, the fourth specimen of *C. pastinaca*, which is not from Lamarck's collection, resembles the form figured by Reeve under this name. Thus it appears that, under the name of *C. pastinaca*, the Delessert collection contains three species, viz. the *C. pastinaca* of Kiener (young), that of Reeve, also young, and, lastly, two small specimens of *Conus quercinus*. The question which now has to be settled is this:—Is the specimen in Delessert's collection, which is similar to Reeve's figure, really the same species as that delineated? if not, may it not be the true *pastinaca*?

In the British Museum the shell which accords most closely with the Lamarckian diagnosis is a worn specimen of *C. tabidus*, Reeve, figured in the '*Conchologia Iconica*' under the name of *C. hepaticus*, Kiener (*Conch. Icon. Suppl.* pl. viii. fig. 278).

EXPLANATION OF PLATE XLVI.

- Figs. 1, 2. *Tellina wroblewskyi*, p. 727.
 3. *Trochus (Thalotia) yokohamensis*, p. 727.
 4. *Melania formosensis*, p. 728.
 5. — *formosensis*, var., p. 728.
 6. — *dicksoni*, p. 728.
 7. — *obliquigranosa*, p. 729.
 8. — *obliquigranosa*, var., p. 729.
 9. — *tuberculata*, p. 729.

Fig. 10. *Melania subplicatula*, p. 729.

11. *Bullia persica*, p. 730.

12. *Ostrea*, attached to a *Trochus*, whose character of sculpture it has assumed, p. 730.

13, 14. *Cypræa peasei*, var. *monstrosa*, p. 731.

16. Descriptions of some apparently new Species of Butterflies from New Ireland and New Britain, sent by the Rev. G. BROWN. By F. D. GODMAN and O. SALVIN.

[Received June 18, 1878.]

The five species described below form part of a collection just received from Mr. G. Brown. We are preparing a full report of this collection, which we hope to lay before the Society in the autumn. In the mean time we have thought it desirable to publish the following descriptions.

EUPLŒA ERIMAS.

♂. Exp. 3·7. Upper surface rich steel-blue, a large patch of bluish white on the primaries cut by the dark median nervure and its branches and by the nervules at the end of the cell; there is a dark triangular spot in the acute angle between the median nervule and its first branch; the inner margin of the primaries is strongly convex, and covers a brown patch on the secondaries; the secondaries have a whitish median band cut by the nervules, one section falling inside the cell; the inner edge of this band is deeply sinuated, as also is the outer edge to a less extent.

Beneath greenish black, the spots of the upper surface are much more broken up, that on the primaries being divided into eight separate portions, the largest of which lies just within the cell; that on the secondaries is broken into eleven portions, one of which occupies the end of the cell.

Hab. New Ireland.

Obs. Allied to *E. jessica* from the Fiji Islands, and more remotely to *E. eupator*, Hew., from Celebes. From the former it differs in having the markings on the upper surface bluish white instead of yellow, and the spot on the upper wing is not broken into two as shown in Mr. Butler's figure (Lep. Ex. pl. 8. fig. 3).

PIERIS MADETES.

♂. Exp. 3·5. Above uniform orange, apex and costa of primaries black.

Primaries beneath black, a large spot at the end of the cell and seven large elongated submarginal spots yellow; a pale yellowish patch spreads from the inner margin over the median branches to just within the cell; secondaries orange, base and outer margin black, the latter including a row of six large yellow spots; a large red spot between the costal and subcostal nervures near their origin.

♀. Exp. 3·8. Above, primaries black, a large yellowish spot at

the end of the cell and six submarginal spots running from the costa to the anal angle, those nearest the latter nearly white; the central portion and inner margin of secondaries dull yellowish white, the base and outer margin broadly black, the latter including six obsolete yellowish spots.

Beneath like the male, except that the primaries have no yellowish spot spreading from the inner margin over the median branches.

Hab. New Ireland.

Obs. Belongs to the *Delias* group. The male resembles on the upperside the same sex of *P. aruna*, Bois., as figured by Hewitson, and *D. inferna*, Butl. The female on the upperside, and both sexes on the under, more nearly resemble *P. descombesi*, Bois.

PIERIS EURYGANIA.

♂. Exp. 3·2. Above white, the apex of the primaries chrome-yellow, margined with the black costa and outer margin and a curved band running from inside the cell to near the anal angle, the outer margin of the secondaries broadly black.

Beneath, primaries chiefly black, yellow apical spot as on the upperside, the proximal end of the cell yellow, and the inner margin white; the secondaries at the basal half yellow, black towards the distal half, across the black a distinct band of crimson, which becomes orange where it meets the yellow near the inner margin.

♀. Like the ♂, except that the basal portion of the primaries is black, the outer margin of the secondaries is more broadly black, and the inner portion of the secondaries, together with inner margin of the primaries, pale yellow.

Beneath same as the male.

Hab. New Ireland.

Obs. This is a very distinct species, apparently belonging to the *Delias* group.

PIERIS LYTÆA.

♀. Exp. 2·5. Above black, a large subtriangular spot on the inner margin, extending to just within the cell, three apical spots of the primaries and the basal half of the secondaries white.

Beneath, black arranged as above, a submarginal row of large white spots on both wings; the base of the primaries and the greater portion of the base of the secondaries sulphur-yellow; the rest of the secondaries (not occupied with black) is white.

Hab. New Britain.

A female, apparently belonging to the *Belenois* group; we have no nearly allied species with which to compare it.

PAPILIO SEGONAX.

♂. Exp. 4·6. Primaries slightly falcate, secondaries produced, Upper surface rich metallic green, a median row of five nearly circular spots starting from the apex to the space between the third and fourth median nervules, a similarly coloured subtriangular spot near the middle of the inner margin, and a very small one close

inside the submedian nervure. The proximal half of the secondaries greyish white, rather darker towards the anal angle.

Beneath umber-brown, the outer portion of both wings rather darker, the spots on the primaries as above.

Hab. New Ireland.

Obs. Allied to *P. codrus*, from which it differs in having the band of spots of the primaries interrupted, there being no spots in the spaces between the first and second, and second and third median branches, that between the first median branch and the submedian nervure being wanting. On the other hand, there is a spot on the inner margin of the primaries not usually seen in *P. codrus*. The single specimen sent by Mr. Brown has the secondary wings slightly injured, so that the prolongation of the second median branch, common to all the allied species of the *P.-codrus* group, is broken off.

17. Reports on the Collections of Birds made during the Voyage of H.M.S. 'Challenger.'—No. XII. The Procellariidæ. By OSBERT SALVIN, M.A., F.R.S., &c.

[Received June 18, 1878.]

Eighty specimens of Procellariidæ are comprised in the 'Challenger' collection, belonging to 22 species and 13 genera. The greater part of these were obtained during the visit to Kerguelen Island; others were secured at sea in the South Pacific Ocean, a few near the Straits of Magellan, at Nightingale Island, and elsewhere. None of the species present any difficulty as regards their nomenclature; but I take this opportunity of adding a few notes on this subject gathered during recent study of the species to which they belong.

OCEANITES OCEANICUS.

Procellaria oceanica, Kuhl, Beitr. p. 136, pl. x. f. 1.

Oceanites oceanica, Coues, Pr. Ac. Phil. 1864, p. 82; Salv. Orn. Misc. ii. p. 227.

a-c. Males. }
d, e. Females. } Ice Barrier.

"Obtained on the 14th February, 1874."

FREGETTA GRALLARIA.

Procellaria grallaria. Vieill. N. Dict. d'Hist. N. xxv. p. 418.

Fregetta grallaria, Bp. Consp. ii. p. 197; Coues, Pr. Ac. Phil. 1864, p. 86.

Thalassidroma leucogastra, Gould, Ann. & Mag. N. H. xiii. p. 367, et B. Austr. vii. pl. 63.

568-571. Females. }
572, 573. Males. } South Pacific.

"Eyes brown. Shot on the 11th November, 1875, at sea. Their

stomachs were filled with a yellow oil, and mixed with it some pieces of Crustacea.”

I am strongly disposed to add to the above synonyms *Thalassidroma gracilis*, Elliot, Ibis, 1859, p. 391, and *T. segethi*, Phil. & Landb. Arch. f. Naturg. 1860, p. 282, names admitted by many authors to apply both of them to a species found on the Chilian coast. I have seen specimens of the present species in the Paris Museum from the same locality; and the Challenger specimens now before me were obtained at sea at no great distance from the same shore; so that on geographical grounds their identity is a reasonable supposition. The chief, if not the only discrepancy I can find between the description of *F. gracilis* and *F. grallaria* is one of dimensions, the former being considerably smaller (as shown by Mr. Elliot's measurements) than the 'Challenger' birds. Thus we have:—

	Wing. in.	Tarsus. in.	Tail. in.
<i>F. gracilis</i>	5·22	2·40	1·20
<i>F. grallaria</i>	5·9–6·3	2·9–3·0	1·3–1·4

T. segethi seems to be intermediate in dimensions; but so far as the description goes, its identity with *F. grallaria* is obvious.

Mr. Sharpe (Zool. Kerg., Aves, p. 31) suggests that *P. leucogastra* may prove to be a stage of plumage of *P. melanogaster*; but I cannot think that this will ever turn out to be the case.

FREGETTA MELANOGASTRA.

Thalassidroma melanogastra, Gould, Ann. & Mag. N. H. xiii. p. 367, et B. Austr. vii. pl. 62.

a. Betsy Cove, Kerguelen.

Mr. Sharpe (Zool. Kerg., Aves, p. 30) unites *T. tropica*, Gould, with this bird, and calls it by the last-mentioned name. They may be identical; but in any case the adoption of the name *tropica* in place of *melanogastra* cannot be justified, as the latter, having been in use for over thirty years, ought not to be supplanted by the former, the two having been published simultaneously on opposite pages of the same publication!

PELAGODROMA MARINA.

Procellaria marina, Lath. Ind. Orn. p. 410.

Pelagodroma marina, Salv. Orn. Misc. ii. p. 228.

a-c. Nightingale Island.

“Eyes black; a night-bird. These were taken out of holes in the ground during the day by help of the dogs.”

THALASSÆCA GLACIALOIDES.

Procellaria glaciuloides, Smith, Ill. Zool. S. Afr. pl. 51.

Thalassæca glacialoides, Coues, Pr. Ac. Phil. 1866, p. 30.

a. Male. Ice Barrier.

“Obtained on the 26th February, 1874.”

THALASSÆCA ANTARCTICA.

Procellaria antarctica, Gm. Syst. Nat. i. p. 565.*Thalassæca antarctica*, Coues, Pr. Ac. Phil. 1866, p. 31.

a. Male. Ice Barrier.

Obtained on 14th January, 1874.

b. Male.

c, d. Females. } Ice Barrier.

Obtained on the 14th January, 1874.

ADAMASTOR CINEREUS.

Procellaria cinerea, Gm. Syst. Nat. i. p. 563.*Adamastor cinereus*, Coues, Pr. Ac. Phil. 1864, p. 119.

565. Female. } South Pacific.

566. Male. }

"Eyes hazel; feet flesh-colour: the stomach of one was full of the beaks of Cuttlefish; stuff from the ship in the other, and small crustacea."

"Obtained on the 5th November, 1875.

MAJAEQUEUS ÆQUINOCTIALIS.

Procellaria æquinoctialis, Linn. Syst. Nat. i. p. 213.

Majaqueus æquinoctialis, Coues & Kidder, Bull. U.S. Nat. Mus. No. 2, p. 25; Sharpe, Zool. Kerg., Birds, p. 19.

a-d. Males. } Kerguelen.

e. Female. }

OSSIFRAGA GIGANTEA.

Procellaria gigantea, Gm. Syst. Nat. i. p. 563.*Ossifraga gigantea*, Coues, Pr. Ac. Phil. 1866, p. 32.

567. Female. South Pacific.

"Bill yellowish green, feet black."

Obtained on the 5th November, 1875.

a. Betsy Cove, Kerguelen.

PAGODROMA NIVEA.

Procellaria nivea, Gm. Syst. Nat. i. p. 562.*Pagodroma nivea*, Coues, Pr. Ac. Phil. 1866, p. 160.

a, b. Females. Ice Barrier.

"Obtained on the 14th January, 1874."

DAPTION CAPENSIS.

Procellaria capensis, Linn. Syst. Nat. i. p. 213.*Daption capensis*, Coues, Pr. Ac. Phil. 1866, p. 163.

a. Antarctic Sea.

"Shot in April 1874."

ÆSTRELATA LESSONI.

Procellaria lessoni, Garn. Ann. Sc. Nat. 1826, vii. p. 54.*Æstrelata lessonia*, Coues, Pr. Ac. Phil. 1866, p. 142; Coues &

Kidd. Bull. U.S. Nat. Mus. No. 2, p. 27; Sharpe, Zool. Kerg. Birds, p. 26.

a, b. Males. Betsy Cove, Kerguelen.

c-f. Females. Betsy Cove, Kerguelen.

"Eyes black."

During a recent visit to the Paris Museum I had an opportunity of examining the type of *Æ. sericea*, concerning which I had occasion to publish some notes in 'The Ibis' for 1875 (p. 373). On seeing this type I at once recognized a specimen of *Æ. lessoni*! *Æ. sericea* (Less.), placed in the genus *Adamastor* by Bonaparte and Coues, has therefore no existence as a species distinct from *Æ. lessoni*.

ÆSTRELATA MOLLIS.

Procellaria mollis, Gould, Ann. & Mag. N. H. xiii. p. 363.

Æstrelata mollis, Coues, Pr. Ac. Phil. 1866, p. 150.

a, b. Nightingale Island.

"Eyes hazel. Night bird. Obtained on the 17th of October, 1875."

ÆSTRELATA BREVIROSTRIS.

Procellaria brevirostris, Less. Man. d'Orn. ii. p. 611.

Æstrelata brevirostris, Salv. Orn. Misc. ii. p. 235; Sharpe, Zool. Kerg., Birds, p. 24.

Æstrelata kidderi, Coues, Bull. U.S. Nat. Mus. No. 2, p. 28.

a. Young. Kerguelen.

The species included in Cabanis and Reichenow's paper on the Birds collected by the 'Gazelle' (J. f. Orn. 1876, p. 329) under the name *Procellaria mollis*, belongs here. Last year I examined in Berlin the specimen brought home by the 'Gazelle,' and found it to belong to this species.

The 'Challenger' specimen is quite young, but interesting, as showing that these birds moult at once from the downy plumage into the feathering of the adult bird.

PRION DESOLATUS.

Procellaria desolata, Gm. Syst. Nat. i, p. 562.

Prion desolatus, Gray, H.-list. iii. p. 108; Sharpe, Zool. Kerg., Birds, p. 37 (excl. syn.).

Pseudoprion desolatus, Coues, Bull. U.S. Nat. Mus. No. 2, p. 32.

a. Male. Betsy Cove, Kerguelen.

Obtained 11th January, 1874.

"Eyes black."

b-e. Males. Betsy Cove, Kerguelen.

"Eyes black."

f. Female. Ice Barrier.

Obtained on the 14th February, 1874.

g, h. Females. Betsy Cove, Kerguelen.

Of the eight specimens of this species brought home by the ex-

pedition, five are males and three females. They thus offer an opportunity of testing the view advanced by Mr. Sharpe as to the supposed sexual difference in the size of the bill existing in these birds¹.

In these specimens there is no tangible difference between the bills of the sexes; and as the opposite sexes of *P. banksi*, as shown by the two 'Challenger' specimens, are also alike as regards the size of the bills, doubts may fairly be raised whether the great difference observable in the size of the bills in these birds is a sexual character at all.

PRION BANKSI.

Pachyptila banksi, Smith, Ill. Z. S. Afr. Birds, pl. 55.

Pseudoprion banksi, Coues, Pr. Ac. Phil. 1866, p. 166.

a. Male. Marion Island.

"Eyes brown."

b. Female. "Caught at sea near Crozets."

Without attempting to decide the question as to how many species of *Prion* exist, I use the name *P. banksi* for these birds, as their bills agree most nearly with that of the type of *P. banksi* in the British Museum.

PELECANOIDES URINATRIX.

Procellaria urinatrix, Gm. Syst. Nat. i. p. 560.

Pelecanoides urinatrix, Coues, Pr. Ac. Phil. 1866, p. 190; Sharpe, Zool. Kerg., Birds, p. 14.

a. Male. Kerguelen.

"Eyes dark grey."

b. Male. Betsy Cove, Kerguelen. Obtained January 1874.

c. Male. Christmas Harbour, Kerguelen.

d. Male. Betsy Cove, Kerguelen.

e-h. Females. Kerguelen.

i. Kerguelen.

j. Young. Kerguelen?

PELECANOIDES GARNOTI.

Puffinuria garnoti, Less. Voy. Coq. Zool. pl. 46.

Pelecanoides garnoti, Coues, Pr. Ac. Phil. 1866, p. 190.

639. Female. }
640. Male? } Cove Harbour, Messier Channel.

"Eyes hazel. These birds and another one which was put in spirit were found dead. Two were picked up by the boat in which Captain Maclear and I went, floating on the surface of the water; and the third was picked up by the galley on the rocks. They were quite fresh; the bodies were very thin.

"Their stomachs were filled with small leaves. It looks very much

¹ Latham seems to have been the first author who mentioned this supposed sexual difference in *Prion*. After describing *P. vittatus* (Syn. iii. p. 414), he adds:—"The female has the same plumage; but the bill, though greatly exceeding that of any other Petrel, is scarcely more than half the breadth of that of the "male."

as if these birds had got out of their region. Mr. Moseley says he saw what he supposed to be one of these birds on Penguin Island."

DIOMEDEA EXULANS.

Diomedea exulans, Linn. Syst. Nat. i. p. 214; Coues, Pr. Ac. Phil. p. 866, p. 175; Coues & Kidder, Bull. Nat. Mus. No. 2, p. 11; Sharpe, Zool. Kerg., Birds, p. 45.

574. Kerguelen.

DIOMEDEA BRACHYURA.

Diomedea brachyura, Temm. Pl. Col. 554; Coues, Pr. Ac. Phil. 1866, p. 177.

517-519. Males. } North Pacific.
520. Female. }

"These were all caught with the hook from the ship while at sea in June and the first half of July 1874, between Japan and Honolulu; they followed the ship every day in numbers till we got into the trade-winds, when no more were observed."

509. Female. North Pacific.

"Eyes brown, bill black, stomach empty. Shot on the 1st April, 1875, by Lord Campbell, with the Henry rifle, while on the wing. We were just north of the tropic; but this bird, as well as another Albatross, were seen some days before we had passed out of the tropics."

511. Male. North Pacific.

"Eyes brown, feet and bill dark or nearly black; stomach had cuttlefish. Caught with a hook by Percy on the 7th April, 1875."

DIOMEDEA MELANOPHRYS.

Diomedea melanophrys, Temm. Pl. Col. 456; Coues, Pr. Ac. Phil. 1866, p. 181; Sharpe, Zool. Kerg., Birds, p. 46.

Male. } Shot at sea, 8th July, 1874.
Female. }

Male. } Christmas Harbour, Kerguelen.
Female. }

DIOMEDEA FULIGINOSA.

Diomedea fuliginosa, Gm. Syst. Nat. i. p. 595; Sharpe, Zool. Kerg., Birds, p. 48.

Phæbetria fuliginosa, Coues, Pr. Ac. Phil. 1866, p. 186; Coues & Kidder, Bull. Nat. Mus. No. 2, p. 21.

Male. See Barnier, 16th February, 1874.

Female. Royal Sound, Kerguelen, 17 January.

18. Liste des Antilopes d'Angola. Par J. V. BARBOZA DU
BOCAGE, F.M.Z.S.

[Received June 17, 1878.]

La présente liste des espèces d'Antilopes observées en Angola a été dressée d'après les exemplaires qui existent au Muséum de Lisbonne. La plupart de ces individus ont été recueillis dans l'intérieur de Mossamedes et au Humbe, sur la rive droite du Cunene, par notre infatigable explorateur M. de Anchieta.

1. GAZELLA EUCHORE (Forst.).

Une paire d'individus adultes envoyés de Huila par M. de Anchieta. Le blanc de la tête, de l'abdomen et des membres est remplacé chez la femelle par une teinte uniforme d'un fauve-jaunâtre pâle.

2. *ÆPYCEROS PETERSI*, sp. nov.

Nous possédons également une paire d'individus adultes de cette espèce, qui nous semble nouvelle. Le mâle, que nous avons reçu d'abord, nous avait paru identique à l'*Æpyceros melampus* d'après un premier examen; mais ayant reçu plus tard la femelle, nous avons été frappé de quelques particularités de coloration qui nous semblent autoriser leur distinction spécifique. Nous commencerons donc par donner un rapide aperçu des caractères de la femelle.

Pelage d'un roux-fauve, plus pâle sur les flancs et la face externe des membres; menton, gorge, poitrine, ventre et partie interne des cuisses et de l'avant-bras d'un blanc presque pur. La tête porte sur un fond de la couleur du dos quelques marques très-caractéristiques: le dessus du chanfrein, une bande au travers de l'œil et une tache en fleur-de-lys sur le front d'un noir profond; au devant de l'œil une bande blanche bien distincte. Oreilles longues, arrondies à la pointe, d'un roux-fauve en dehors, revêtues de poils blancs en dedans, avec un espace noir à l'extrémité, plus large en dehors qu'en dedans. Queue longue, de la couleur du dos à la base, le reste blanc, marquée en dessus d'une bande longitudinale noire, à laquelle vient aboutir de chaque côté une autre bande étroite de la même couleur qui s'étend sur les fesses. Un trait noir coupant verticalement la face antérieure du genou, une tache de la même couleur à la pointe du jarret. Aux membres postérieurs, de chaque côté de l'extrémité inférieure du canon, une brosse de poils noirs. Point de mufle et point d'onglons. Deux paires de mamelles.

Dimensions.

mètre.

Du bout du museau à la base de la queue	1.30
Hauteur au garrot	0.80
Longueur de la tête	0.29
Longueur de l'oreille	0.17
Longueur de la queue	0.38

Chez notre individu mâle, plus jeune que la femelle, nous remarquons des cornes en forme de lyre fortement annelées sur leur tiers inférieur. Il présente quelques légères différences de coloration. La teinte des parties supérieures est d'un bai-roux plus foncé et le blanc des parties inférieures moins pur, plus lavé de jaune-isabelle; le dessin de la tête ressemble à celui de la femelle, quoique le noir y soit plus rembruni. Malheureusement une portion de la peau de la région frontale a été détruite par suite du coup qui l'a tué, de sorte qu'on ne peut pas constater la présence de la tache noire si nettement indiquée sur la région frontale de la femelle.

Les cornes portent trois bourrelets étroits mais saillants sur leur tiers inférieur, supérieurement elles sont lisses et arrondies; leur courbure est simple, à convexité en dehors et à pointes convergentes.

Dimensions du mâle.

	mètre.
De l'extrémité du museau à la base de la queue	1·20
Hauteur au garrot	0·70
Longueur de la tête	0·25
Longueur de l'oreille	0·15
Longueur de la queue	0·35
Longueur des cornes	0·29

Le mâle nous vient de Capangombe, la femelle du Humbe, tous les deux par M. d'Anchieta¹.

3. NANOTRAGUS TRAGULUS (Forst.)?

Nous rapportons avec hésitation à cette espèce une jeune femelle que M. d'Anchieta nous a envoyée du Humbe en 1874. Voici ses principaux caractères:—

Pelage d'un roux-fauve, plus pâle sur les flancs et les membres; gorge et ventre d'un blanc pur; front et chanfrein de la couleur du dos; les joues d'une teinte plus pâle; tour des yeux blanchâtre; une tache brune en forme de fer à cheval sur le front; une autre petite tache triangulaire brune sur le chanfrein immédiatement au-dessus du mufle, qui est petit. Oreilles très-longues, légèrement acuminées, grises en dehors, blanches en dedans avec un liséré brun sur les bords. Point de brosses aux genoux; point d'onglons; queue, incomplète, de la couleur du dos. Quatre mamelles.

Dimensions.

	mètre.
De l'extrémité du museau à la base de la queue	0·75
Hauteur au garrot	0·45
Longueur de la tête	0·14
„ de la l'oreille	0·11

¹ La figure qui accompagne cette note permettra de bien juger les caractères de coloration de la femelle. Notre ami le Prof. Peters, à qui nous l'avons communiquée, penche à croire, comme nous, qu'il s'agit d'une espèce nouvelle.

4. *NEOTRAGUS SALTIANUS* (Blainv.).

Des individus de Capangombe et du Humbe, sur la rive droite du Cunene, par M. d'Anchieta.

5. *CEPHALOPHUS GRIMMIUS* (Linn.).

Une paire d'individus adultes et un jeune mâle de Capangombe par M. d'Anchieta.

Il y a même au Muséum d'autres individus de cette espèce provenant d'Angola, mais dont on ignore la localité où ils auraient été pris ; quelques uns de ces individus ont vécu pendant quelques années au Jardin du Palais de Necessidades appartenant à sa Majesté le Roi Ferdinand, et s'y sont même reproduits.

Tous nos individus nous semblent appartenir par leur système de coloration à la variété dont le Dr. Gray a fait une espèce distincte sous le nom de *Grimmia splendidula* (Proc. Zool. Soc. Lond. 1871, p. 590). Nous les avons d'abord rapportés au *C. burchellii* (Journ. Acad. Sci. Lisboa, ii. p. 222).

6. *CEPHALOPHUS MONTICOLA* (Thunb.).

Deux individus, mâle et femelle, rapportés de Benguella par M. Freitas Branco ; un individu mâle envoyé de Loanda par M. Toulson.

7. *CEPHALOPHUS ANCHIETÆ*, sp. nov.

Une paire d'individus adultes et une jeune femelle capturés à Capangombe par M. d'Anchieta.

Caractères :—Brun-cendré ; les flancs, l'avant-bras et les cuisses d'une teinte plus pâle et plus cendrée ; dessus de la tête d'un cendré noirâtre, avec une touffe de poils noirs entre les cornes ; côtés de la tête et du cou de la couleur des flancs ; raie sourcilière roussâtre ; menton, gorge, poitrine, ventre et face interne des avant-bras et des cuisses d'un blanc pur ; face antérieure et externe des membres d'un cendré lavé de fauve ; queue très-courte, d'un noir profond en dessus ; la région anale de cette même couleur. Cornes effilées.

Dimensions.

mètre.

De l'extrémité du museau à la base de la queue	0·58
Longueur de la tête	0·14
Hauteur au garrot	0·33
Longeur de l'oreille	0·07
„ de la queue	0·07

La teinte générale est plus rembrunie chez la jeune femelle, les membres sont plus lavés de fauve à leur partie inférieure, le dessus de la queue et la région anale d'un brun foncé.

Nos individus doivent ressembler sans doute à *C. melanorrhous*,

Gray, de Fernão do Pó, que nous connaissons à peine d'après la planche publiée dans *Knowsley Menagerie* (Gray, Knowsl. Ménag. p. 11, pl. 10); ils en diffèrent cependant par le moins d'étendue du noir, qui couvre à peine le dessus de la queue et la région anale, tandis que chez le *C. melanorrhous* la croupe est aussi de cette couleur. À juger d'après les figures du Dr. Gray, cette espèce aurait une queue plus longue que la nôtre et des cornes moins effilées. Malheureusement le Dr. Gray dans ses diverses publications sur les Antilopes a presque toujours oublié de nous donner les dimensions des individus qu'il décrit.

8. CEPHALOPHUS RUFICRISTA, sp. nov.

C. longiceps, Bocage, Journ. Acad. Sci. Lisboa, ii. p. 220.

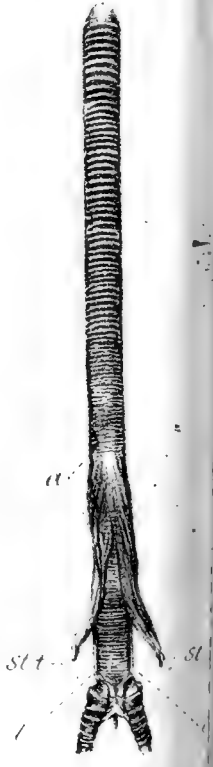
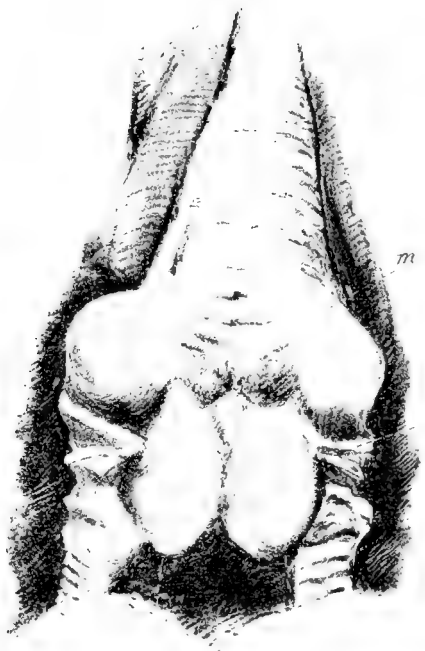
Cette espèce se trouve à peine représentée au Muséum de Lisbonne par une tête, recouverte de sa peau, envoyée en 1869 de Loanda par M. Toulson, sans s'accompagner d'aucune indication au sujet de sa provenance.

Nous avons d'abord pensé qu'elle pourrait bien être identique à *C. longiceps*, Gray, espèce établie exclusivement d'après les caractères ostéologiques d'une tête recueillie au Gabon par Du Chaillu (Proc. Zool. Soc. 1865, p. 204); aujourd'hui nous revenons sur nos pas, car notre première affirmative nous semble trop hasardeuse.

Le spécimen du Muséum de Lisbonne ressemble aussi par ses couleurs à la figure du *C. niger*, publiée par le Dr. Gray dans *Knowsley Menagerie*, pl. 7. Cependant, même sous ce rapport, leur identité spécifique ne nous paraît pas évidente, et à cela vient encore s'ajouter une différence sensible dans les dimensions d'après les chiffres publiés par Temminck. Nous trouvons dans les *Esquisses de Mammalogie* de cet auteur que la distance du bord antérieur de l'œil à la pointe du nez chez *C. pluto* (= *C. niger*, Gray) est de 4 pouces et 4 lignes, et en mesurant cette distance sur la tête d'Angola nous constatons qu'elle dépasse 5 pouces; elle est de 14 centimètres.

La face supérieure de la tête est d'un brun clair sur le chanfrein et d'un brun foncé, couleur chocolat, sur le front; les faces latérales, en haut d'un gris brunâtre, deviennent blanchâtres en se rapprochant du menton, où le blanc domine; une raie sourcilière brun-jaunâtre; une tache allongée de la même couleur au-dessous de l'œil se prolongeant vers le chanfrein; tour des yeux brun-foncé; ligne muqueuse légèrement courbe et horizontale. Sur le front un toupet abondant de poils bruns et d'un roux ardent, en partie couchés sur les cornes, en partie s'élevant verticalement au milieu de ces appendices; la touffe verticale est composée de poils longs de 7 centimètres d'un roux vif, les deux touffes latérales sont formées de deux ordres de poils, les uns courts et bruns, les autres longs et roux. Les oreilles sont petites, mesurant moins de la moitié de la longueur totale de la tête; elles sont arrondies au bout, couvertes en dehors de poils très-courts et clair-semés, nues en dedans avec une large bande marginale de poils blanchâtres. Les cornes arrondies, à peine rugueuses à la





TRACHEA OF RHYNCHAEA BENGALENSIS

base, sont couchées en arrière et placées sur le plan du front; elles ont 10 centimètres de longueur. Le muffle est régulier.

Dimensions.

	mètre.
Longueur de l'occiput à l'extrémité du museau	0·26
Du bord de l'œil à l'extrémité du museau	0·14
Longueur de l'oreille.	0·95
„ des cornes	0·10
„ de la touffe frontale	0·07

9. HELEOTRAGUS REDUNCUS (Pall.).

Un mâle adulte de Huilla par M. d'Anchieta.

10. HIPPOTRAGUS NIGER (Harris).

La tête d'un individu mâle envoyée de l'intérieur de Mossamedes par Welwitsch. Les cornes de cet spécimen ont 130 centimètres de longueur.

11. STREPSICEROS KUDU, Gray.

Deux individus adultes, mâle et femelle, envoyés vivants d'Angola et ayant vécu longtemps dans la ménagerie du Jardin de Necessidades.

Un jeune, de quelques jours à peine, né des précédents, tué par le mâle, qui était d'une grande férocité.

Une jeune femelle de Capangombe, par M. d'Anchieta.

12. OREAS CANNA, Gray.

Un mâle jeune d'Angola.

19. On the Structure and Development of the Trachea in the Indian Painted Snipe (*Rhynchæa capensis*). By J. WOOD-MASON.

[Received June 18, 1878.]

(Plate XLVII.)

During the cold season of 1876-77, Lieut.-Colonel Godwin-Austen and I paid almost daily visits to the Calcutta bazaar for the purpose of making collections of the skins and skeletons of the numerous migratory and other birds which are at that season of the year caught and carried to market in such enormous numbers. On one of these visits my attention was attracted to a bird that lay conspicuous amongst its fellows of the same species by its greater size and more richly coloured plumage, by the low and regular, hoarse

but rich, purring call which, with breast puffed out, it was uttering—a call perceptible to the hand no less than to the ear. I at once recognized the smaller and less conspicuously coloured birds as specimens of one sex; and there seemed very little doubt, from its perfect correspondence in structure and general similarity in plumage, that the larger and handsomer one was an individual of the other sex of the Indian Painted Snipe (*Rhynchæa capensis*, sive *bengalensis*); but which of the two was the female and which the male, it must be confessed, I was at the time ignorant. In order that I might be enabled to determine the precise relation of the two forms to one another, and to ascertain whether any structural differences in their vocal organs accompanied the observed differences in their vocal powers—merely that I might know these facts of my own knowledge, certainly without the slightest hope or thought that I should be able, from such a cursory examination as alone I could give to it, to glean any thing new about so common an animal, I purchased a pair of the species.

Before killing the birds for examination, I referred to Darwin's 'Descent of Man'¹; and what I read therein served but to increase my interest in the matter; for I soon saw that I had it in my power to corroborate or to contradict a statement which had been made about the trachea of this very species—the very part, curiously enough, the sounds issuing from which had drawn my attention to the bird.

It is well known that in many birds the windpipe, instead of taking a straight course from the *rima glottidis* through the interclavicular membrane to the point where it bifurcates to form the bronchi, is bent upon itself or convoluted, and that often to an extraordinary extent. The position of such flexures is very variable: "they may lie outside the thorax under the integument (as in *Tetrao urogallus*, some species of *Crax* and *Penelope*, and, I may add, the *Manucodias*² and the *Rhynchæas*), in the cavity of the thorax (as in some Spoonbills), on the exterior of the sternum (as in some Swans and Cranes), or even in a sort of cup formed by the median process of the furcula (as in a species of Guinea-fowl)"³. The increase in the length of the tracheal column implied by these convolutions, and other modifications of the windpipe, such as the swollen tympanum of Ducks and Geese, the air-sac of the Emu, may be dependent wholly upon sex; and the males may have the trachea more or less looped or more complex, whilst the females have it straight or simple, or only partially so, in which case the flexure or other modification may be more marked in males than in females. But however this may be, it is a general rule that whenever "the trachea differs in structure in the two sexes it is more developed and complex in the male than in the female"⁴; and it is a fact familiar to all that in the vast majority of instances it is the male which, in point of richness of plumage, vocal powers, and ornamental appendages, is the more highly

¹ *Op. cit.* p. 476.

² 'Nature,' vol. xv. p. 127.

³ Huxley, 'Anatomy of Vertebrated Animals,' p. 315.

⁴ 'Descent of Man,' *l. supra cit.*

endowed of the two sexes; but to this there are a few interesting and remarkable exceptions (*Phalaropus*, *Casuaris*, *Dromæus*, *Milvago*, *Climacteris*, *Eurostopodus*, and the Rynchæas), of which the last, the ones we are here concerned with, are not the least conspicuous. In these birds in general, and in the Painted Snipes in particular, it may be taken as established that we have, to use the words of Mr. Darwin, a complete reversal not only of the secondary sexual characters, but also of the parental and incubating instincts—the females being not only larger and much more richly coloured than the males¹, but having the trachea more or less tortuous instead of straight and simple, deputed the duty of incubation to the other sex, and reserving the business of courting to themselves.

In *Rynchæa australis*, according to Gould², the trachea, which is simple in the males, in the females passes down between the skin and the muscles of the breast for the whole length of the body, making four distinct convolutions before entering the lungs; but Mr. Darwin states, on the authority of Blyth, who had examined many specimens, that “it is not convoluted in either sex in *Rh. bengalensis*, which species resembles *R. australis* so closely that it can hardly be distinguished except by its shorter toes.” This is the statement which seemed to me to stand in need of corroboration, especially when I called to mind the peculiar call of the female³ and the sharp squeak jerked out only at long and irregular intervals by the male, and then apparently only in answer to the female.

On opening the necks of the two birds by a longitudinal incision extending to the middle of the breast or thereabouts, and carefully turning aside the skin on either hand so as not to disturb the natural relations of the underlying parts, I found that the trachea of the adult male (ascertained to be such by subsequent examination of the genital organs) was straight and simple throughout, whilst that of the female had a distinct loop lying between the integument and the interclavicular membrane on the left side, and was not only an absolutely but apparently also a relatively stouter tube than that of the male.

As the contrary of what I have found has been stated by so good and usually trustworthy an observer as Mr. Blyth, I put in evidence two sketches (figs. 1 and 2, p. 748) showing the course of the trachea in the two sexes. For these sketches I am indebted to Col. Godwin-Austen, who was with me at the time.

The numerous birds belonging to this species examined by me may be divided according to sex and age into the following groups:—

1. *Adult and probably old females*, remarkable for the extreme richness of their plumage. In all the birds of this group which

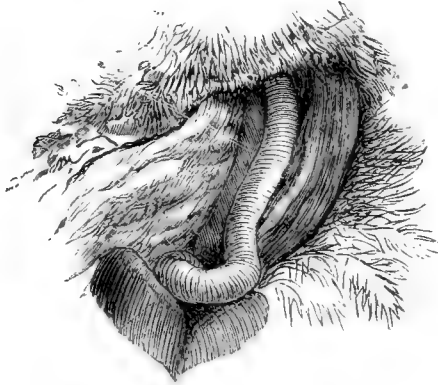
¹ Jerdon, ‘Birds of India,’ vol. iii. p. 677.

² ‘Handbook to the Birds of Australia,’ vol. ii. p. 275.

³ Of *R. australis* J. Gould says (*op. cit.* p. 276), “The use of this convoluted trachea, so exclusively confined to the female, I could not in any way discover or surmise; no note whatever was heard to proceed from either sex while on the wing or when flushed”—times at which a call such as that of the female of *R. capensis*, like the coo of a dove, would be least likely to be heard.

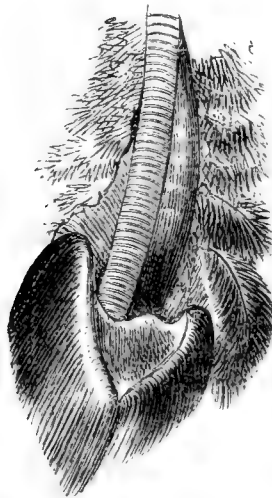
were purchased alive and killed and examined before muscular contraction had set in, the trachea was found to be looped as in fig. 1; a specimen living when obtained, but which died unexpectedly and in which decomposition had set in before I had had an opportunity of

Fig. 1.



Rhynchæa capensis ♀, dissected, so as to show its looped trachea *in situ*.

Fig. 2.



Rhynchæa capensis ♂, dissected, so as to show its straight and simple trachea *in situ*.

opening it, also had its windpipe looped; several, however, that were purchased dead had it retracted, almost straight, with the sternotracheal muscles strongly contracted.

2. *Females* not nearly so richly and deeply coloured as the preceding. In these there was only a slight superficial sinuosity in

the trachea, and the remarkable modification of the intrathoracic rings, to be presently described, had not proceeded so far.

3. *Immature females*, indistinguishable in point of plumage, though already larger than males. In all of these, without exception, the windpipe was found quite straight and simple throughout, though even at this stage females are infallibly to be distinguished from males by their stouter trachea, by the more powerful musculature of this, and by the more inflated condition of the delicate membranes connecting the bronchial half-rings with one another and with the three-way piece.

4. *Young, adult, and apparently old males*, all agreeing together in plumage and in the straight and simple condition of the trachea.

We shall see that the superficial loop which is invariably to be found in birds belonging to group 1 (*old females*) is the outward expression, so to speak, of a modification of the intrathoracic tracheal rings that takes place *pari passu* with those external changes which, when they are completed, mark the adult. But in order to make my description of this curious modification more intelligible, a few words, by way of preface, about the unmodified trachea of the male, or, better, of an immature female. If such a trachea be drawn through the fingers from end to end, a broad and shallow constriction will be felt near its posterior end, twenty rings or so from the compound three-way piece; the rings composing it are cylindrical instead of flattened, more than thrice as numerous as they are in an equal length of any other part of the tube, and so closely packed and firmly bound together as to possess little or none of that power of expansion and contraction which, by reason of their peculiarly bevelled ends, so eminently distinguishes the rest; it occupies a position as much within as without the thorax; and the great extrinsic muscles which pass between the sternum and the trachea, serving amongst other purposes as "guys" to keep the latter in place, expand and unite sheath-like over it, being inserted into it at numerous points, but especially at its anterior extremity; it is, in fact, the part of the trachea upon which the sterno-tracheal muscles directly pull when they contract, and thereby approximate the rings of the extensible intrathoracic portion of the windpipe in the adult female, to which we may now return.

On more closely examining the extrathoracic portion of the trachea in a bird in which that part is in the condition represented in fig. 1, p. 748, it can be seen that the loop is almost wholly composed of the constricted portion above described, and that the 2 or 3 rings that immediately succeed in order from before backwards (those situated at the point where the tube disappears within the cavity of the chest) suddenly get coarser and more prominent, and at the same time separated from one another by perceptible membranous intervals. On cutting away the sternum so as not to sever the sterno-tracheal muscles from their attachments, and so as to leave the furcula together with the membrane included between its two arms in place, the rest of the tube is displayed in a completely extended condition; it is then seen that the 12 or 13 rings immediately succeeding the coarser

ones which follow upon the fine-ringed constricted portion become suddenly still coarser and more prominent and convex, have lost their typical bevelled form, and are separated from one another by far longer and subequal membranous intervals. These are thin and transparent, and each is so constricted in the middle that any two consecutive rings form, with the membrane that connects them, a short hourglass-shaped figure. Six or seven coarsish rings, separated by much narrower membranous intervals, but otherwise unmodified, complete this portion of the tube, which is twisted spirally to the left, carrying spirally entwined with it the elongated sterno-tracheal muscles. The rings have come to be bent, and, instead of appearing as regular parallel bands as in other parts of the column, to be arranged obliquely, by adaptation, no doubt, to the spiral form taken by the tube whenever it is extended, so as, in fact, to present somewhat the appearance of having resulted from the breaking up into rings of what was primitively a hard spiral thickening of the walls of a membranous tube. Inside the thorax the spiral is necessarily very open, from the tube being restricted to a middle position by the membranous bands which sling it, together with the anterior moieties of its great contractor muscles, from the dorsal wall of the body, so as to form a sheath for it; whilst outside, in the neck, where is more room and more lateral freedom, it becomes closer, there constituting the well-marked superficial loop, the concave curvature of which is the true ventral surface of that fine-ringed portion of the tube over which the muscles spread, twisted out of its natural position.

If an adult female be killed with chloroform and rapidly opened, the sterno-tracheal muscles may be seen slowly to contract, and thereby gradually to take out the superficial spiral "turn" from the trachea, and the intrathoracic rings of this to close up, until at last all that remains of the loop is a slight sinuosity visible near the point where the tube passes into the thorax, the constricted and close-ringed portion, which occupied that position in the unmodified trachea, also having acquired an ineffaceable crook.

Unfortunately, we possess no more complete description of the highly convoluted trachea of the Australian species than that quoted above; but the two species *R. capensis* and *R. australis* are so very closely allied that we may feel tolerably confident that the tracheal modification is of the same kind in the two, only carried to a much greater extent in the latter, the constricted many-ringed part of the trachea of the former containing two or three potential convolutions.

In conclusion, I have to thank Col. Godwin-Austen for aid rendered to me in the matter of the illustrations.

EXPLANATION OF PLATE XLVII.

Fig. 1. The complete trachea of an adult female of *Rhynchoæa capensis*, nat. size, showing the modified intrathoracic portion of the tube in an expanded condition. The compound three-way piece is seen to be formed by the partial fusion of the last tracheal ring with the modified first pairs of bronchial half-rings; these have their ventral ends

greatly expanded and produced backwards, so as to form by their fusion in the middle line a broad, flat, and squarish plate of bone strongly bilobed and tipped with cartilage at the hinder extremity, into which ossification extends with advancing age, rendering the posterior angles of the plate prominent, and bringing them into very loose relation of apposition with the much less expanded ventral ends of the second pair of bronchial half-rings; the ovoid saccular dilatations seen in figs. 3 and 4 result partly from the inflation of the membrane interposed between the ends of these half-rings and the posterior angles of the three-way piece, but principally from that of the ventral halves of the membranous inner walls of the second and third pairs of bronchial half-rings. The spatulate dorsal ends of the first pair of bronchial half-rings do not meet in the middle line, but curve inwards and backwards so as to leave between them a membranous interval, into which a narrow tongue of bone projects from the middle of the posterior margin of the last tracheal ring. In so small a figure no distinction between bone and cartilage in the three-way piece was possible. Drawn from a fresh specimen by Behari Lál Dós.

Fig. 2. A much enlarged view of a portion of the same, to show the form the modified part of the tube assumes when it is naturally expanded; the constricted portion (*a*) presents a singularly finely and regularly ribbed appearance, being composed of about forty very fine and closely packed cylindrical rings, all firmly bound together so as to form a stiff but still somewhat elastic mass.

Fig. 3. A much magnified ventral view of the posterior end of the same, to show the inflated condition of the membrane connecting the compound three-way piece with the second (apparent first) bronchial half-ring on each side, and also the two egg-shaped saccular dilatations (*e, e*) of the membranous inner walls of the bronchi.

Fig. 4. The same, from the left side, to show the egg-shaped dilatations (*e, e*) in profile, and the thin and narrow lateral slip of muscle (*l*) which is attached to the three-way piece at *m*, whence some of its fibres pass on to the second bronchial half-ring (*n*).

(All the three preceding figures were drawn under the microscope by the aid of a camera lucida, immediately after the death of the animal.)

Fig. 5. The complete trachea of an immature female, nat. size. The two sterno-tracheal muscles (*st.t, st.t*) are seen to be blended on the ventral surface of the constricted portion of the tube at *a*; *l, l*, are the lateral muscles, somewhat exaggerated in the drawing. Drawn by B. L. D.

Fig. 6. The posterior portion of the unmodified windpipe of an adult male, nat. size. The lateral muscles (*l, l*) are here so pale and transparent as to be all but undistinguishable in the fresh state.

Fig. 7. The same, much enlarged.

(With the two exceptions above mentioned, the figures of this plate have been obligingly drawn for me by Lieut.-Col. H. H. Godwin-Austen, by whom also the plate has been lithographed.)

The following paper was read on June 4th, but was necessarily omitted from its proper place in consequence of the illustrations not having been finished in time:—

On the Classification and the Distribution of the Crayfishes. By T. H. HUXLEY, Sec. R.S., V.P.Z.S.

[Received May 23, 1878.]

- I. Introduction, p. 752.
- II. The Modifications of the Branchiæ in the Crayfishes, p. 756.
 - 1. The branchiæ of *Astacus*, p. 756.
 - 2. The branchiæ of *Cambarus*, p. 763.
 - 3. The branchiæ of *Astacopsis*, p. 764.
 - 4. The branchiæ of *Chærops*, p. 768.
 - 5. The branchiæ of *Engæus*, p. 769.
 - 6. The branchiæ of *Paranephrops*, p. 770.
 - 7. The branchiæ of *Parastacus*, p. 771.
 - 8. The branchiæ of *Astacoides*, p. 773.
- III. The Classification of the Crayfishes, p. 775.
- IV. The Distribution of the Crayfishes considered in relation to their morphological differences, p. 786.

I. INTRODUCTION.

The dismemberment of the genus *Astacus* of the older naturalists, down to the time of Fabricius, was commenced by Leach, who separated the Norway Lobster as the type of a new genus, *Nephrops*¹.

Milne-Edwards advanced a step further by establishing the genus *Homarus* for the Lobsters, and leaving only the freshwater *Astaci*, or the proper Crayfishes, in *Astacus*².

The later proposal of Leach, to use *Astacus* for the Lobsters, and to give a new generic name (*Potamobius*) to the freshwater Crayfishes, would have had the advantage of retaining the primitive signification of ἀστράκος. But *Potamobius* had already been used in another sense; and the change introduced by Milne-Edwards is so generally adopted that it would be confusing to attempt any further alteration.

Guérin³ next proposed to distinguish the *Astacus madagascariensis* of Audouin and Milne-Edwards, as *Astacoides*, from the other Crayfishes; and Erichson, in his valuable Monograph of the group⁴, adopts *Astacoides* for the Madagascar and some of the Australian forms, and establishes the new genera *Cambarus*, *Chærops*, and *Engæus*. In *Cambarus* and *Chærops* the number of the branchiæ is taken into account as an important generic character.

In 1842⁵ Mr. Adam White described some Crayfish from New Zealand, for which he constituted a new genus, *Paranephrops*, under the impression that the New-Zealand form approximated to the genus *Nephrops*. Mr. Wood-Mason⁶ has since "denied the existence of any special relationship between the New-Zealand

¹ Leach, Trans. Linn. Soc. xi. 344.

² 'Histoire Naturelle des Crustacés,' 1837.

³ Revue Zoologique, 1839.

⁴ "Uebersicht d. Gattung Astacus," Archiv für Naturgeschichte, Bd. 6.

⁵ Gray's 'Zoological Miscellany.' See also Dieffenbach's 'New Zealand,' 1843, vol. ii. p. 267.

⁶ Proc. Asiat. Soc. Bengal, 1876, p. 4.

species of freshwater *Astacidae* and the marine genus *Nephrops*;" and "as the species referred to *Paranephrops* differed less from [some of] those of *Astacoides* than these latter did from one another, and as, moreover, the latter name had the priority, he proposed provisionally to refer the New-Zealand species of *Astacidae* to it."

Mr. Wood-Mason is unquestionably right both in denying any special relationship between *Paranephrops* and *Nephrops*, and in asserting that the New-Zealand Crayfish differ less from some of the species of the genus *Astacoides*, as its limits are at present understood, than these do from one another. But I shall have occasion to show that the type of the genus *Astacoides*, the Madagascar Crayfish, differs so widely from the other Crayfishes of the southern hemisphere, that the latter cannot be included in the same genus; while *Paranephrops* is sufficiently different from the Australian and Tasmanian Crayfishes to render its recognition as a distinct generic type desirable¹.

The distribution of the Crayfishes, so far as it is hitherto ascertained, is not a little remarkable. *Astacus fluviatilis* occurs in various parts of England and in Ireland; but I cannot find any record of it in Scotland. Dr. McIntosh, who has been kind enough to look into this point in aid of my inquiries, assures me that Crayfishes are not indigenous to that part of Britain, that they do not exist in the Tweed and the Teviot, and that an attempt to introduce them into the island of Mull failed; they were placed in various streams, but none were ever seen again. Even in England, Crayfishes appear to be restricted to certain rivers. They abound, for example, in the Thames; but I cannot hear of any in the Cam or the Ouse, though their absence in the latter rivers cannot be ascribed to any want of calcareous matter in the districts through which those rivers flow.

Astacus fluviatilis, however, extends all over the western half of Europe, as far south as the Pyrenees and the northern shores of the Mediterranean; while, eastward, it reaches Sicily, Northern Greece, and the western shores of the Black Sea. In Spain there appears to be no doubt that it occurs about Barcelona; but whether it is found in the rest of the Spanish peninsula is uncertain².

Northwards and eastwards, *Astacus fluviatilis* extends to Sweden and the Baltic provinces of Russia, and through Western Russia, by the basins of the Dniester and the Bug, to the Black Sea.

Over this vast area, marked local varieties appear to be not uncommon; and most authors agree to regard a Crayfish which occurs in Southern Europe, France, Switzerland, and Germany, and which

¹ See on this subject the remarks of Mr. Miers, "Note on the genera *Astacoides* and *Paranephrops*" (Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. 1876).

² See Gerstfeldt, "Ueber die Flusskrebse Europa's" (Mém. présentés à l'Acad. Imp. des Sciences de St. Petersbourg, 1859, p. 587). As far back as 1675, Sachs à Lewenbeimb wrote:—"Sic in Hispaniâ licet flumina, negant inveniri ibi *Cancros fluviatiles*, contra in Galliâ frequentissimi, item in Pannoniâ, in Helvetiâ, in Germaniâ; etiam in fluviis Americanis inveniri referunt navigatores. In fluvio Lydiæ Haly caneros invenit Busbequius, Ep. Turc. i. p. 89." But were these Lydian "caneri" crayfishes or fluviatile crabs?

is known in the latter country as the "Steinkrebs," as a distinct species, *Astacus torrentium* or *A. saxatilis*¹.

Eastward of the region inhabited by *Astacus fluviatilis*, from the Arctic to the Black and Caspian Seas, another species, *A. leptodactylus*, ranges, associated with the allied but possibly distinct forms *A. pachypus* and *A. angulosus*, in the southern part of the area; and it is remarkable that these Crayfishes not only frequent the rivers which debouch into the Black Sea and the Caspian, but are said to thrive in the salt waters of those seas.

No Crayfishes are known in the Ob, Jenisei, Lena, or other rivers which flow into the Arctic Ocean²; but the Amur has one or two species (*A. dauricus*). There is a species in Japan (*A. japonicus*); and Dr. Hagen³ enumerates no fewer than six species from British Columbia, Oregon, and California.

East of the Sierra Nevada, all the Crayfishes at present known belong to the genus *Cambarus*, of which Dr. Hagen distinguishes as many as thirty-two species. They extend from the Great Lakes to Mexico, Guatemala, Cuba, and probably other of the West-India Islands. Sloane, in his 'Natural History of Jamaica' (vol. ii. p. 271) describes two species in that island. According to the figure, one of these attains a length of 12 inches.

No Crayfishes are known to occur in the whole continent of Africa, in Syria, the Euphrates valley, Persia, Hindostan, and India beyond the Ganges, nor in China as far as the Corea, nor in the Philippines, nor in any island of the Malay or Papuan archipelagos⁴. The late Prof. Agassiz, though he sought for Crayfishes in the

¹ In 1560, Gesner was acquainted with this distinction:—"Astacus fluviatilis talis apud Helvetios et Germanos est, major silicet et simpliciter dictus *Krebs* vel *Edelkreb*s; eo enim minor est, et colore diversus qui saxatilis cognominatur *Steinkrebs*." ('Nomenclator Aquatilium,' p. 374). Heller (Die Crustaceen des südlichen Europa, p. 217) refers our English Crayfish to this species; but no specimens I have seen agree with his diagnosis. Whether there is any difference between *A. saxatilis* and the Crayfishes which have been named *A. pallipes* and *A. fontinalis* by Lereboullet and Carbonnier; and whether our English Crayfish is more similar to these than to the form which is commonly known as *A. fluviatilis* on the Continent, is more than I am able to say at present. A critical comparison of large series of specimens from different localities would probably yield results of great interest to the theory of the origin of species.

² Kessler, "Die russischen Flusskrebse" (Bull. de la Soc. Imp. des Nat. de Moscou, 1874).

³ 'Monograph of the North-American Astacida,' Illustrated Catalogue of the Museum of Comparative Zoology at Harvard College, 1870.

⁴ I have been favoured by Sir Henry Barkly with the opportunity of examining specimens of two kinds of "Cammarons," or so-called Crayfishes, from the rivers of Mauritius. They are large Prawns.

I must confess myself to be in a state of hopeless perplexity respecting the Crayfish or Lobster which is said to occur at the Cape of Good Hope, *Cancer (Astacus) capensis* of Herbst. At the beginning of his description (Naturgeschichte der Krabben und Krebse, Band ii. p. 49) Herbst says:—"Dieser schöne Krebs hält sich auf den Kap in solchen Flüssen auf, die sich auf den Bergen befinden;" and at the end he states, "die Füße haben insgesamt scheerenförmige Spitzen, da bey dem gemeinen Flusskrebse nur die ersten zwey Paare dergleichen haben." Moreover, the diagnosis runs, "pedibus omnibus cheliferis." It is impossible to suppose that Herbst should have made a mistake on such a point as this; and therefore it must be concluded that his *Cancer ca-*

Amazons, could find none. Two species from Southern Brazil have been described by Dr. von Martens¹ as *Astacus brasiliensis* and *A. pilimanus*; but Von Martens recognizes the affinity of these forms with the *Astacoides* of Erichson.

Several species of *Paranephrops* have been described from New Zealand; and the Fijian Crayfish belongs to the same genus.

Crayfishes occur all over Australia; and the species have been referred to the genera *Astacoides* and *Chærapis*. The only Tasmanian species which have been described constitute the genus *Engæus* of Erichson.

Thus it appears, from what is already published on this subject:—

1. That the Crayfishes of the northern hemisphere are generically distinct from those of the southern hemisphere.

2. That the American Crayfishes, east of the Sierra Nevada, are generically distinct from those west of that range, as well as from the South-American species; and that, while the western North-American Crayfishes belong to the same genus as those of the Old World, the South-American forms are more closely allied with those of Madagascar and Australia.

3. That the New-Zealand species are distinct from the Australian forms; and that the latter are to be placed in the same genus as the Madagascar and South-American species.

4. That there is a negative fact of distribution, not to be accounted for by any apparent difference of climate or other physical conditions—namely, the entire absence of Crayfishes in Equatorial South America, Africa, and the rest of the Old World south of the northern escarpment of the great Asiatic highlands.

The problem thus offered is one of the most remarkable among the many presented by the facts of Geographical Distribution; and it appeared to me that one of the first steps towards attempting its solution was to obtain some more definite conception, than is furnished by extant descriptions, of the actual amount of resemblance and difference between the Crayfishes which are found in the different areas of distribution.

For the most part the Crayfishes are so similar in their general structure, that the characters by which the genera have been distinguished are almost trivial. Erichson, however, has drawn attention

penis is neither a Crayfish nor a Lobster, and that, unless he was wrongly informed, it is an inhabitant of fresh water.

Milne-Edwards (Hist. Nat. des Crustacés, ii. p. 335) identifies his *Homarus capensis* with the *Cancer capensis* of Herbst; but, as it is stated in the definition of the genus *Homarus* (l. c. p. 333) that the Lobsters “ne se trouvent que dans la mer,” and as *Homarus* has only three pairs of chelate limbs, the identification presents difficulties. Krauss (Südafrikanische Crustaceen, p. 54), under the head of “*Homarus capensis*,” refers to Herbst and Milne-Edwards, and, apparently on the authority of the former, merely says:—“In den Bergflüssen des Kaplandes. Ich habe ihn in Natal nie gesehen.” Elsewhere (p. 20) he gives “*Thelphusa perlata* and *T. depressa* and *Homarus capensis*” as the only South-African freshwater Thoracostraca.

¹ “Südbrasilische Süß- und Brackwasser-Crustaceen,” Archiv für Naturgeschichte, 1869.

to the diminution of the number of the branchiæ in *Cambarus* and *Astacus*, and to an important difference in the structure of those of *Engæus*; and Hagen has pointed out some important peculiarities of these organs in *Cambarus*; while the remarkable fact, that the appendages of the first somite of the abdomen are absent in many of the Crayfishes of the southern hemisphere, has been duly noted by Erichson and several other zoologists.

Having recently had occasion to make a careful reexamination of the structure of *Astacus fluviatilis*, I found two minute filaments attached to the epimera of the penultimate and antepenultimate thoracic somites. The structure and the position of those filaments led me to suspect that they must be rudimentary branchiæ¹; and as the Australian Crayfishes appeared to me to be, on the whole, less specialized forms than the European species, I thought that I should probably find in them fully-formed functional branchiæ occupying the place of these rudiments. Through the kindness of my friend and former pupil, Mr. J. Wood-Mason, a specimen of "*Astacoides franklini*" was placed at my disposal; and on examination, I not only found the functional branchiæ I sought, but discovered a number of other interesting differences between the respiratory organs of this Crayfish and those of *Astacus*.

Following up the line of inquiry thus suggested, I have examined examples of all the chief forms of Crayfishes at present known, with the result of establishing some remarkable parallel relations between the morphology and the distribution of these animals.

In order to make these points clear, I must premise a fuller and more precise description of the branchial apparatus of the common Crayfish than has yet been given, in order that it may serve as a standard of comparison for the branchiæ of the other Crayfishes.

II. THE MODIFICATIONS OF THE BRANCHIÆ IN THE CRAYFISHES.

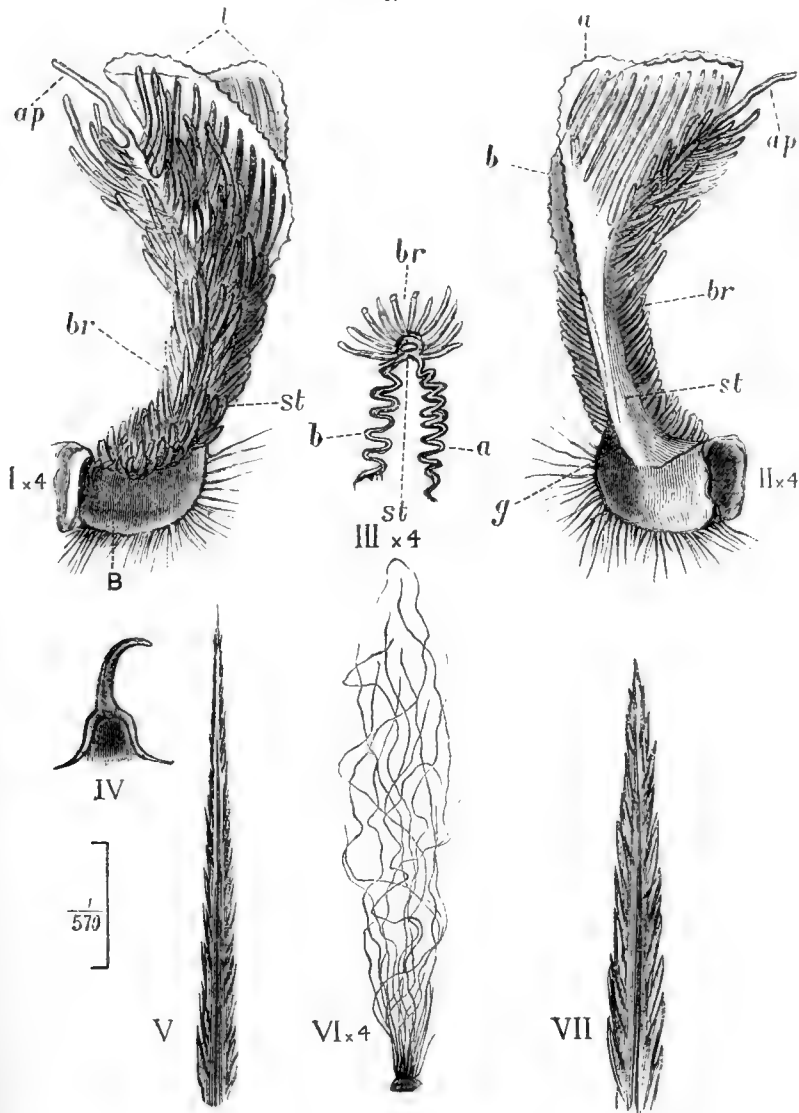
The Branchiæ of Astacus fluviatilis.

When the branchiostegite of a Crayfish is removed, seven branchiæ are seen, running from the base towards the apex of the branchial cavity, parallel with one another, and disposed in curved lines, which are concave forwards and convex backwards. The length of the branchiæ gradually increases from the first to the sixth; the seventh ascends as high as the sixth, but is rather shorter, in consequence of the attachment of its base lying at a higher level.

In each of the six anterior branchiæ, a *basal portion*, a *stem*, an expanded *lamina*, and an *apical plume* may be distinguished. The *basal portion* (fig. 1, 1, B) is broad, with a convex posterior and inferior free edge, beset with long setæ; and it is articulated by its

¹ I have met with no allusion to these structures, unless the following passage in Brandt's and Ratzeburg's description of the Crayfish (*Med.-Zoologie*, ii. p. 61) refers to them:—"Ueber jeder der obersten Kiemen der beiden mittlern Fußspaaire steht etwa 1''' entfernt ein kleiner fädenförmiger, unten breiterer, bärtelähnlicher Theil." I do not quite see the applicability of "unten breiterer," unless "unten" applies to the attached ends of the filaments; but in other respects the description fits the rudimentary branchiæ very well.

Fig. 1.

*Astacus fluviatilis.*

- I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side ($\times 4$): B, the basal portion; *st*, the stem; *l*, the lamina; *br*, the branchial filaments; *ap*, the apical plume. II. The inner face of the same podobranchia ($\times 4$): the letters as before, except *g*, the decurrent fringe, continued from the inner lobe of the lamina. III. A transverse section of the podobranchia, taken a little above the level of *b* in II. ($\times 4$): *a*, the inner lobe of the lamina; *b*, its outer lobe; *st*, the stem; *br*, the branchial filaments. IV. One of the hooks of the lamina; and V. The extremity of one of the setæ of the base of the podobranchia: the vertical line indicates the scale to which these figures are drawn, and represents $\frac{1}{570}$ of an inch. VI. The coxopoditic setæ of the same limb ($\times 4$). VII. The free end of one of these setæ, magnified to the same degree as IV. and V.

truncated anterior end with the coxopodite of one or other of the thoracic limbs, from the second maxillipede to the penultimate ambulatory limb inclusively. I shall therefore term these gills *podobranchiæ*. A fold of the integument rises over the outer face of the basal portion of the branchia, which is freely movable, inwards and outwards, upon its articulation.

The basal portion of the branchia curves slightly upwards, and is continued into the comparatively narrow *stem* (fig. 1, *st*), which bends up at right angles to the base, and lies nearly parallel with the inner wall of the branchial chamber. Rather beyond the middle of its length, the stem expands into the broad *lamina* (fig. 1, *l*), the two lobes of which are folded together like the leaves of a partly open book, their free rounded edges being turned backwards and the uniting fold forwards. The lamina of each branchia, from the second to the sixth, is received between the lobes of the lamina of that which precedes it, and, from the first to the fifth, receives the lamina of the branchia which follows it.

The edges of the laminæ are beset with minute hooked spines, seated upon low tubercles (fig. 1, *iv.*), and are flat; but, a short distance within the edge, each lamina is folded longitudinally in such a manner as to give rise to ten or twelve plaits. From the mode of their formation, these plaits or folds are, of course, as distinctly marked on the outer as on the inner faces of the laminæ (fig. 1, *iii.*). Small elevations, terminated by minute hooked setæ, like those on the edges of the laminæ, are observable on both faces, particularly on the ridges.

The inner lobe of the lamina is continued down the stem as a decurrent gradually narrowing fringe, which terminates on the inner face of the basal portion (fig. 1, *ii. g*). The outer lobe ends more abruptly, in a thin ridge which lies external and posterior to the last. Between this ridge and the fringe there is a longitudinal groove, which occupies the inner and posterior face of the stem.

A short distance from the upper edge of the lamina, and proceeding, as it were, from the anterior face of the median fold of the latter, the *apical plume* (fig. 1, *i. a p*) is given off. At its base this is beset with cylindrical branchial filaments; but at its free extremity it becomes simple and filiform; at its attached extremity, it passes into the stem of the gill, of which it is seen to be the direct continuation. The whole of the outer and anterior face of the stem, as far as the basal fold, is beset with branchial filaments, of which those in the region of the lamina are the longest, while towards the base they are shorter and more closely set.

Close to the attachment of the podobranchia, the upper surface of the coxopodite presents a rounded elevation, from which a great number of long, flexible and tortuous setæ proceed (fig. 1, *vi.*). When undisturbed, they ascend vertically between the gills on the sides of the branchial chamber. The apex of each of these *coxopoditic setæ* is acute; and at a short distance from its extremity it is beset with numerous short foliaceous scales, which gives it the aspect of a minute catkin (fig. 1, *vii.*). Further down these scales become

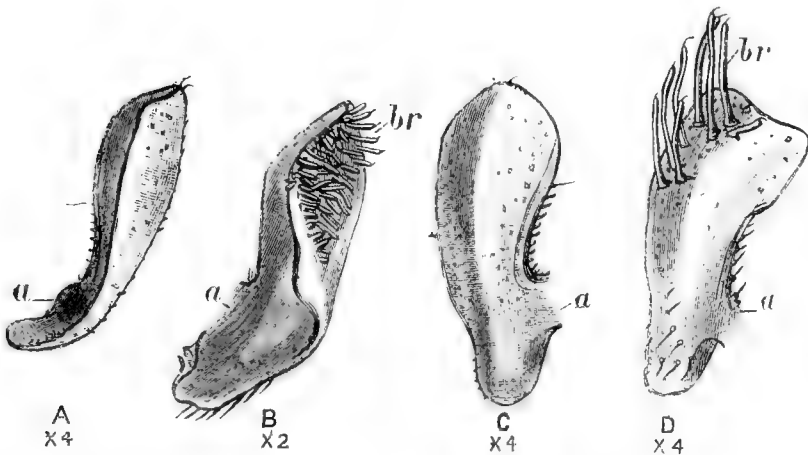
more widely separated, and at length disappear, the base of the seta being smooth. A canal traverses the whole length of the seta.

These bundles of setæ were regarded as branchiæ by Brandt and Ratzburg; but they certainly have no direct relation to the respiratory function. They may aid in keeping parasites out of the branchial chamber.

The setæ which fringe the base of the podobranchia are straight, stiff, hollow, and composed of a cylindrical basal portion, and an acuminate acicular terminal part, which often appears articulated with the foregoing; the junction of the two is marked by an inflexion of the wall of the seta. The acicular part (fig. 1, v.) is fringed with minute pointed scales, which, in the setæ of the anterior part of the base, pass into long lateral processes, and give the seta a penniform appearance. None of these setæ are hooked at the apex.

The only differences, except those of size, which are observable in the six podobranchiæ, are, that the external lobe of the lamina, which is not nearly so large as the internal, in the hindermost

Fig. 2.

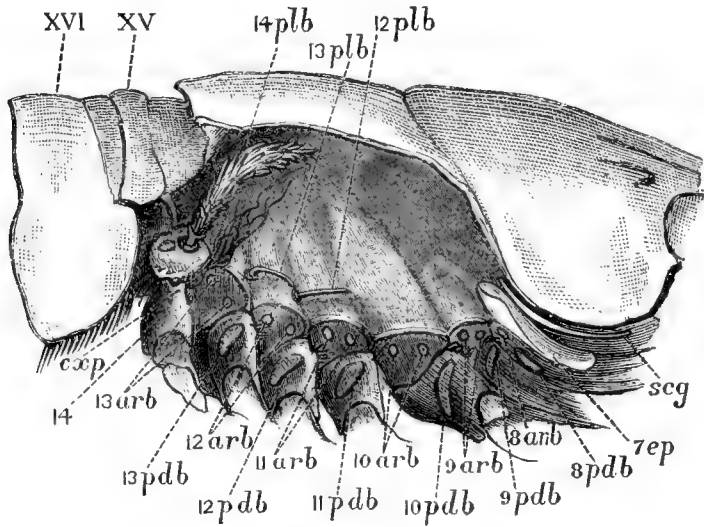


- A. The podobranchia (epipodite) of the first maxillipede of *Astacus fluviatilis*, viewed from the outer side ($\times 4$). B. The podobranchia of the first maxillipede of *Astacoides madagascariensis*, outer side ($\times 2$); *br*, branchial filaments. C. The podobranchia (epipodite) of the first maxillipede of *Astacus fluviatilis*, viewed from behind ($\times 4$). D. The podobranchia of the first maxillipede of *Parastacus brasiliensis*, from behind ($\times 4$); *br*, branchial filaments. In each figure *a* marks the pedicle by which the more or less modified podobranchia is attached to the coxopodite.

branchia increases in relative size, until, in the most anterior branchia it becomes larger than the internal lobe. The penniform setæ are more numerous on the bases of the anterior podobranchiæ.

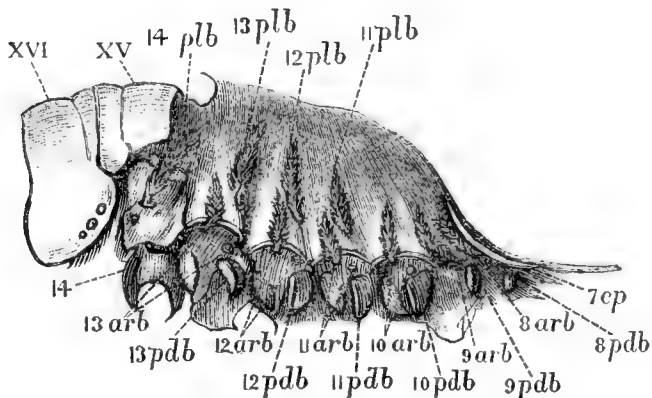
The first maxillipede is said, and, in a physiological sense, rightly, to possess no branchia; but it is provided with an appendage (fig. 2, A, c) which is undoubtedly the homologue of the podobranchia of the other thoracic limbs. This is a soft membranous

Fig. 3.

*Astacus fluviatilis.*

The branchiostegite, all the podobranchiæ, except the epipodite of the first maxillipede, and all the arthrobranchiæ of the right side are removed ($\times 4$).

Fig. 4.

*Astacopsis franklinii.*

The branchiostegite, all the podobranchiæ, except that of the first maxillipede, and all the anterior arthrobranchiæ, except the first, of the right side are removed ($\times 2$).

scg, scaphognathite (not shown in fig. 4); *7cp*, the epipodite of the first maxillipede; *8pdb* to *13pdb*, the other podobranchiæ; *8arb* to *13arb*, the arthrobranchiæ or their attachments to the arthrobranchial membranes of the second and following thoracic appendages; *11plb* to *14plb*, the pleurobranchiæ; *14*, the coxopodite of the hindermost ambulatory limb; *cxp*, the coxopoditic setae of that limb in *Astacus*.

plate, which broadens at its upper extremity, and sends a short process downwards beyond its articulation with the coxopodite of the maxillipede. The plate is slightly folded upon itself longitudinally, but in such a manner that it is concave forwards instead of backwards. It bears no branchial papillæ, and has no longitudinal plaits; but, on its posterior face and along its inner edge, it presents hooked tubercles, like those of the laminæ of the podobranchiæ. It is obvious that this structure, which lies immediately behind and parallel with the scaphognathite of the second maxilla (but, as I have ascertained, does not share its function of scooping the water out of the branchial cavity¹), is a modified podobranchia, reduced, as it were, to the part which, in the other podobranchiæ, is represented by the base, stem, and lamina.

Thus every thoracic limb, except the last, is provided with the representative of a podobranchia—though, in the case of the first maxillipede, this structure, if it plays any part in the respiratory process, does so simply in virtue of its thin and soft texture, and not by means of any special branchial filaments. The podobranchia of the first thoracic appendage is, in fact, reduced to a mere *epipodite*.

When the podobranchiæ are removed, six other gills come into view. They are attached (fig. 3, *arb*) to the flexible membrane which unites the coxopodites of all the thoracic limbs to the thorax, save the first and last, and may be termed *anterior arthrobranchiæ*. Like the foregoing, they are disposed vertically, and increase in size from the first, which belongs to the second maxillipede and is hidden behind the epipodite of the first maxillipede, to the last. The apex of each of these gills is exactly like the apical plume of one of the podobranchiæ; and the branchial filaments are set upon the outer and anterior face of the stem in the same way. The inner face is flat and free from filaments; and there is no trace of a lamina or of a basal dilatation.

Above and behind these, more directly above in the posterior, more behind in the anterior limbs (fig. 3, *arb*), are five other branchiæ of similar character, attached to the arthrodistal membranes of the third maxillipede and the anterior four ambulatory limbs. These may be termed the *posterior arthrobranchiæ*.

After the removal of all these functional branchiæ, there will be found, immediately above the bases of the penultimate and antepenultimate thoracic limbs (fig. 3, *12 plb*, *13 plb*), two minute filamentous processes, the longer of which was not more than one sixth of an inch in length in any specimen I have examined, while both are so delicate as to be invisible except under a simple lens. The posterior of these is the larger: it has the structure of an ordinary branchial filament, with a somewhat swollen base, which is attached to the margins of a foramen in the lower part of the epimeron of the penultimate thoracic somite, just below a transverse depression which separates this from the upper part of the epimeron. The position

¹ If the branchiostegite of a living Crayfish is carefully removed, the rapid rhythmical motion of the scaphognathite is readily seen; but the modified podobranchia of the first maxillipede remains quiescent.

of this filament is sometimes vertical, but more frequently horizontal. The anterior filament is sometimes a mere papilla; it is attached to the margins of a small foramen which occupies a similar position in the antepenultimate epimeron—namely, close to the anterior edge and just below the transverse depression. These are two rudimentary gills, of the same order as that next to be described.

The seventh, and most posterior branchia of those which become visible when the brachio-stegite is removed (fig. 3, *14 plb*), has yet to be considered. It resembles one of the arthrobranchiæ in all essential characters, but it is not attached to the arthro-dial membrane; on the contrary, the base of its stem is fixed to the margins of a circular aperture situated close to the edge of a peculiar shield-shaped plate, the posterior and outer surface of which is covered with strong setæ. Immediately behind and below the attachment of the gill there is an oval space, occupied by a soft and flexible portion of the cuticle, like a tympanic membrane. By its lower margin this plate furnishes an articular surface to the outer condyle of the coxopodite of the last thoracic limb, while its anterior and upper angle, bending sharply upwards, passes into a curved prolongation, which extends upwards and backwards in the soft integument of the flank, and articulates with a slender process of somewhat similar form sent forward from the first abdominal somite. Internally this shield-shaped branchiferous plate is continuous with the sternum of the last thoracic somite. It is obvious that this plate, with its anterior process, represents the epimeron of the last thoracic somite, which is thus adherent to the penultimate somite only by the slender anterior and superior process and the soft integument. Hence, the last thoracic somite moves easily upon its predecessor, though, in strictness, the usual statement that the last thoracic somite in *Astacus* is "free" is not altogether exact.

It follows from this determination of the nature of the shield-shaped plate, that the gill which it bears is attached to the epimeron, or side-wall, of the last thoracic somite; and it may be termed a *pleurobranchia*. The similarly attached filaments (*12 plb* and *13 plb*) represent reduced or rudimentary pleurobranchiæ.

We may suppose that the total number of branchiæ which a thoracic somite can possess is eight, four on each side, namely:—one podobranchia, connected with the coxopodite of the appendage; two arthrobranchiæ, fixed to the articular membrane; and one pleurobranchia, attached to the epimeron. And if four places for branchiæ are assigned to each somite, the extent to which the hypothetically complete scheme or formula is actually filled up will be readily seen, and the branchial arrangements of different Crayfishes will be easily compared.

*The Branchial formula of Astacus fluviatilis*¹.

Somites and their appendages.	Podo- branchia.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep)	0	0	0	= 0 (ep)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	0	= 3
XII.....	1	1	1	<i>r</i>	= 3 + <i>r</i>
XIII.....	1	1	1	<i>r</i>	= 3 + <i>r</i>
XIV.....	0	0	0	1	= 1
	6 + ep + 6	6	5	1 + 2 <i>r</i>	= 18 + ep + 2 <i>r</i>

“ep” here signifies a podobranchia which has lost its branchial filaments and become completely metamorphosed into an epipodite, while *r* indicates that a rudiment of a branchia exists.

It will be observed that, in this species of Crayfish, no somite possesses its hypothetically full complement of branchiæ except XII. and XIII.; and even in them the pleurobranchiæ are rudimentary. The representatives of eleven possible branchiæ are altogether wanting.

2. *The Branchiæ of Cambarus.*

The principal distinction between this genus and *Astacus*, as it was established by Erichson, lies in the absence of the single pleurobranchia of the latter, and the consequent reduction of the number of the branchiæ to seventeen on each side.

In his elaborate monograph of the genus, Dr. Hagen observes, “But there is also another difference, not before noticed². In *Astacus* each pair of gills, except the single one on the fifth set of legs, has a broad deeply-folded membrane, closely fixed behind the most external gill-lobe. In *Cambarus*, this membrane is always wanting in the gills of the fourth pair of legs, but exists, as in *Astacus*, in all the others.

“In the true *Astacus*, all the gills with a folded membrane behind have a basal external bundle of shorter but broader and irregularly placed gill-tubes; these are never to be found in *Cambarus*.”

In a species of *Cambarus* from Guatemala, of which a number of specimens have been presented to the British Museum by Mr. Salvin³, I find Dr. Hagen’s first remark fully borne out. The last

¹ In this, as in all other cases, it is to be understood that the branchial formula gives the branchiæ of only one side of the body, and that the total number of branchiæ is therefore double that given in the formula.

² Dr. Hagen appears to have overlooked De Haan’s definition of the distinctive characters of the American Crayfishes known to him:—

“Branchiæ 17; nulla supra pedes quintos; externæ supra quartos tantum e tubulis liberis, externæ supra sequentes infra e tubulis, supra e laminis tuberculatis compositæ” (Fauna Japonica, Crustacea, p. 164).

³ Mr. Salvin informs me that they were obtained in a river near Coban, in Vera Paz, at an elevation of about 4300 feet above the sea.

podobranchia is devoid of even a trace of a lamina; in the five which precede it, on the other hand, the lamina is very large, and folded into two longitudinally plaited lobes, as in *Astacus*. The edges and the surfaces of the laminae present tubercles, which are more prominent than in *Astacus*, and bear similar hooked spines.

The inner decurrent prolongation of the lamina is wider than in *Astacus*, particularly in the anterior podobranchiæ. It is also beset with hooked setæ mounted on low tubercles.

The setæ of the upper part of the base are relatively shorter. As in *Astacus*, their apices are straight and not hooked.

The coxopodites bear bundles of twisted setæ, which are similar to those of *Astacus*, but are more obtusely pointed.

The arthrobranchiæ are similar in number and in form to those of *Astacus*. Those of the posterior series are proportionately larger.

I cannot discover a trace of the hindermost pleurobranchia, nor of the rudiments of the anterior ones, in this species; but it is not improbable that they may be discovered in larger forms.

The modified podobranchia (epipodite) of the first maxillipede is soft, and folded longitudinally in such a manner as to present a broad and shallow anterior groove. It bears no branchial papillæ, nor any setæ; but there are a few short hooks here and there.

The Branchial formula of Cambarus.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.				Pleuro- branchiæ.
		Anterior.	Posterior.			
VII.....	0 (ep)	0	0			0 = 0 (ep)
VIII.....	1	1	0			0 = 2
IX.....	1	1	1			0 = 3
X.....	1	1	1			0 = 3
XI.....	1	1	1			0 = 3
XII.....	1	1	1			0 = 3
XIII.....	1	1	1			0 = 3
XIV.....	0	0	0			0 = 0
	6 + ep + 6	+ . 5	+ 0			= 17 + ep.

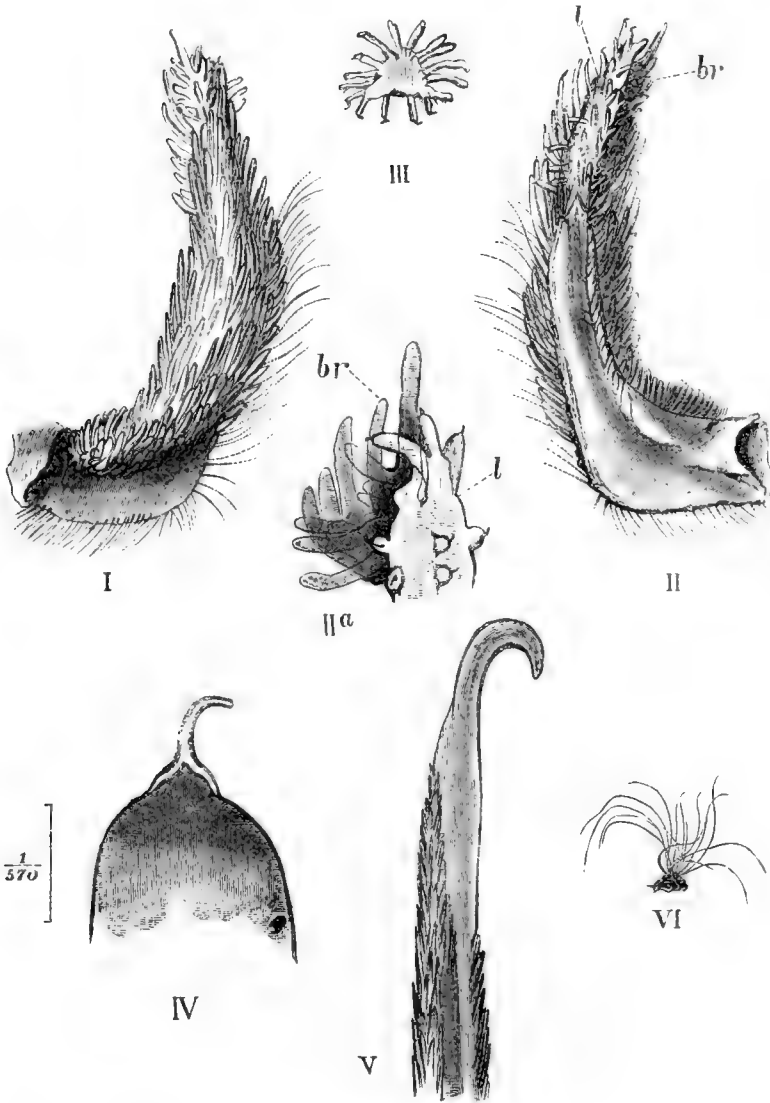
In comparison with *Astacus*, there is obviously a reduction of the branchial system, arising from the complete disappearance of all the pleurobranchiæ in *Cambarus*.

3. *The Branchiæ of Astacopsis¹ franklinii.*

When the branchiostegite is removed, seven branchiæ are seen, having the general appearance and disposition of those of *Astacus*; and, as in *Astacus*, the six anterior are podobranchiæ, attached to the coxopodite of the second maxillipede and the five following appendages, while the seventh is a pleurobranchia, fixed to the epimeron of

¹ Since, as will be shown below, those Australian Crayfishes which neither belong to *Cheraps* nor to *Engæus* are distinct from *Astacoides*, as represented by the Madagascar species, I propose to apply the generic name of *Astacopsis* to them.

Fig. 5.

*Astacopsis franklinii.*

- I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side ($\times 3\frac{1}{2}$). II. The inner face of the same podobranchia: *br*, branchial filaments; *l*, rudimentary lamina. II *a*. The apex of the same, more highly magnified. III. A transverse section of the podobranchia at about the junction of its middle and upper thirds. IV. The extremity of one of the hooked filaments; and V, that of one of the hooked setae. In these two figures the vertical line represents $\frac{1}{370}$ of an inch magnified to the same extent. VI. The coxopoditic setae ($\times 3\frac{1}{2}$).

the last thoracic somite. There is also an anterior series of six arthrobranchiæ, and a posterior series of five (p. 760, fig. 4, *arb*), disposed as in *Astacus*. But instead of the two rudimentary pleurobranchiæ borne by the twelfth and thirteenth somites, in *Astacus*, there are three perfect branchiæ attached to the eleventh, twelfth, and thirteenth somites (fig. 4, 11-13 *plb*), in positions which, in the case of the two latter, exactly correspond with those of the rudimentary pleurobranchiæ of *Astacus*.

The pleurobranchiæ and the arthrobranchiæ are very similar to those of *Astacus*; but the inner surface of the stem is channelled by a sort of groove, the edges of which are pretty sharp. I could find no hooks, nor spines, nor hooked papillæ on any part of these branchiæ.

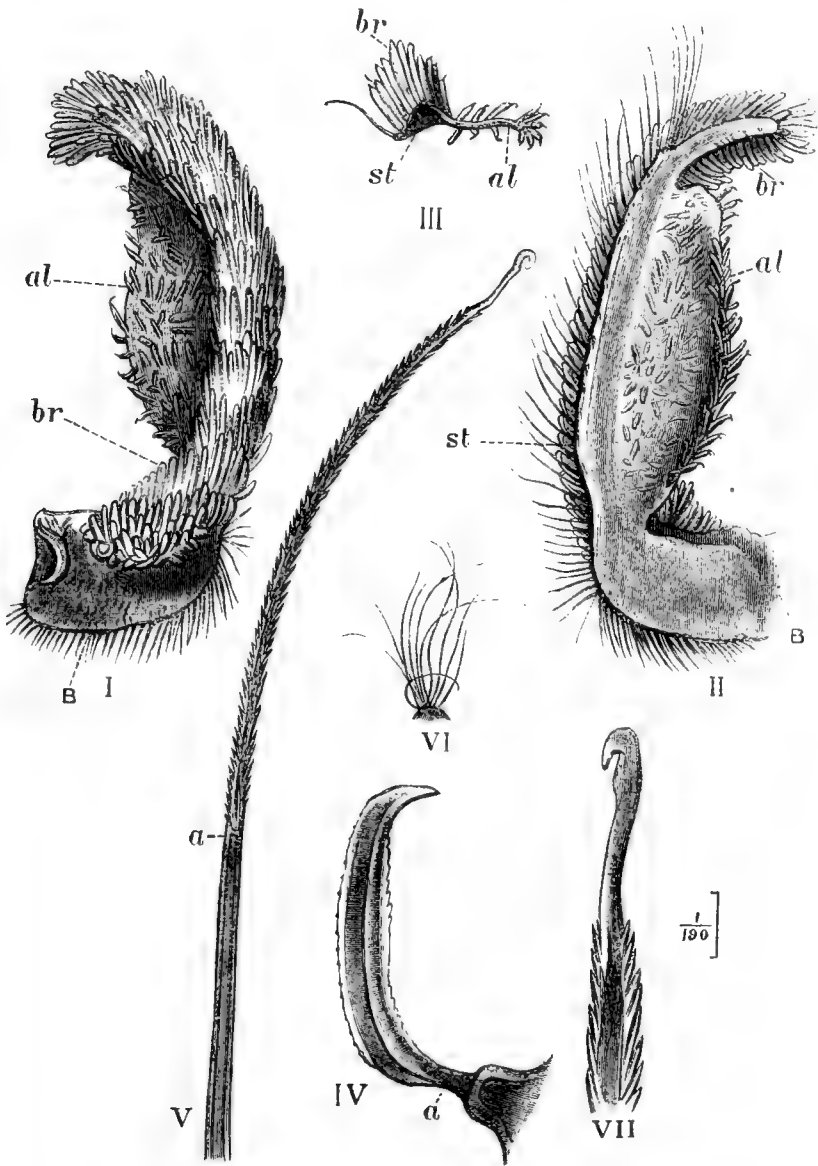
The podobranchiæ (fig. 5, I, II, III) resemble those of *Astacus* in their general form; but the basal portion is relatively larger and the stem stouter, while, at first sight, the lamina appears to be altogether wanting. Close examination, however, shows that the apex of the branchia is distinguishable into an apical plume and a lamellar appendage, but that the latter is relatively very small; in fact, it is a mere outgrowth of the inner wall of the stem, and is neither bilobed nor plaited. Moreover its surface is beset with numerous filamentous prolongations, which are altogether similar to ordinary branchial filaments, except that the extremity of each, instead of being smooth and rounded, is provided with a short recurved hook-like seta (fig. 5, II *a*, IV). The groove on the inner or posterior face of the stem is broader than in *Astacus*. It is bounded on the inner side by a decurrent fringe, which runs down onto the base and stops there, as in the foregoing genera (fig. 5, II). This fringe is provided with long slender curved setæ, each beset with imbricated scales and terminated by a recurved hook (fig. 5, V). The external ridge is wider than in *Astacus*, and is provided with similar hooked setæ. It may be said, in fact, that the whole lower half of the posterior margin of the stem in *Astacopsis* has the character of the posterior margin of the base, while in *Astacus* there is a sharp demarcation between the base and the stem.

In principle, therefore, the podobranchiæ of *Astacopsis* are similar to those of *Astacus*; and the main difference between the two is that the lamina in the former is represented by a slight expansion of the stem, which is neither bilobed nor plaited, while its surface is covered with cylindrical filaments terminated by hooked spines. In *Astacus*, as in *Cambarus*, on the other hand, the lamina is large, bilobed, plaited, and the place of the filaments is taken by mere papillæ terminated by similar hooks. Moreover, in *Astacus* and *Cambarus* the setæ of the base are not hooked.

The appendage of the first maxillipede is similar to that of *Astacus* in form; but on the outer surface of the outer lobe there are sixteen or eighteen short branchial papillæ, some of which, but apparently not all, are terminated by hooks; in fact, except in size, they quite resemble the filaments of the other branchiæ.

In this Crayfish, therefore, the first podobranchia is not reduced

Fig. 6.

*Cheraps* (?)

- I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side ($\times 3$). II. The inner face of the same podobranchia : B, basal portion ; *st*, stem ; *al*, ala ; *br*, branchial filaments. III. A transverse section of the middle of the podobranchia ($\times 3$). IV. A sickle-shaped hook of a branchial filament $\frac{1}{100}$ of an inch in length. V. One of the coxopoditic setae more highly magnified : *a*, the circumferential inflexion of the wall of the seta. The central canal does not stop at this point, but is continued to the end of the seta. VI. A bundle of coxopoditic setae ($\times 3$). VII. The extremity of one of the long setae of the posterior edge of the stem. The vertical line represents $\frac{1}{100}$ of an inch magnified to the same extent.

to a mere epipodite, but retains true branchial characters in the scanty respiratory filaments of its outer lobe.

There are only small tufts of short, straight or slightly curved setæ in the position of the bundles of long coiled coxopoditic setæ of *Astacus* and *Cambarus* (fig. 5, vi).

The Branchial formula of Astacopsis.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep r)	0	0	0	= 0 (ep r)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
	6 + ep	r + 6	+ 5	+ 4	= 21 + ep r.

Thus *Astacopsis* presents a much nearer approximation to the hypothetically complete branchial formula than *Astacus*, inasmuch as the epipodite of the first maxillipede is an imperfect branchia, and there are four complete pleurobranchiæ: only the hindermost podobranchia, the first and last anterior arthrobranchiæ, the first two and the last posterior arthrobranchiæ, and the first four pleurobranchiæ are wanting. In fact, this is the most complete branchial formula with which I am at present acquainted, among the podophtalmous Crustacea.

4. *The Branchiæ of Chærapis* (?).

I have examined a single specimen of a species attributed to this genus, from the Yarra-Yarra river, in the collection of the British Museum¹.

The second maxillipede and the five following thoracic limbs bear podobranchiæ, which increase in length from the first to the last, and have a close general resemblance to those of *Astacopsis*; but they differ in the production of the upper part of the anterior lip of the groove of the stem into a broad limb or ala, wider at the upper end than below, which must not be confounded with the lamina of *Astacus*, as it corresponds only with part of the inner lobe and the decurrent fringe in that genus (fig. 6, I, II, III *al*). Both faces, as well as the free posterior margin of this fringe, are beset with cylindrical branchial filaments, the apex of each of which is terminated by a strong sickle-shaped hook (fig. 6, IV). The majority of the branchial filaments of the stem are also terminated either by smaller hooks or by short straight spines. Long setæ, hooked at

¹ My best thanks are due to Dr. Günther, F.R.S., for the readiness with which he has aided my investigations by giving me free access to the Crustacean collection under his charge.

the ends, and otherwise similar in structure to those of *Astacopsis*, are attached to the posterior edge of the stem of the podobranchia (fig. 6, VII).

The ala is widest, and extends furthest towards the summit of the branchia, in the most anterior podobranchia, while in the hindermost it is reduced to little more than a longitudinal ridge. This branchia, in fact, is very similar to one of those of *Astacopsis*.

There are six anterior arthrobranchiæ, which are not more than half as long as the podobranchiæ, and five still smaller posterior arthrobranchiæ, the hindermost of which is almost rudimentary.

As in *Astacopsis*, there are four large pleurobranchiæ, the hindermost of which is only slightly larger than the other three, which are nearly equal in size.

Small branchial filaments are scattered over the whole posterior face of the epipodite of the first maxillipede; and the apex of each is provided with a strong sickle-shaped hook.

The coxopoditic setæ are relatively short, as in *Astacopsis*, but slender and curved, and even slightly undulating (fig. 6, VI). Each is hooked at its free extremity (fig. 6, V).

If the distinctive character of *Chæraps*, as given by Erichson, is correct, this is not a true *Chæraps*; but the branchiæ of these animals are so readily detached, that I can give no opinion on this point without comparison with the original specimens. In any case, the structure of the podobranchiæ shows the distinctness of this form from *Astacopsis*.

The Branchial formula of Chæraps (?)

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep r)	0	0	0	= 0 (ep r)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
	—	—	—	—	—
	6 + ep	r + 6	+ 5	+ 4	= 21 + ep r.

5. The Branchiæ of Engæus.

The number, the general disposition, and the structure of the branchiæ are the same as in *Astacopsis* and *Chæraps*.

The podobranchiæ have no vestige of a lamina. The first podobranchia has a small ala, much as in *Chæraps*; but only a few of the branchial filaments have terminal hooks.

The arthrobranchiæ are very small, those of the posterior series being the smaller; and the three anterior pleurobranchiæ are much smaller than the hindermost.

In all the branchiæ, and especially in the arthrobranchiæ and pleurobranchiæ, the terminal filament is exceptionally long and thick.

There are only a few very small hooked papillary elevations on the epipodite of the first maxillipede; in fact the podobranchia is reduced to nearly the same condition as in *Astacus*. The hooks of the setæ are very slender.

The branchial formula is the same as in *Astacopsis* and *Charaps*, viz.:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep r)	0	0	0	= 0 (ep r)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	1	1	= 4
XIV.....	0	0	0	1	= 1
<hr/>		<hr/>		<hr/>	
6 + ep r		+ 6	+ 5	+ 4	= 21 + ep r.

6. The Branchiæ of Paranephrops.

In *Paranephrops planifrons* I find the branchiæ to have the same general character and disposition as in *Astacopsis* and *Engæus*.

The podobranchiæ are devoid of any trace of a lamina. The branchial filaments on the posterior faces of these branchiæ are, for the most part, provided with terminal hooks, while the rest have smooth and rounded apices.

The anterior arthrobranchiæ have not half the size of the podobranchiæ, while the posterior arthrobranchiæ are very minute, and the hindermost is rudimentary, being a mere simple filament, like one of the rudimentary pleurobranchiæ of *Astacus*. The pleurobranchiæ are larger, but the three anterior ones are small. None of these branchiæ have hooked papillæ.

The external and posterior face of the epipodite of the first maxillipede is beset with short hooked branchial filaments.

The coxopoditic setæ are few, slender, short, and hooked at the extremity.

The Branchial formula of Paranephrops.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep r)	0	0	0	= 0 (ep r)
VIII.....	1	1	0	0	= 2
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	1	= 4
XII.....	1	1	1	1	= 4
XIII.....	1	1	r	1	= 3 + r
XIV.....	0	0	0	1	= 1
<hr/>		<hr/>		<hr/>	
6 + ep r		+ 6	+ r	+ 4	= 20 + ep r + r.

The branchiæ of two specimens of a *Paranephrops*, from the Fiji Islands, like the foregoing in the British Museum, are in such bad condition, the specimens having apparently got dry before they were placed in spirits, that I cannot make out all the details of their structure; but, so far as it can be ascertained, they agree with those of the preceding species.

7. *The Branchiæ of Parastacus.*

By the kindness of Prof. Peters, I have been able to examine two well preserved males of the *Astacus brasiliensis* and *A. pilimanus* of Von Martens; and the results are very interesting.

The branchiæ of the two species are so much alike that they may be described together. In many points they resemble those of *Charaps*; but the structure is by no means identical; and as these Crayfishes are peculiar in other respects, I think it will be most convenient to consider them as members of a distinct genus, *Parastacus*.

There are six ordinary podobranchiæ, of which, as usual, the first is the smallest, the next two are longer, and the last three are longest of all and nearly equal. In the podobranchia of the second maxillipede, the inner lip of the groove of the stem of the branchia is produced into a broad ala, as in *Charaps*; but the ala becomes broader towards the apex, and is there abruptly truncated. The truncated edge is fringed by a single series of branchial papillæ. The posterior lip of the groove is beset with long hooked setæ. In the four following podobranchiæ the ala is a little narrower, especially at its apex, but it has essentially the same characters. In the last the ala is present in the basal half of the stem, but narrows to a mere ridge in the apical half.

The modified podobranchia of the first maxillipede bears from ten to sixteen longer or shorter branchial filaments on the outer half of the posterior surface of its apical end (fig. 2, D, p. 759).

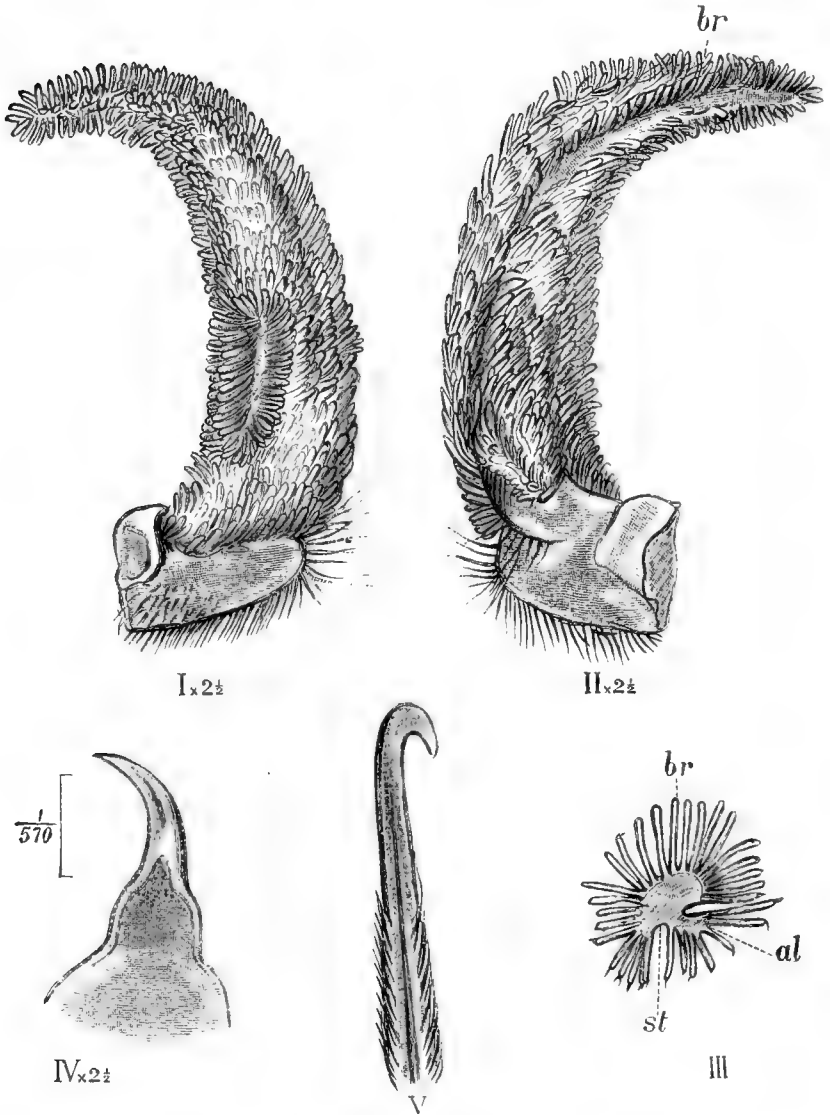
The six anterior arthrobranchiæ are full-sized, and increase in length from before backwards. The five posterior arthrobranchiæ are much smaller; and the last is rudimentary, consisting of a very short slender stem, with from one to three lateral filaments.

There are four pleurobranchiæ, all well developed, but the hindermost the longest.

In the podobranchiæ, many of the posterior branchial filaments are terminated by hooks. As usual, these are absent in the other branchiæ.

The coxopoditic tubercles give origin to bundles of long and tortuous setæ, with hooked apices. These are neither so long, nor so numerous, as in *Astacus* and *Cambarus*, but are more like them than are those of any other *Parastacida*.

Fig. 7.

*Astacoides madagascariensis.*

- I. The outer face of the podobranchia of the antepenultimate thoracic limb of the left side ($\times 2\frac{1}{2}$). II. The inner face of the same: *br*, branchial filaments. III. A transverse section of the middle of the podobranchia: *st*, the grooved inner face of the stem. IV. The terminal hook of a branchial filament; and V. The apex of a coxopoditic seta. The straight line represents $\frac{1}{570}$ of an inch magnified to the same extent as these.

The Branchial formula of Parastacus.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.		
		Anterior.	Posterior.			
VII.....	0 (ep r)	0	0	0	=	0 (ep r)
VIII.....	1	1	0	0	=	2
IX.....	1	1	1	0	=	3
X.....	1	1	1	0	=	3
XI.....	1	1	1	1	=	4
XII.....	1	1	1	1	=	4
XIII.....	1	1	r	1	=	3+r
XIV.....	0	0	0	1	=	1
	—	—	—	—	—	—
	6 + ep r	+ 6	+ 4	+ r + 4	=	20 + ep r + r.

8. *The Branchiæ of Astacoides.*

I am indebted to the courtesy of Prof. Alphonse Milne-Edwards for the opportunity of examining the branchiæ of a male specimen of the Crayfish of Madagascar, *Astacoides madagascariensis*. On account of the rarity of this species, it is desirable to describe its branchial apparatus in some detail. The length of the specimen was 5·7 inches.

The branchiostegite of the left side being carefully removed, the six large podobranchiæ were seen. The first, 0·9 inch long (measured from its attachment to its apex), was directed upwards and backwards in the cervical depression. The second, 1 inch long, took a similar direction, but was concave forwards. The third, slightly shorter, lay parallel with the second. The fourth (fig. 7, I, II) was much longer; bent round the third, its summit touched the apex of the second; the total length of the branchia when straightened out was about 1·3 inch. The fifth branchia was still longer, curving round the posterior edge of the last, so that its apex touched the front boundary of the branchial cavity. The sixth branchia started from a higher level than any of the others, in consequence of the great size of the coxopodite of the penultimate thoracic limb; its length was 1·05 inch; and it was nearly straight, its apex fitting into the summit of the branchial cavity. The base of each podobranchia is elongated upwards, as in *Astacopsis*; and there is a soft fold of integument over its attachment. There is no trace of any lamina.

On the removal of the podobranchiæ the arthrobranchiæ came into view. But, in contradistinction to all other known Crayfishes, there are only five of them fully developed, and even these are remarkably small in comparison with the podobranchiæ. The first is the shortest (0·5 in.); and they increase in length to the hindermost, which is 0·35 in. long. Each is concave forwards and convex backwards; and the apex of the hindermost comes within 0·15 inch of the nearest part of the anterior superior boundary of the branchial cavity. In all these branchiæ the branchial filaments are very numerous, stiff, relatively short and close-set; so that they

approach the characters of the branchiæ of the Lobster. The groove on the inner face of the stem seems, at first, to be reduced to nothing in the upper part of the podobranchiæ. However, a transverse section (fig. 7, III) shows that it exists and is bounded by two lips, the anterior of which is produced into a narrow ala. But the numerous hooked branchial filaments, which arise from the posterior face of the stem, fill the groove and appear to obliterate it.

The hindermost of the arthrobranchiæ is attached close to the articulation of the coxopodite with the epimeron, and is therefore in the same position as one of the anterior series of arthrobranchiæ in other Crayfishes. There is not the slightest trace of the attachment of another branchia on the arthrodial membrane behind this. But on the epimeron, just above the margin of the articular cavity, and 0·1 inch behind the root of the anterior branchia, a minute filament, 0·05 in. long, which I take to be a rudiment of the posterior branchia, enclosed by the downward extension of the epimeron, projects.

The attachment of the next arthrobranchia is like that of its predecessor, but not quite so far forward. At a distance of 0·5 in. behind and above its root, an exceedingly minute papilla, not more than a fifth of the length of the foregoing, is enclosed in the articular edge of the epimeron. This is doubtless the rudiment of the posterior arthrobranchia. The three remaining arthrobranchiæ are fixed into the arthrodial membranes of the other ambulatory and prehensile limbs, in a position corresponding with that occupied by the fourth. In the case of the hindermost of these, or that of the eleventh pair of appendages, there is, above and behind the root of the gill, and 0·08 inch distant from it, a filamentous rudimentary branchia, rather less than 0·1 inch long, attached within the articular margin of the epimeron. Three or four minute unequal processes are given off from the posterior edge of this filament. There is another very small papillary rudiment immediately above and behind the root of the next arthrobranchia; but none could be discovered above that of the most anterior arthrobranchia.

In addition to the five conspicuous and functional outer arthrobranchiæ, there was another very small one, only 0·18 inch long, and almost rudimentary, attached to the second maxillipede.

The pleurobranchia of the last thoracic somite was only 0·3 inch long, and was hardly visible at first, from being overlapped by the hindermost podobranchia. I could not discover the slightest trace of any other pleurobranchiæ.

The upper part of the modified podobranchia of the first maxillipede is sharply folded upon itself longitudinally; and its outer lobe is beset with numerous short branchial filaments, most of which have terminal hooks. Similar hooked filaments are to be found about the base and the posterior region of the other podobranchiæ; but a large proportion of the filaments of these branchiæ, and all of those of the arthrobranchiæ, appear to be hookless.

The tubercles of the coxopodites give rise to small tufts of short and straight setæ, which are hooked at the end, like those of *Asta-*

copsis (fig. 7, v). The hinder and upper setæ of the bases of the podobranchiæ are similarly hooked; but, as in the other species, the anterior setæ are straight, or only slightly curved at the extremities.

The Branchial formula of Astacoides madagascariensis.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.		
		Anterior.	Posterior.			
VII.....	0 (ep r)	0	0	0	=	(ep r)
VIII.....	1	r	0	0	=	1 + r
IX.....	1	1	0	0	=	2
X.....	1	1	r	0	=	2 + r
XI.....	1	1	r	0	=	2 + r
XII.....	1	1	r	0	=	2 + r
XIII.....	1	1	r	0	=	2 + r
XIV.....	0	0	0	1	=	1
$\begin{array}{cccc} \hline 6 + \text{ep } r + 5 & + & r & + & 4r & + & 1 & = & 12 + \text{ep } r + 5r \end{array}$						

In *Astacoides*, therefore, the branchiæ have suffered more reduction than in any other known Crayfish; and this reduction is, as it were, a continuation of the process already commenced in *Engæus* and *Paranephrops*, in which the anterior pleurobranchiæ and the posterior arthrobranchiæ are small, or even rudimentary.

III. THE CLASSIFICATION OF THE CRAYFISHES.

Whatever may be the variation in the structure of the branchiæ of the different species of Crayfish, it will be observed that they all agree in possessing podobranchiæ, or branchiæ attached to the coxopodites, of the six middle thoracic appendages, and that these are either not at all, or incompletely, differentiated into a branchial and an epipoditic division. Moreover *Astacopsis*, *Charaps*, *Engæus*, *Paranephrops*, *Parastacus* and *Astacoides*, in which the apices of the podobranchiæ are not separated into a branchial plume and a well developed lamina, present a less-differentiated type of branchial structure than that which obtains in *Astacus* and *Cambarus*.

Thus the structure of the branchiæ in the Crayfishes separates them into two groups, of which I propose to term the latter the POTAMOBIIDÆ, and the former the PARASTACIDÆ.

In the PARASTACIDÆ the podobranchiæ are devoid of more than a rudiment of a lamina, though the stem may be alate. The podobranchia of the first maxillipede has the form of an epipodite; but, in almost all cases, it bears a certain number of well-developed branchial filaments.

The first abdominal somite possesses no appendage in either sex; and the appendages of the four following somites are large.

The telson is never completely divided by a transverse suture.

More or fewer of the branchial filaments of the podobranchiæ are terminated by short hooked spines; and the coxopoditic setæ, as well

as those which beset the stems of the podobranchiæ, have hooked apices.

In the POTAMOBIIDÆ the podobranchiæ of the second, third, fourth, fifth, and sixth thoracic appendages are always provided with a large plaited lamina. The podobranchia of the first maxillipede is converted into an epipodite, entirely devoid of branchial filaments.

The first abdominal somite invariably bears appendages in the male, and usually in both sexes. In the male these appendages are styli-form, and those of the second somite are always peculiarly modified.

The appendages of the four following somites are relatively small.

The telson is usually completely divided by a transverse suture.

None of the branchial filaments are terminated by hooks; nor are any of the coxopoditic setæ or the longer setæ of the podobranchiæ hooked, though hooked tubercles occur on the stem and on the lamina of the latter.

The coxopoditic setæ are always long and tortuous.

It is worthy of notice that the Parastacidæ agree with the Palinuridæ and Scyllaridæ in the abortion of the appendages of the first abdominal somite, and in possessing hooked setæ, while in the Potamobiidæ, as in the Lobsters, the setæ are not hooked, and, as in almost all the Podophthalmia, except the Palinuridæ and Scyllaridæ¹, the appendages of the first abdominal somite are present, and are specially modified in the males.

Of the six genera of the Parastacidæ, *Astucoides* is widely separated from all the rest by the reduction of the number of its functional branchiæ to twelve, while all the other genera at present known have, at fewest, twenty, and usually twenty-one, branchiæ.

Astacopsis, *Chærapis*, *Engæus*, and *Parastacus* have, in common, a long epistoma, the surface of which is flattened, the basal joint of the antennæ fixed by the overlapping edge of the cephalostegite, the posterior thoracic sterna narrow, the coxopodites of the hinder thoracic limbs large and approximated in the middle line. The rostrum and the antennary squame are short. *Engæus* is distinguished among these, not only by the narrowness of the first abdominal somite, but by the form of the anterior part of the head, with its short and deflexed rostrum, and very small antennary squame.

In *Chærapis* the podobranchiæ are alate, in *Astacopsis* they are not. *Parastacus* somewhat resembles *Chærapis* in its alate podobranchiæ, but differs from all the rest by possessing long and tortuous coxopoditic setæ.

I have nothing to add to the distinctive characters of the two genera of the Potamobiidæ, *Astacus* and *Cambarus*, already given by Erichson, Hagen, and others.

All the branchiæ of the Crayfishes consist of a stem beset with numerous cylindrical filaments. In fact, they are typical examples of what are termed by Milne-Edwards "branchies en brosse," and may be called "trichobranchiæ," in contradistinction to the lamellar

¹ In *Gebia*, *Callinaxis*, and *Porcellana*, the first abdominal appendages are rudimentary or abortive in the male sex.

gills or "phyllobranchiæ," which are met with in a large number of other Crustacea. The whole of the Macrurous Podophthalmia, excepting the genera *Gebia* and *Callianassa*, the Prawns, the Shrimps, and the Mysidæ, have trichobranchiæ.

In the Mysidæ the branchiæ are rudimentary or absent, and in the Euphausidæ and Penæidæ they are peculiarly modified. In the Prawns and Shrimps, in *Gebia* and *Callianassa*, in all the Anomura and Brachyura, the gills are phyllobranchiæ.

Thus the Podophthalmia or Thoracostraca (to use the convenient name proposed by Prof. Claus) are divisible in respect of the structure of their respiratory organs into three groups, which may be termed Abranchiata, Trichobranchiata, and Phyllobranchiata.

Among the trichobranchiate Podophthalmia, the Euphausidæ possess no other than podobranchiæ¹. These are mere respiratory plumes presenting no differentiation even into base and stem. All the rest of the Trichobranchiata have arthrobranchiæ, either with or without functional podobranchiæ and pleurobranchiæ. Among those which possess all three kinds of branchiæ, the Parastacidæ and the Palinuridæ are highly exceptional among the Thoracostraca in the absence of the appendages of the first abdominal somite in both sexes. They further, as a rule, possess 21 branchiæ (*pdb.* 6, *arb.* 11, *plb.* 4), though the number is, in some cases, reduced by the suppression of more or fewer of the arthrobranchiæ and pleurobranchiæ.

In most, if not all the other Trichobranchiata, the first abdominal appendages of the males are present and specially modified. Among these, the Potamobiidæ are characterized by the imperfect division of their podobranchiæ into a proper branchial and an epipoditic portion.

In *Homarus* and *Nephrops*, *Axius* and *Thalassina*, the podobranchiæ are completely differentiated, from their bases onward, into a proper branchial and an epipoditic portion. In this condition the podobranchia is usually described as an epipodite, to the base of which a branchia is attached.

In *Homarus* the branchial filaments are numerous and multiserial, and the branchial formula is:—

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII. . . .	0 (ep)	0	0	0 =	0 (ep)
VIII. . . .	1	0	0	0 =	1
IX.	1	1	1	0 =	3
X.	1	1	1	0 =	3
XI.	1	1	1	1 =	4
XII.	1	1	1	1 =	4
XIII.	1	1	1	1 =	4
XIV.	0	0	0	1 =	1
	6 + ep	+ 5	+ 5	+ 4 =	20 + ep.

¹ Possibly some of the branchial plumes in *Sergestes* may be attached to the arthrochial membranes. A critical examination of the species of *Sergestes* in reference to this point would probably yield interesting results.

In *Nephrops* the branchiæ have the same structure, but the branchial plume of the podobranchia of the second maxillipede is absent or rudimentary; hence the number of the branchiæ is reduced to 19.

In *Axius* the podobranchia of the penultimate thoracic limb is reduced to an epipodite by the disappearance of the branchial plume, and the hindermost pleurobranchia is also wanting. The arthrobranchia of the second maxillipede is represented by a mere rudiment.

The Branchial formula of Axius stirhynchus.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.	0 (ep)	0	0	0	= 0 (ep)
VIII.	1	r	0	0	= 1+r
IX.	1	1	1	0	= 3
X.	1	1	1	0	= 3
XI.	1	1	1	1	= 4
XII.	1	1	1	1	= 4
XIII.	0 (ep)	1	1	1	= 3+ep
XIV.	0	0	0	0	= 0
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	5 + 2 ep	+ 5 + r	+ 5	+	3 = 18 + 2 ep + r.

The branchial filaments in this genus, again, are arranged only in two series on the stem, though, as they remain filiform, the approximation to the phyllobranchiate type is but slight.

In *Homarus*, *Nephrops*, and *Axius* the epipoditic divisions of the podobranchiæ are very large; but in *Thalassina*, *Stenopus*, and *Penæus* they are much reduced in size, and the branchial element disappears in more than the hindermost.

In *Thalassina scorpioides* the last thoracic somite is provided with no branchiæ of any kind, nor have its limbs any epipodite, and there are no pleurobranchiæ. The podobranchiæ of the twelfth and thirteenth somites are reduced to stout curved setose epipodites. In the eleventh there is a similar epipodite, but a branchial plume springs from its base. The tenth had a small epipodite, without a branchia in the specimen examined; but I am inclined to think that the branchia may have become detached; for the similar epipodite of the external maxillipede bore a mutilated, or rudimentary, small branchia. The small epipodites of the second maxillipedes figured by Milne-Edwards were broken off; but the places to which they were attached were discernible. The first maxillipede had no epipodite, in which respect *Thalassina* approaches *Callinassa*.

There are twelve arthrobranchiæ attached in pairs, from the second maxillipede to the penultimate thoracic limb inclusively. All these branchiæ are remarkable from the fact that, for a greater or less distance from the base of the gill, the stem is provided with broad imbricated foliaceous expansions, which are traversed by ramified

vessels, and take the place of the branchial filaments, which are sometimes very few, and confined altogether to the basal region of the branchia. These branchial plates differ from those of the true phyllobranchiæ in their small number and in their disposition, inasmuch as they are directed obliquely to the stem and not at right angles to it. Nevertheless it is interesting to find, in both *Axius* and *Thalassina*, a certain approach to the phyllobranchiate type, which is completely reached in *Gebia* and *Callianassa*.

The Branchial formula of Thalassina.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0	0	0	0	= 0
VIII.....	0 (ep)	1	1	0	= 2 + ep
IX.....	1	1	1	0	= 3
X.....	1	1	1	0	= 3
XI.....	1	1	1	0	= 3
XII.....	0 (ep)	1	1	0	= 2 + ep
XIII.....	0 (ep)	1	1	0	= 2 + ep
XIV.....	0	0	0	0	= 0
	—	—	—	—	—
	3 + 3 ep	+ 6	+ 6	+ 0	= 15 + 3 ep.

In *Stenopus hispidus* the branchiæ resemble those of *Astacopsis* in structure, the filaments being loose, slender, and multiserial. But the disappearance of the branchial plumes from the podobranchiæ has gone still further than in *Thalassina*; and all these organs are reduced to delicate, almost vesicular epipodites entirely devoid of any proper branchial filaments, except in the case of the second maxillipede, in which a few such filaments are attached to the base of the epipodite. Moreover the number of the pleurobranchiæ is increased to seven.

The Branchial formula of Stenopus.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep)	?	0	0	= (ep)
VIII.....	0 (ep r)	1	1	1	= 3 + ep r
IX.....	0 (ep)	1	1	1	= 3 + ep
X.....	0 (ep)	1	1	1	= 3 + ep
XI.....	0 (ep)	1	1	1	= 3 + ep
XII.....	0 (ep)	1	1	1	= 3 + ep
XIII.....	0 (ep)	1	1	1	= 3 + ep
XIV.....	0	0	0	1	= 1
	—	—	—	—	—
	0 + 7 ep + r	+ 6	+ 6	+ 7	= 19 + 7 ep + r

I am inclined to suspect the existence of a rudimentary anterior arthrobranchia in VII.; but I could not make sure of it.

By the structure of its branchiæ *Stenopus* is sharply separated from *Penæus*, with which it has hitherto been associated, although it approaches *Penæus* in the almost complete abortion of the branchial element of the podobranchiæ. In the Penæidæ, in fact, each branchia consists of a stem which is pointed at both ends and gives off two series of opposite lateral branches. This stem is attached by a pedicle near its lower end. Near each end of the stem the lateral branches are very short, and stand straight out; but they rapidly become longer; and as they do so they curve outwards towards one another, and eventually meet in the middle line. The middle of the branchia consequently assumes the form of a hollow cylinder.

The outer face of each lateral branch gives off a close-set series of secondary branches, which diminish in size towards the free end of the lateral branch, and at the free end are simple undivided filaments. But towards the attached end of the branch the secondary branches are themselves dichotomously subdivided in the direction of their length; so that the most complicated of these secondary branches presents a short stem whence two branches proceed, each of these again gives off two, and these may terminate in yet other two. Hence each secondary branch is like a flat triangular plate slit by fissures of varying depths, and attached by its apex to a lateral branch. All these secondary branches are directed upwards and outwards.

A detached lateral branch closely resembles one of the branchiæ of *Thysanopoda*; while, so far as I can judge from the figures given by Krøyer¹ and Sars², the branchiæ of *Sergestes* and *Lophogaster* still more closely approach those of *Penæus*.

A similar structure was described by Duvernoy in *Aristæus*, and was supposed by him to be characteristic of that genus; but Dana has already justly expressed a doubt whether, in this respect, *Aristæus* differs from the other Penæidæ.

In *Penæus*, the last and the penultimate thoracic limbs present no trace of podobranchiæ; and in all the rest the podobranchia is reduced to a small epipodite, which, in the middle of the series, is bifurcated at its free end. The latter lies between the arthrobranchiæ of its own somite and the next following. There are seven pleurobranchiæ, of which the hindermost is the largest, while the most anterior is very small.

¹ Forsøg til en monographisk Fremstilling af Kraæbsdyrslagten *Sergestes*: 1855.

² Beskrivelse over *Lophogaster typicus*: 1862.

The Branchial formula of Penæus brasiliensis.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	=	
		Anterior.	Posterior.			
VII.....	0 (ep)	1 (small)	0	0	=	1 + ep
VIII.....	0 (ep)	1	1	1	=	3 + ep
IX.....	0 (ep)	1	1	1	=	3 + ep
X.....	0 (ep)	1	1	1	=	3 + ep
XI.....	0 (ep)	1	1	1	=	3 + ep
XII.....	0 (ep)	1	1	1	=	3 + ep
XIII.....	0	1	1	1	=	3
XIV.....	0	0	0	1	=	1
	—	—	—	—	—	—
	0 + 6 ep	+ 7	+ 6	+ 7	=	20 + 6 ep.

The arthrobranchia of VII. is very small ; in fact, it is a mere tuft of dichotomously divided branchial filaments.

The results of this examination of the principal forms of those Trichobranchiata which possess more than one kind of branchiæ may be thrown into a tabular form, as follows :—

- I. No appendages to the first abdominal somite in either sex. *Astyla.*
 - 1. Podobranchiæ undivided..... PARASTACIDÆ.
 - 2. Podobranchiæ divided into branchial and epipoditic portions PALINURIDÆ.
- II. Appendages of the first abdominal somite almost always present, and specially modified in the males. *Stylophora.*
 - 1. Podobranchiæ partially divided..... POTAMOBIIDÆ.
 - 2. Podobranchiæ completely divided or reduced to epipodites.
 - a. Pleurobranchiæ not more than four.
 - α. Posterior pleurobranchia present, and the most posterior of the podobranchiæ complete HOMARIDÆ.
Homarus, Nephrops.
 - β. Posterior pleurobranchia wanting, and more or fewer of the posterior podobranchiæ reduced to epipodites.
 - a. Branchiæ with only filamentous processes..... *Axius.*
 - b. Branchiæ with foliaceous as well as filamentous processes *Thalassina.*
 - b. Pleurobranchiæ more than four.
 - α. Branchiæ filamentous *Stenopus.*
 - β. Branchiæ ramose..... *Penæus.*

All the Trichobranchiata are Macrura, in the sense of having the abdomen and its appendages well developed ; but, in *Ibacus* and *Thenus*, the abdomen becomes shortened and the cephalothorax wide, while the antennary and the ocular regions are modified in a manner very similar to that which gives rise to the peculiar "face" or "metope" of the typical Brachyura. A very little further modification would convert *Thenus*, for example, into a trichobranchiate Crab. Such forms as these, which simulate the Brachyura, and yet differ profoundly from them, may be termed "pseudo-carcinoids."

If the branchial filaments of *Axius* were shortened and widened, the structure of the branchiæ would approach that which obtains in *Gebia* and *Callianassa*, which are truly phyllobranchiate. But in other respects there is a wide interval between these genera, on the one hand, and *Axius* and *Thalassina*, which are ordinarily associated with them among the Thalassinidæ, on the other hand; for the podobranchiæ have entirely disappeared on the six hinder thoracic limbs, and even on the first or second maxillipede they are represented only by rudimentary epipodites.

There are no pleurobranchiæ; and the total number of gills is reduced to five pairs of arthrobranchiæ on each side.

The Branchial formula of Gebia and Callianassa.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.					
		Anterior.	Posterior.						
VII.....	0	0	0	0	= 0				
VIII.....	0	0	0	0	= 0				
IX.....	0	1	1	0	= 2				
X.....	0	1	1	0	= 2				
XI.....	0	1	1	0	= 2				
XII.....	0	1	1	0	= 2				
XIII.....	0	1	1	0	= 2				
XIV.....	0	0	0	0	= 0				
	0	+	5	+	5	+	0	=	10

In the almost complete abortion of the podobranchiæ, and in the presence of ten arthrobranchiæ attached in pairs to the middle thoracic somites, *Gebia* and *Callianassa* agree with *Porcellana*, *Galathea*, *Lithodes*, *Pagurus*, and *Remipes*. But in *Galathea* and *Porcellana* the four hindermost pleurobranchiæ are present, making fourteen gills on each side; in *Lithodes* and *Pagurus* the penultimate pleurobranchia exists, making eleven; in *Remipes* there is no pleurobranchia, and only nine arthrobranchiæ, viz. one on the ninth and two for each of the four following somites, are present.

In this group, which nearly corresponds with the Anomala of De Haan, and which I propose to term the "Anomomorpha," there is every degree of modification—from such typically Macrurous forms as *Gebia* and *Galathea* to such pseudo-carcinoids as *Lithodes* and *Porcellana*. It is interesting to remark, however, that, while in *Thenus* and *Ibacus* the process of modification has chiefly affected the head, in the Anomomorpha the characteristic changes are more marked in the abdomen. In none of the latter are the basal joints of the antennæ fixed, nor are distinct orbits formed.

It is easy to understand the possibility of the derivation of the Anomomorpha from some form allied to *Axius* and *Thalassina* (but with four pleurobranchiæ) by the further reduction, and final almost complete disappearance, of the podobranchiæ, while the biserial filaments of the other gills flattened out and became lamellar.

The Prawns and Shrimps ("Salicoques" of Milne-Edwards, *Carides*

of De Haan), if we exclude the Penæidæ, constitute a natural assemblage, to which I will apply the name of "Caridomorpha." They are all eminently Macrurous; and the characteristic feature of their branchial system is the predominance of the pleurobranchiæ, and the concomitant diminution in the number and the importance of the arthrobranchiæ and of the podobranchiæ. In fact, so far as I am aware, there are never any traces of the latter except upon the maxillipedes.

In both *Palæmon* and *Crangon* I find five pleurobranchiæ attached to the posterior thoracic somites, from the tenth to the fourteenth inclusively. In *Palæmon*, two arthrobranchiæ, one of which is very small, are attached to the arthrodistal membrane of the external maxillipede, which has a very short and rudimentary epipodite. The second maxillipede bears a podobranchia divided into a small branchia and an oval epipoditic plate. In the first maxillipede the place of the podobranchia is occupied by a rounded bilobed lamella.

In *Crangon* none of the maxillipedes bear gills. The epipodite of the first maxillipede is relatively much larger and triangular; that of the second is tongue-shaped and almost vesicular; that of the third is a mere rounded process.

I can find only one arthrobranchia on the ninth somite.

The Branchial formula of Palæmon.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.		
		Anterior.	Posterior.			
VII.....	0 (ep)	0	0	0	=	0 (ep)
VIII.....	1	0	0	0	=	1
IX.....	0 (ep)	1	1	0	=	2 + ep
X.....	0	0	0	1	=	1
XI.....	0	0	0	1	=	1
XII.....	0	0	0	1	=	1
XIII.....	0	0	0	1	=	1
XIV.....	0	0	0	1	=	1
		+ +				
		1 + 2 ep	+ 1	+ 1	+ 5	= 8 + 2 ep.

From the number of their pleurobranchiæ the Caridomorpha cannot be regarded as a reduced modification of any of the Trichobranchiata, except the Penæidæ and *Stenopus*. But it is easy to derive them from a *Stenopus*-like primitive form by the reduction of the podobranchiæ and the arthrobranchiæ, and the conversion of the five posterior pleurobranchiæ into gills of the lamellar type.

In the Brachyura of Milne-Edwards the disposition of the branchial apparatus is well known to be definite and characteristic. In *Cancer pagurus*, for example, there are nine branchiæ; seven of these are pyramidal in form, and take a general direction from the base towards the apex of the branchial chamber, to the inner walls of which they are applied. The two posterior of these gills are pleurobranchiæ, being attached respectively to the epimera of the eleventh and the twelfth somites. The fifth and fourth, the third and second,

are fixed in pairs by a common pedicle to the arthroal membrane of the appendages of the tenth and ninth somites—that is, the great forceps and the third maxillipede. The most anterior gill, slenderer than the others, is attached to the arthroal membrane of the second maxillipede. There are therefore five arthrobranchiæ.

The podobranchia of the first maxillipede is represented only by the large curved epipodite, which sweeps over the surface of the arthrobranchiæ and the pleurobranchiæ. The podobranchia of the second maxillipede is divided into a branchial plume, which lies horizontally under the bases of the four anterior arthrobranchiæ, and an epipodite, which ascends between the arthrobranchia of its somite and those of the next, and lies internal to the latter, close to the inner wall of the branchial cavity.

In the third maxillipede the epipodite is very long, and forms the valve to the afferent aperture of the branchial cavity. Attached to its base is a short truncated branchia, which fits in between the bases of the second and the third arthrobranchiæ.

The Branchial formula of Cancer pagurus.

Somites and their appendages.	Podo- branchiæ.	Arthrobranchiæ.		Pleuro- branchiæ.	
		Anterior.	Posterior.		
VII... . .	0 (ep)	0	0	0	= 0 (ep)
VIII... . .	1	1	0	0	= 2
IX... . . .	1	1	1	0	= 3
X...	0	1	1	0	= 2
XI... . . .	0	0	0	1	= 1
XII... . . .	0	0	0	1	= 1
XIII... . . .	0	0	0	0	= 0
XIV... . . .	0	0	0	0	= 0
	—	—	—	—	—
	2 + ep	+ 3	+ 2	+ 2	= 9 + ep.

A considerable reduction of the branchial apparatus occurs in some Brachyura, especially the *Catometopa*. Thus, in *Gelasimus* the hinder pleurobranchia and the most anterior arthrobranchia have disappeared, and the two podobranchiæ are so small as to be almost rudimentary.

In the Raninidæ and in *Latreillia*, the Brachyurous metope is incompletely formed; but the branchial system is essentially that of the true Crabs. The same may be said of *Dromia*, although the branchial apparatus of this crustacean presents some very interesting approximations to the less-modified type from which it cannot be reasonably doubted that the Brachyura have proceeded.

The epipodites of the three maxillipedes are very similar in form and disposition to those of the ordinary Crabs; and that of the second bears a small horizontal branchial plume. That of the third sometimes bears a small branchia. The coxopodite of the fourth thoracic limb has a small epipodite; but I find no trace of such an appendage on the rest of the thoracic limbs. Moreover there are five pairs of arthrobranchiæ attached to consecutive somites from the ninth to

the thirteenth—and four pleurobranchiæ, one for each of the four posterior thoracic somites.

The Branchial formula of Dromia.

Somites and their appendages.	Podo-branchiæ.	Arthrobranchiæ.		Pleuro-branchiæ.	
		Anterior.	Posterior.		
VII.....	0 (ep)	0	0	0	= 0 (ep)
VIII.....	1	0	0	0	= 1
IX.....	1	1	1	0	= 3
X.....	0	1	1	0	= 2
XI.....	0	1	1	1	= 3
XII.....	0	1	1	1	= 3
XIII.....	0	1	1	1	= 3
XIV.....	0	0	0	1	= 1
<hr/>		<hr/>		<hr/>	
2 + ep.		+	5	+	5
				+	4
		= 16 + ep.			

On comparing this branchial formula with that of *Homarus*, the relation between the two is obvious. In fact, if the three posterior podobranchiæ of the Lobster are suppressed, and the next is reduced to an epipodite, the branchial formula becomes the same as that of *Dromia*, and the remaining differences between the respiratory organs of the two result from the modification in form and structure of the branchial elements which remain. Thus it is a permissible, if not a probable, suggestion that, just as the Anomomorpha may have been derived from the modification of some form allied to *Axius*, and the Caridomorpha from some form allied to *Stenopus* and *Penæus*, so the Carcinomorpha (= the Brachyura and the Raninidæ, with *Homola* and *Dromia*) may have proceeded from some Homarine stock.

However this may be, the actual morphological relations of the Thoracostraca appear to me to be represented with tolerable accuracy by the following scheme:--

CRUSTACEA.

THORACOSTRACA OR PODOPHTHALMIA.

III. PHYLLOBRANCHIATA.

CARIDOMORPHA.

ANOMOMORPHA.

CARCINOMORPHA.

II. TRICHOBRANCHIATA.

Penæidæ. *Stenopidæ.*

Thalassinidæ. *Axiidæ.*

Homaridæ. *Potamobidæ.*

Palinuridæ.

Parastacidæ.

Euphausidæ.

I. ABRANCHIATA.

Mysidæ.

STYLOPHORA.

ASTYLA.

IV. THE DISTRIBUTION OF THE CRAYFISHES CONSIDERED IN RELATION TO THEIR MORPHOLOGICAL DIFFERENCES.

From what has been said above, it will be obvious that there is a remarkable correspondence between the morphological and the geographical divisions of the Crayfishes. Thus, all the Crayfishes of the northern hemisphere are Potamobiidæ, and all those of the southern hemisphere are Parastacidæ. In the northern hemisphere, again, the *Astaci* are Eurasiatic and West-American, while the *Cambari* are characteristic of the North-American region east of the Sierra Nevada—in other words, of the river-basins which flow into the Gulf of Mexico and the West Atlantic.

The *Astacine* region nearly answers to the Palæarctic province of Mr. Sclater, minus the southern shores of the Mediterranean, and plus Western North America; while the *Cambarine* region takes in most of the Palæarctic region, with the Neotropical region as far as Guatemala and the West Indies.

In the southern hemisphere, *Astacopsis*, *Chæraps*, and *Engæus* are confined to the Australian region, *Paranephrops* to New Zealand and the Fijis; while the South-American *Parastacus* is distinct from either of these, though closely allied with the Australian forms; and the peculiarity of the Madagascar fauna is vindicated by *Astacoides*.

Thus, if we were to establish provinces of distribution on the Crayfishes alone, they would bear only a partial resemblance to those based on the association of terrestrial animals. On the other hand, if we compare the distribution of the Crayfishes with that of the freshwater fishes, there are, as might be expected, some curious points of resemblance. The distribution of the Salmonidæ, for example, corresponds pretty closely with that of the Potamobiidæ, though the range of the Salmonidæ extends less far to the south in North America, and a little further, namely, as far as Algeria in the Old World. Again, the Salmonidæ to the east of the Rocky Mountains are, for the most part, distinct from those to the west, while the genus *Onchorhynchus* is, like *Astacus*, common to both the Asiatic and the American shores of the North Pacific.

With the singular exception of *Retropinna*, there is no true Salmonoid in the southern hemisphere; but, as Dr. Günther has pointed out, the Haplochitonidæ and the Galaxiadæ, which stand in somewhat the same relation to the Salmonidæ as the Parastacidæ do to the Potamobiidæ, represent the Salmonidæ in the fresh waters of New Zealand, Australia, and South America.

It is worthy of remark that the Salmonidæ, the Haplochitonidæ, and the Galaxiadæ are singular among Teleostean fishes for the embryonic character of their female reproductive organs, which have no oviducts—just as, among the Podophthalmous Crustacea, the Crayfishes are distinguished by the undifferentiated character of their podobranchiæ.

With the exception of one or two species in Algeria and Asia Minor, the Salmonoids and their allies are wanting in the whole of

Africa and Asia south of the great Asiatic highlands, just as the Crayfishes are. It will be very interesting to learn, from the thorough investigation of the fauna of Madagascar, which is now being carried out, whether the Salmonoids or their allies are in any way represented there.

The broad similarity in distribution between the Salmoniform fishes and the Crayfishes is doubtless due to the likeness of the conditions under which the two groups have reached their present development. I do not think that there can be any reasonable ground for questioning the assumption, that both the freshwater fishes and the freshwater Crustacea are modifications of a marine prototype, which has more or less completely adapted itself to freshwater conditions. In the case of the Crayfishes, at any rate, there is abundant analogical evidence in support of this hypothesis. It is well known that, in many parts of the world, the Prawns ascend rivers, and become fluviatile. The *Palæmon lacustris* (*Anchistia migratoria*, Heller) of the Lago di Garda is identical with a Prawn now living in the Mediterranean. Again, the *Mysis relicta* of the lakes of Norway, Sweden, Western Russia, and North America (Michigan and Superior) is only a variety of the *Mysis oculata* of the Arctic seas¹. Nor do I think it can be seriously questioned that the fluviatile and the land Crabs are modified descendants of marine Brachyura.

Let it be supposed that, at some former period of the earth's history, a Crustacean, similar to *Paranephrops* or *Astacopsis* in its general characters, but with the first pair of abdominal appendages fully formed, which we may call provisionally *Protastacus*, inhabited the ocean, and that it had as wide a distribution as *Palæmon* or *Penæus* have at the present day. Let us suppose, further, that the northern form of the genus tended towards the assumption of the Potamobiine, and the southern towards that of the Parastacine type. Under these circumstances, it is easy to understand how such rivers as were, or became, accessible in both hemispheres, and were not already too strongly tenanted by formidable competitors, might be peopled respectively by Potamobiine or Parastacine forms, which, acquiring their special characters in each great river-basin, would bring about the distribution we now witness. As time went on, the *Protastacus* stock might become extinct, or might be represented only by rare deep-water forms, as the Homaridæ are represented in the Indian Ocean only by *Nephropsis*.

Some such hypothesis as this appears to me to be fully justified by the present state of knowledge; and though it cannot as yet be said to be directly supported by palæontological facts, these facts agree with the hypothesis very well as far as they go. For the Mesozoic marine

¹ G. O. Sars, 'Histoire Naturelle des Crustacés d'eau douce de Norvège.' In the British Museum there is a species of that especially marine genus *Penæus*, which is affirmed by the Messrs. Schlagintweit to have been obtained from an affluent of the Sutlej, at the foot of the Himalayas. *Penæus brasiliensis* ascends the North-American rivers for long distances (Smith, in Prof. Baird's Report, 1872-72).

strata abound in Crustacea, such as *Glyphæa* and *Hoploparia*, which are evidently closely allied to the Crayfishes.

The great difficulty is, not to account for the Crayfishes where we find them, but to understand their absence over so large a part of the Old World and of intertropical America. Whether this is to be explained by extensive alterations in geographical conditions since the extinction of the *Protastacus* stock, or by the competition of Prawns and freshwater Crabs, or by some other circumstance at present unknown, is a very interesting subject for further inquiry.

Postscript, Oct. 24, 1878.

Since this paper was read, my friend Mr. Moseley, F.R.S., has written for and obtained specimens of the "Crayfish" said to exist in the fresh waters of the Cape-Verd Islands. They belong to the genera *Atya* and *Palæmon*. Moreover, by the intervention of Sir Joseph Hooker, I have procured a considerable number of freshwater Crustacea from Jamaica. But these also all belong to *Atya* and *Palæmon*. I suspect that all Sloane's "Crayfishes" are simply Prawns. The largest example of one of the species sent to me measures sixteen inches in length when the great chelate limbs are fully extended.—T. H. H.

November 5, 1878.

Arthur Grote, Esq., V.P., in the Chair.

The Secretary read the following reports on the additions to the Society's Menagerie during the months of June, July, August, September, and October 1878 :—

The total number of registered additions to the Society's Menagerie during the month of June was 159, of which 35 were by birth, 75 by presentation, 29 by purchase, 14 were received on deposit, and 6 by exchange. The total number of departures during the same period, by death and removals, was 73.

The most noticeable additions during the month of June was as follows :—

A Japanese Wolf (*Canis hodophylax*, of the 'Fauna Japonica,' Mamm. t. 9, p. 38), presented by H. Heywood Jones, Esq., F.Z.S., June 26th, being the first example of this little-known animal we have ever received alive.

Judging from the present specimen the Japanese Wolf, although nearly allied to *Canis lupus*, would seem to be a distinct species, to be recognized by its smaller size and shorter legs.

The Japanese Dog sent to us by Mr. Pryer (see P. Z. S. 1878, p. 115) is quite a different animal, and is, I have no doubt, only a variety of the domestic dog or a hybrid.

The registered additions to the Society's Menagerie during the month of July were 154 in number; of these 68 were acquired by presentation, 45 by purchase, 7 by exchange, 18 were bred in the Gardens, and 16 were received on deposit. The total number of departures during the same period by death and removals was 108.

The most noticeable additions during the month were:—

1. A male Beatrix Antelope (*Oryx beatrix*), presented 10th July, 1878, by Commander F. M. Burke, of B. I. S. N. SS. 'Arcot.'

Capt. Burke writes me that he obtained this animal at Jeddah from a friend of his, who received it as a present from the Shereff of Mecca. It had been originally captured in the neighbourhood of Tyeff or Tayf, some 150 miles E.S.E. from the Red Sea, in the Hedjaz passes.

I am sorry to have to add that this interesting animal (so far as I know, the third¹ specimen of its species known) reached the Gardens in a very poor state of health, and died shortly afterwards.

2. A fine young female Orang (*Simia satyrus*) received in exchange from the Zoological Gardens of Calcutta, July 27th.

The registered additions to the Society's Menagerie during the month of August were 117 in number. Of these 40 were acquired by presentation, 12 by purchase, 13 were bred in the gardens, 14 were obtained by exchange, and 38 were received on deposit. The total number of departures during the same period, by death and removals, was 116.

The most noticeable additions during the month were:—

1. One Spanish Blue Magpie (*Cyanopolius cooki*), presented August 2nd, by Lord Lilford, F.Z.S.

2. A young example of the Prairie-Wolf of North America (*Canis latrans*), presented by Prof. C. M. Vincent, F.G.S., F.R.G.S., August 21st.

Both these species are new to the Society's collection.

3. Three hybrid Boas, bred between a male of *Chilobothrus inornatus* and a female *Epicrates angulifer*, and born on the 30th of August.

There can be no question about the paternity of these curious hybrids, as there is no male *Epicrates* in the collection, and the *Chilobothrus* was observed *in copulâ* with her in March or April last.

The three young ones were brought forth alive on the 30th of August; and six eggs, more or less decomposed, came away subsequently.

So far as I know, hybridism among the Ophidians in captivity has not yet been recorded, and in this instance is the more singular as occurring between species of different genera.

The total number of registered additions to the Society's Menagerie during the month of September were 85 in number; of these, 43 were acquired by presentation, 4 by purchase, 13 by birth, and

¹ For a notice of two previous specimens, see P. Z. S. 1857, p. 158, Mamm., pl. lv., and P. Z. S. 1872, p. 603.

25 were received on deposit. The total number of departures during the same period, by death and removals, was 73.

The most noticeable additions during the month were as follows:—

1. An Oriental Eagle-Owl (*Bubo orientalis*), from Karennee, in the interior of Siam, presented September 16th by Charles Fowler, Esq., being the first specimen of this remarkable Owl that has been received by the Society.

2. Two fine Ostriches (*Struthio camelus*), presented by the Hon. H. C. Vivian, H.B.M. Consul-General for Egypt; and two Secretary Birds (*Serpentarius reptilivorus*), presented by C. Rivers Wilson, Esq., C.B.; received September 19th. These birds are from the collection of the Khedive of Egypt, at Cairo.

The total number of registered additions to the Society's Menagerie during the month of October 1878 was 93, of which 4 were by birth, 43 by presentation, 21 by purchase, 20 were received on deposit, and 5 by exchange. The total number of departures during the same period, by death and removals, was 123.

The most noticeable additions during the month of October were as follows:—

1. A female Sumatran Rhinoceros (*Rhinoceros sumatrensis*), deposited by Mr. C. Jamrach, October 4th. This Rhinoceros, which is full-grown, seems to agree in every respect with the two females of the same species previously purchased (in 1872 and 1875¹).

2. Two Leopard Tortoises (*Testudo pardalis*), presented by the Rev. G. H. R. Fisk, C.M.Z.S., of Capetown, October 9th. Mr. Fisk writes to me as follows respecting these Tortoises:—

“I am informed by Mr. Foster, of Clanwilliam, that in the year 1846 two full-grown Leopard Tortoises were transferred from Kaffirland to Clanwilliam, where they remained for many years without progeny, but that in the year 1857 these two young ones were hatched from the eggs of the female. We arrive, then, at the interesting fact, speaking of a Tortoise after the manner of men, which, perhaps, we may do of a Vertebrate, that these Tortoises are now of age, having lived just twenty-one years, and yet, according to the nature of Tortoises, are only children; for I am assured that they are in size scarcely two thirds of that of their parents, which died early in the year 1877, and within three months of each other.

“I wish to bestow on this Tortoise and its fellow the popular names of Kreli and Sandilli, in remembrance of the land inhabited by their ancestors, and of the war just ended between the Colony and those chiefs who will ever find a place in the history of the Cape.”

3. A young male Tufted Deer (*Elaphodus cephalophus*²), purchased October 15th, being the second example of this rare and little-known animal received alive. Having been caught in a trap, it is unfortunately deficient in one of its fore feet.

4. A female of the new Fallow-deer lately described by Sir Victor Brooke in the Society's ‘Proceedings’ (P. Z. S. 1875, p. 261)

¹ See Trans. Zool. Soc. ix. p. 659, et P. Z. S. 1876, p. 694.

² See P. Z. S. 1876, p. 273 et pp. 757, 758.

as *Cervus mesopotamicus*, purchased October 31st. This makes a pair of this fine Deer now in the Society's Gardens. Like the male obtained in 1877, the present specimen was obtained at Bussorah and brought to England by our energetic correspondent Capt. Phillips, of the S.S. 'Mesopotamia.'

I take this opportunity of recording the following facts relating to some hybrid Monkeys lately born in the Society's Menagerie, which Prof. Garrod has kindly put together for me:—

During the earlier months of the present year (1878) there were, together in one cage, three Monkeys along with others of smaller size and less developed. The three were:—(1) a male of *Macacus cynomolgus*, or of one of the allied local forms, from Upper Burmah (presented on May 19th, 1875), a particularly fine specimen; (2) a female adult *Cercocebus fuliginosus* (presented on the 3rd of April, 1876); and (3) a female Mandrill, *Cynocephalus mormon* (presented on the 5th of September, 1877), not adult.

The keepers of the House assert that they repeatedly observed the male Macaque in copulation with both females.

On October 2nd the Mangabey fell down from a high perch in her cage dead. All organs, including the brain, appeared quite healthy on postmortem examination. The uterus contained a fœtus far advanced in growth, apparently lacking about three weeks or a fortnight of full development.

On October 14th the Mandrill gave birth to a live young one, which still survives.

There seems no reason to doubt that the Macaque was the father of both the young ones, there being no male Mandrill nor Mangabey which could have had access to them, and the Mandrill's young one having a short tail¹.

The following note was read from Mr. J. H. Gurney, F.Z.S.:—

"Northrepps Hall, Norwich,
July 30, 1878.

"In the 'Proceedings' of the Society for the present year, mention is made at page 354 of two specimens of *Asturinuia monogrammica*, procured by Mr. E. C. Buxton at Darra-Salam, on the eastern coast of Africa.

"One of these skins was presented by Mr. Buxton to the Norwich Museum, accompanied by the following memorandum:—'Sings like any thing of an evening and, I believe, morning.'

"I am not aware that this habit of *A. monogrammica* has been previously noticed; and as it appears to indicate an affinity between this species and the genus *Melierax* (which *Asturinuia* also resembles when adult, in the remarkable red coloration of the cere, tarsi, and feet), I think Mr. Buxton's short note on the subject ought to be recorded.

"J. H. GURNEY."

¹Cf. Blyth's notice of a hybrid Monkey between *Macacus nemestrinus* and *Cynocephalus porcarius* in J. A. S. B. xxxii. p. 455 (1863).

The Secretary read the following extract from a letter addressed to him by Dr. A. B. Meyer, C.M.Z.S., of the Royal Zoological Museum, Dresden :—

“Mr. Van Musschenbroek, the well-known discoverer of *Diphylodes gulielmi* III., tells me that one of his colleagues in the Moluccas received about ten years ago from the west coast of New Guinea (*viâ* Aru Islands) a Bird-of-Paradise as large as *P. apoda*, but in general like *P. minor*, with this difference, that the whole body was covered with orange-coloured feathers. This bird was presented to the king of Holland ; but never was any thing heard of it again. In the year 1875 Mr. Van Musschenbroek saw in the hands of Prof. Steere, at Menado, among a collection of bird-skins which the latter had bought at Amboina, a specimen of *P. minor* which reminded him of the orange Bird-of-Paradise mentioned above. This specimen was spotted with yellow all over ; but it was a bad skin, and gave Mr. Van Musschenbroek the impression that it had belonged to a sick bird.

“Are these individual varieties of *P. minor*? or have we to deal with a new and unknown Bird-of-Paradise?”

A communication was read from the Marquis of Tweeddale, President, pointing out that a correction made in the proof of his last paper on Philippine Birds, *anteâ*, p. 611, had been through some mistake overlooked. The correct specific name of the *Polyplectron* there mentioned, page 623, was *napoleonis*, Lesson, not *emphanes*, Temminck, Lesson having given a description of his bird in the additions and corrections to his ‘*Traité d’Ornithologie*,’ page 650.

The following extract was read from a letter addressed to Lord Tweeddale by Mr. A. H. Everett, dated Singapore, July 21, 1878 :—

“Just before leaving Manilla I paid a visit to the small museum attached to the College of St. Thomas. There were a few bird-skins ; but the room was very dark, and, being with a party of friends, I could not make any satisfactory notes. My visit was, however, repaid by finding a specimen of the Wild Ox of Celebes (*Anoa depressicornis*), which had been brought from Mindoro. I had been led to suspect its existence in that island, but had hitherto failed to get any tangible evidence. I cannot say whether the Philippine animal is identical with that found in Celebes or not. The Professor of Natural History, who had no idea of the interest attaching to his specimen, although he had labelled it correctly, said that he had never heard of the *Anoa* being found at that part of the world, except in the rugged interior of Mindoro, where, however, it abounded. It is not easy to weigh the full import of the occurrence of this singular animal in the Philippines until something more is known about the fauna of Mindoro. I had previously been disposed to doubt the existence of another Celebesian animal, the black *Cynopithecus*, in the islands ; but I now feel less confidence on this point, and it is quite possible that it may turn up in Mindoro.”

Professor Newton, M.A., F.R.S., V.P., exhibited the skin of a bird supposed to be a hybrid between the Red Grouse (*Lagopus scoticus*) and the Ptarmigan (*L. mutus*), observing:—

“This remarkable specimen was lately given to me for the museum of the University of Cambridge by Capt. Houston, of Kintradwell, in Sutherland, having been shot there out of a covey of Grouse on the 1st of September, 1878. As will be seen, it bears some considerable resemblance, above, to a hen Ptarmigan in summer plumage; but its general appearance is much darker. Beneath, there is a greater resemblance to the young of the Red Grouse; and the primaries are much as in that bird, being, however, partially edged with white to a much greater extent than is commonly found in the latter. I have shown the skin to several ornithological friends, none of whom have been able to offer any other suggestion concerning it than that originally made by the donor, namely that it is a hybrid between the two species named; and in confirmation thereof, Capt. Houston told me that the part of his ground on which it was shot is close to a locality frequented by the Ptarmigan. Without having made an exhaustive search, I may say that I am not aware of any record of such a hybrid as this is supposed to be, though information received from several quarters induces me to believe that other examples have before now occurred; and my chief object in exhibiting the present specimen is to call attention to the subject.”

The following papers were read:—

1. On a new Species of *Indicator*, with Remarks on other Species of the Genus. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c.

[Received July 18, 1878.]

In an article which I sent to Mr. Dawson Rowley's 'Ornithological Miscellany' (vol. i. part iii.) I gave a revision of the Indicatoridæ, or family of Honey-Guides; and I am now able to add somewhat to the information there recorded.

INDICATOR CONIROSTRIS (Cass.): Sharpe in Rowley's Orn. Misc. vol. i. p. 196.

A few specimens of Honey-Guide having in the hasty packing away of my African collection become mislaid in another box, were not available when I wrote my paper on Indicatoridæ. Now that my collection has been added to the British Museum they have been discovered; and I was pleased to find among the missing birds a fine adult specimen of the present species from the interior of Fantee. It was sent to me by Governor Ussher in one of his last collections, and is the first example known from the Gold Coast. I find,

on comparing the two birds, that *I. conirostris* is a very distinct species from *I. minor*, having the head and back strongly washed with deep golden yellow, the centres of the feathers being blackish instead of pale brown as in *I. minor*. This contrast is especially seen in the wings, where the golden edgings to the black feathers stand out in bold relief, and make them very different from the appearance of the South-African species. The Fantee bird measures—total length 6 inches, culmen 0·45, wing 3·6, tail 2·6, tarsus 0·6.

INDICATOR ARCHIPELAGICUS (Temm.): Sharpe, *t. c.* p. 197; id. *Ibis*, 1877, p. 8.

As already recorded by me (*l. c.*) Mr. Alfred Everett procured a female specimen of this rare species at Bintulu, in North-western Borneo. Temminck's description is not very good; but the species is unmistakable from its yellow shoulder-spot.

INDICATOR EXILIS (Cass.): Sharpe, *t. c.* p. 198.

A specimen of this little Honey-Guide was sent recently from Landana, on the Congo, by M. Petit.

INDICATOR MALAYANUS, sp. n.

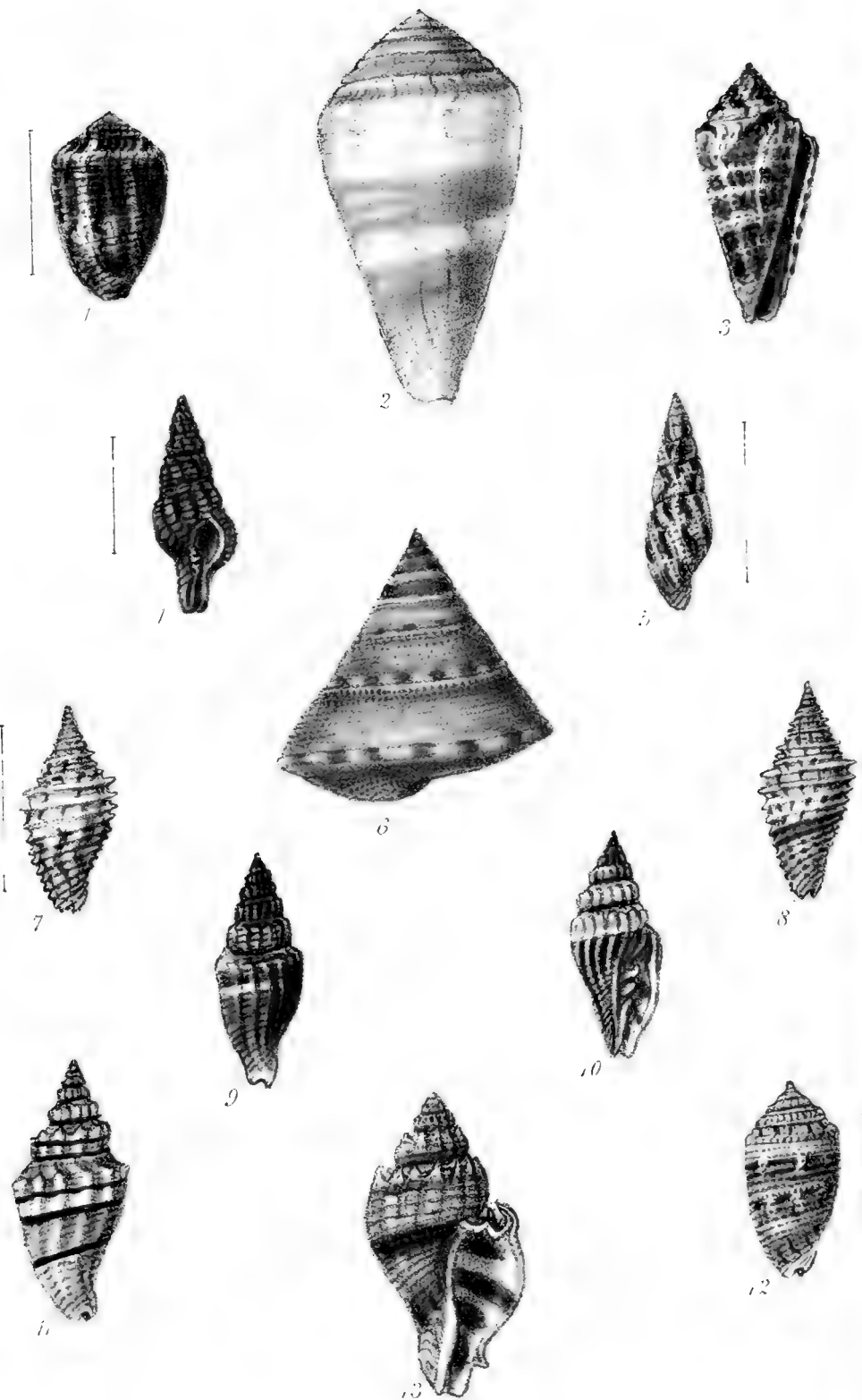
General colour above ashy, washed with olive-yellow, dimly on the head and mantle, the feathers of the back and wings more distinctly edged with olive-yellow, the primaries scarcely perceptibly margined; tail-feathers dark brown, edged indistinctly with olive-yellow, all but the two centre tail-feathers internally whity brown, increasing in extent towards the outermost, which is almost entirely whity brown, obliquely dark brown towards the tip; sides of face and ear-coverts dingy ash-colour with a very faint olive tinge; under surface of the body pale yellowish, creamy white on the chin and upper throat, abdomen, thighs, and under tail-coverts; the feathers of the breast and fore neck with mostly concealed greyish bases, imparting a somewhat mottled appearance; lower flanks mesially streaked with dark brown; under wing-coverts yellowish white, as also the edge of the wing; quills dark brown below, whitish along the edge of the inner web.

Total length 5·7 inches, culmen 0·55, wing 3·9, tail 2·45, tarsus 0·55.

The specimen from which the above description is taken was received by Mr. Henry Whitely, of Woolwich, in a large collection sent direct from Malacca along with the usual Malaccan birds. It cannot be the Himalayan species, *I. xanthonotus*, because the latter has the back and rump yellow; and it differs from the Bornean Honey-Guide (*I. archipelagicus*) in wanting the yellow shoulder-spot, grey breast, and flanks of the last-named bird, and in being altogether larger. This latter fact seems to prevent the possibility of its being considered a young bird of *I. archipelagicus*.

I propose the following amended key for the genus *Indicator*:—





- a. Uropygio et supracaudalibus dorso concoloribus, flavo nec albo marginatis.
- a'. Tetricibus alarum minimis interioribus reliquis concoloribus; plaga cubitali nulla.
- a". Subtus fere concolores, haud squamati.
- a'''. Pectore cineraceo, fascia mystacali nigricante; reetricibus extimis pure albis brunneo terminatis.
- a⁴. Majores; ala 3·5-3·7 unc.
- a⁵. Pallidus: mento summo albicante; tergi alarumque plumis brunneis flavo-olivascanti marginatis *minor*.
- b⁵. Saturatior: mento summo nigricante; tergi alarumque plumis nigris aurato-flavo marginatis... *conirostris*.
- b⁴. Minor; ala 2·5 unc *exilis*.
- b'''. Pectore olivascanti-flavido; fascia mystacali nulla; genis et regione parotica saturate cineraceis olivaceo vix lavatis; reatrice extima albicanti-brunnea, versus apicem oblique brunnea, reliquis saturate brunneis intus albicanti-brunneis *malayanus*.
- b''. Subtus squamati, haud concolores; gulæ plumis fuscis albo marginatis quasi squamatis.
- c'''. Pectore tantum squamato; abdomine fere concolori albo; hypochondriis albis brunneo striatis *variegatus*.
- d'''. Pectore et abdomine squamatis; hypochondriis brunneis fere concoloribus *maculatus*.
- b'. Tetricibus alarum minimis interioribus læte flavis, plagam conspicuam exhibentibus..... *archipelagicus*.
- b. Uropygio et supracaudalibus albicantibus, his albo marginatis.
- c'. Tetricibus alarum minimis interioribus læte flavis, plagam formantibus; hypochondriis brunneo striatis *sparmani*.
- d'. Plaga cubitali nulla; uropygio pure albo, haud brunneo striato; hypochondriis concoloribus; pileo flavo lavato.
- c''. Regione parotica pallide brunnea; rostro pallide brunneo *major*.
- d''. Regione parotica nigricante; rostro nigro *barianus*.
- c. Uropygio et dorso postico flavis *xanthonotus*.

2. Descriptions of ten new Species of Shells.

By G. B. SOWERBY, JUN.

[Received July 18, 1878.]

(Plate XLVIII.)

CONUS MELVILLI, n. sp. (Plate XLVIII. fig. 1.)

C. testa abbreviato-subcylindræa, solida, obtuse angulata, lævi, antice crenulato-sulcata, griseo-albida, cinnamomeo-fusco longitudinaliter strigata, lineis fuscis undulatis transverse cincta; interstitiis lineis curvatis longitudinalibus hic illic irregulariter divis; spira obtusa, fusco-strigata; anfractibus 7, convexis, lævibus; apertura modica, fauce castanea.

Long. 20, maj. lat. 11 mill.

Hab. Key West (*J. Cosmo Melvill*).

A small obtuse Cone, with characteristic markings, somewhat resembling those of *C. lucidus* (Mawe), on a smaller scale; the transverse brown lines are more numerous, and the short longitudinal ones crossing the interstices less so. The light-brown streaks almost

cover the shell, leaving small white patches between the transverse lines.

The shell described was picked up on the beach by Mr. Melvill at Key West (south of Florida) in 1872, and is at present the only specimen known of the species.

LATIRUS CAYOHUESONICUS, n. sp. (Pl. XLVIII. fig. 4.)

L. testa elongato-turrita, solidula, atro-fusca, antice contracta, sub-elongata; spira elongata; anfractibus 9, convexiusculis, spiraler liratis, longitudinaliter costatis, costis latis rotundatis, liris alternis minoribus, interstitiis striatim cancellatis; apertura ovata, parva, fauce laevi, purpureo-fusca; columella bicostata; canali subelongato, recto.

Long. 16, maj. lat. $5\frac{1}{2}$ mill.

Hab. Key West (*J. Cosmo Melvill*).

A very dark little *Latirus*, almost black within and without, with general characters common to the genus, and of the ordinary form of the larger species, such as *L. infundibulum*.

Among the shells found by Mr. Melvill at Key West, and submitted to me, the two above described are all that I can consider new species; but the following are worth mentioning:—

Conus japonicus (Hwass), which is identical with *C. largillierti* (Kiener) of Reeve's *Conch. Icon. Suppl.* pl. 2, species 275. It is a question whether this species, which in all probability never inhabited Japan, should retain the name given by Hwass, or whether that of Kiener should be adopted.

Conus nebulosus: a young specimen with a very sharp elevated spire.

Hemifusus corona (Gmel.). A number of specimens of a very small variety of this species, adult and well developed, but ranging from an inch to an inch and a half in length (Plate XLVIII. fig. 13).

From the collection of the late Sir E. Belcher:—

CONUS CARNALIS, n. sp. (Plate XLVIII. fig. 2.)

C. testa oblonga, subpyriformi, solida, obtuse angulata, obsolete striata, antice leviter costata; pallide carnea, late pallide fuscescenti bifasciata; spira obtuse-exserta; anfractibus 9, laevibus, in medio depressis; apertura modica, carneo tincta.

Long. 50, maj. lat. 25 mill.

Hab. ?

A very pale pink, smooth shell, very faintly banded with buff, of the form of *C. scabriusculus*.

A single specimen from the collection of the late Sir E. Belcher, without any note of locality.

CONUS CATENATUS, n. sp. (Plate XLVIII. fig. 3.)

C. testa subfusiformi, subtiliter granoso-lirata, postice acute angulata, antice attenuata, medio leviter contracta; albida, fusco irregulariter grandimaculata, liris transversis fusco eximie arti-

culatis; spira elata, conica, gradata; anfractibus 11, lævibus, leviter coronatis; apice acuto, fusco; apertura angusta, fusco tincta.

Long. 31, maj. lat. 14 mill.; spira alt. 10 mill.

A very neatly marked Cone, allied to *C. mahogani*, *C. ximines*, and *C. tornatus*, but perfectly distinct, both in form and markings.

Hab. Panama? (*ex coll. Sir E. Belcher*).

MITRA BERTHÆ, n. sp. (Plate XLVIII. fig. 11.)

M. testa angulato-fusiforimi, solidiuscula, cinerea, longitudinaliter striata et valide plicata, transversim leviter sulcata, antice attenuata, recurva, transversim valide costata; spira acuminato-turrata; anfractibus 10, superne angulatis, ad angulum bicarinatis, supra angulum concavis, in medio balteolis nigris duobus cingulatis, linea unica fusca superne circumcinctis; apice nigro-fusco; apertura elongata, intus fusco cincta; columella quadri-plicata, plicis duplicatis; labio externo leviter sinuato, lævi, crassiusculo.

Long. 32, maj. lat. 13 mill., spira alt. 13 mill.

Hab. China Sea (*Sir E. Belcher*).

Several specimens of this pretty shell were found in the above collection, and seem to have been hitherto unnoticed, although the species is very distinct and easily distinguishable from its congeners.

MITRA FULVOLIRATA, n. sp. (Plate XLVIII. figs. 9, 10.)

M. testa fusiformi, solidiuscula, cinerea, fusco-purpureo late fasciata, fulvo tincta, utrinque fuscata, antice contracta, leviter recurva; spira acuminato-turrata; anfractibus 10, convexiusculis, superne obtuse angulatis, transversim leviter sulcatis, longitudinaliter costatis, costis subangulatis, obtusis, fulvescentibus; apertura elongata, fauce lævi, fusco-purpurea; columella quadri-plicata, plicis obtusis, quadratis; labio externo simplici.

Long. 27, maj. lat. 9 mill., spira alt. 12 mill.

Hab. China Sea (*Sir E. Belcher*):

Several specimens presenting scarcely any variation were found in the above collection. Although a species of no very striking character, I cannot identify it with any hitherto described.

MITRA ACUTA, n. sp. (Plate XLVIII. figs. 7, 8.)

M. testa angulato-fusiforimi, albida, interdum purpureo tincta, fusco punctata, castaneo unifasciata, vel flammulata; spira acutissima; anfractibus 10, transversim carinatis; carinis numerosis, elevatis, acutissimis; interstitiis concavis, interdum lævibus, plerumque cancellatis; apertura subangusta, intus alba, lævi; columella quinqueplicata, plicis acutis; labio externo vix arcuato, crenulato.

Long. 20-23, maj. lat. 8-9 mill.

Hab. China Sea (*Sir E. Belcher*).

A number of specimens of this species were found in the above collection. They vary considerably in sculpture, some being smooth

between the keels, and others cancellated; but they all agree in being much more sharply angular than the specimens of *M. annulata* from Ceylon and Mauritius, the keels being more acute and prominent, and the body-whorl being shorter in proportion to the spire.

From other sources:—

MITRA DEBURGHIE, n. sp. (Plate XLVIII. fig. 12.)

M. testa cylindraco-conica, solidula, cinerea, hic illic sparsim fusco punctata, maculis albidis distantibus triseriatim dispositis cingulata, postice albida, ubique transversim sulcata, sulcis profundis, valide cancellatis; spira brevissima, conica, albida; anfractibus 9, obtuse angulatis; apice fusco; apertura oblonga, antice subexpansa, fauce cinereo-fusca; columellu quinqueplicata, plicis acutis, labio externo serrato.

Long. 16, maj. lat. 8 mill.

Hab. Tahiti.

A very pretty and distinct species of the *Imbricaria* section.

MITRA PUNCTURATA, n. sp. (Plate XLVIII. fig. 5.)

M. testa angusta, solida, antice leviter contracta, carneola, rufofusco maculata et flammulata, ubique longitudinaliter costata; costis numerosis, subconfertis, planulatis, interstitiis profunde punctatis; spira elongata; anfractibus 9, planato-convexis; sutura impressa; apertura oblonga, intus costata, carneola; columella 5-plicata.

Long. 20, maj. lat. 5, spira alt. 10 mill.

A single specimen without locality, but very strikingly different from every known species.

ZIZIPHINUS JUCUNDUS, n. sp. (Plate XLVIII. fig. 6.)

Z. testa acute sublata conica, tenui, fulvo-carneola, lineis fuscis minutis confertis interruptis spiraliter cingulata, versus apicem cinereo-fasciata; anfractibus 10, vix convexis, primis grano-liratis, sequentibus lævibus, ultimo juxta suturam iterum subconspicue grano-lirato, liris deinde fere obsoletis; sutura impressa; marginibus obtuse carinatis, maculis rubidis subdistantibus ornatis; basi planato-convexa; apertura oblique quadrata, fauce margaritata; columella callosa, obliqua, vix intorta.

Alt. 30, maj. diam. 33 mill.

Hab. Japan.

A very neatly formed and delicately marked shell, of which only one specimen is at present known.

EXPLANATION OF PLATE XLVIII.

- Fig. 1. *Conus melvilli*, p. 795.
 2. — *carnalis*, p. 796.
 3. — *catenatus*, p. 796.
 4. *Latirus cayohuesonicus*, p. 796.
 5. *Mitra puncturata*, p. 798.
 6. *Ziziphinus jucundus*, p. 798.

- Figs. 7, 8. *Mitra acuta*, p. 797.
 9, 10. — *fulvolirata*, p. 797.
 11. — *berthæ*, p. 797.
 12. — *deburghie*, p. 798.
 13. *Hemifusus corona*, var. *minor*, p. 796.

3. Description of a Remarkable new Spider from Madagascar. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received July 24, 1878.]

Amongst a series of insects of various orders recently collected in Madagascar by the Rev. William Deans Cowan, I found two Epeirids which especially interested me. The first of these I at once recognized as a fine example of the *Epeira tuberculosa* of Vinson (Aran. de Réunion, Maurice, et Madagascar, pl. xiv. fig. 2), specimens of which were previously in the collection of the British Museum.

The second spider struck me as so extraordinary that I wrote to the Rev. O. P. Cambridge respecting it. He tells me that it is a *Cærostris*, allied to *C. mitralis*, Vinson (*loc. cit.* pl. ix. figs. 2-4), but it appears to be perfectly distinct. "*Epeira tuberculosa*" belongs also to *Cærostris*.

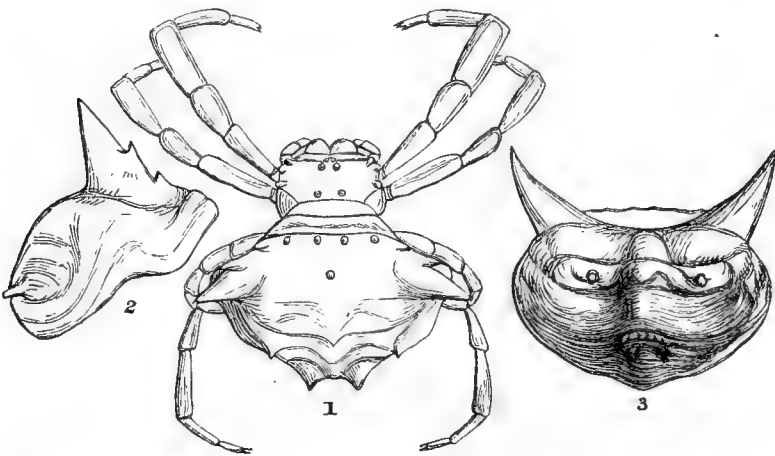


Fig. 1. *Cærostris avernalis* (enlarged).


Fig. 3. View of abdomen from behind.

Fig. 2. Profile of abdomen.

CÆROSTRIS AVERNALIS, n. sp.

Cephalothorax and falces dark castaneous, clothed at the sides and behind with whity-brown pile; palpi and legs above bright reddish castaneous, hairy at the sides, the femora cylindrical, with blackish lateral hairs, the tibiæ and tarsi flattened and longitudinally bisulcate, with whitish lateral hairs; tibiæ and tarsi below with their basal or distal extremities broadly belted with whitish, and their proximal extremities blackish; abdomen dark clay-coloured, covered (excepting the tubercles and odontoid processes) with whitish pile; centre of ventral surface blackish.

Falces large, rugulose, subcylindrical; palpi broad, flattened, bi-

sulcated, hairy at the sides; cephalothorax broader than long, with a small central projection in front, so that its anterior margin is -shaped; a broad gradually formed transverse ridge almost uniting the three oculiferous tubercles; the central oculiferous tubercle forming a transverse oval, with a central longitudinal depression, its highest point just within the eyes, and the uppermost surface of the eyes themselves flattened (as if filed smooth), the anterior pair of eyes much nearer to each other than the posterior pair; lateral oculiferous tubercles standing out obliquely from the antero-lateral angles of the cephalothorax, the eyes much smaller than those of the central group; a long cylindrical process emitted from each side of the cephalothorax at its postero-lateral angles and parallel to the lateral oculiferous tubercles; two widely separated conical tubercles standing perpendicularly upon the posterior border of the cephalothorax: abdomen irregularly subscutiform, with two terminal tubercles, between which it is sinuated; anterior margin with six conical tubercles, followed by a large unequally bidentate process on each side, these processes being widely divergent and oblique; a very minute tubercle on a bare spot between them; second superior abdominal fold with an acute conical tubercle on each side; pectoral shield heptagonal, its margins swollen.

Length 16 millims., including cephalothorax, of abdomen alone 12, width at widest part 15; length of lateral odontoid processes 6, width from tip to tip of processes 15; relative length of legs 1, 2, 4, 3.

Fianarantsoa, Madagascar.

Type in Coll. B. M.

Readily distinguished from *C. mitralis* by the much more prominent, more unequally bidentate, and far more divergent odontoid processes on the abdomen, the almost entire absence of the large central conical tubercle, the different arrangement of the tubercles on the margins of the abdomen, and the absence of bands on the upper surface of the legs.

4. Description of six new Species of Snakes of the Genus *Silybura*, Family *Uropeltidæ*, from the Peninsula of India.

By Lieut.-Colonel R. H. BEDDOME, C.M.Z.S.

[Received August 2, 1878.]

SILYBURA.

Sect. 1. *Scales in nineteen rows.*

* *Caudal disk flat.*

SILYBURA BROUGHAMI, n. sp.

Scales in 19 rows round middle of body, and neck; ventrals 224. Rostral large, high and sharp, nearly but not quite separating the nasals. Caudal disk flat, the scales prominently 3-5-keeled; terminal scute slightly bicuspid, the points side by side. Subcaudals 6. Colour brown, with a series of transverse wavy black blotches

in which are often ocellated white spots; sides with yellow blotches; abdominals dark brown.

Hab. Sirumullay hills (Madura district), 5500 feet elevation.

SILYBURA LEVINGII, n. sp.

Scales in 19 rows round body, ventrals 196. Rostral sharply pointed; nasals not quite separated by the rostral. Caudal disk very flat, the scales prominently 3-10-keeled; subcaudals 8-9. Upper parts purplish-brown, with narrow transverse black bands, in which are arranged yellowish white spots; sides with large yellow blotches; belly purplish brown, the blotches of the sides sometimes extending more or less across, particularly in the posterior portion. Tail with several yellow blotches on each side.

This species has much the coloration of *S. melanogaster*.

Hab. Lower Pulney hills (Madura district), 4000 feet elevation.

Sect. 2. *Scales in seventeen rows.*

A. *Number of scutes exceeding 160.*

b. *Caudal disk convex.*

SILYBURA OCHRACEA, n. sp.

Scales in 17 rows (neck and body), ventrals 225-231, rarely only 214. Rostral obtusely conical, moderate; nasals forming a suture behind the rostral; caudal distinct, more or less convex, the scales 3-8-keeled. Terminal scute much broader than long, ending in two points side by side; anal bifid; subcaudals 6-8-10. Back yellowish green in life (yellowish-brown in spirits), in the young and half-grown purplish brown, with irregular cross bands of ocellated spots, which are yellow with a black ring; sides and belly yellow, but the latter much marbled and blotched irregularly with the ground-colour; tail black beneath, surrounded with a bright yellow band; tail and head blackish olive. Length of a full-grown specimen 20 inches.

Hab. Anamullays, at Nelliampatty, 3000 feet, and at Ponachi, 4500 feet, and on the Bolumpatty hills, 2000 feet.

SILYBURA DUPENI, n. sp.

Scales in 17 rows (19 round neck); ventrals 233. Snout obtuse; nasals not separated by the rostral; caudal disk more or less convex, the scales rough, with 3-7 keels; terminal scute very sharply bicuspid and very rugose, the points side by side; subcaudals 10. Back uniform brown; belly and sides (2-3 outer rows of scales) yellow.

Hab. Anamullays at Nelliampatty, 3000 feet.

This may be only a variety of the last; but it has quite a different coloration.

SILYBURA GUENTHERI, n. sp.

Scales in 17 rows, ventrals 168. Rostral obtuse; nasals entirely separated by the rostral; no supraorbital; caudal disk convex; tail laterally compressed (as in *Plectrurus*); the scales perfectly smooth;

the terminal scute hard, yellow, and almost square at the end, the inconspicuous points being side by side, not superposed; subcaudals 13. Back uniform black nacreous, belly with two rows of the scales on each side of the ventrals yellow; chin and the anterior first inch or so of the belly black; tail black beneath, but with a yellow band on each side; upper labials yellow.

Hab. "High Wavy" mountain, Madura district, 5000 feet elevation.

B. *Number of scutes less than 160.*

a. *Caudal disk flat; snout obtuse.*

SILYBURA MADURENSIS, n. sp.

Scales in 17 rows, abdominals 142-149. Rostral very small, obtusely conical; nasals large, forming a suture behind the rostral; vertical distinctly six-sided; caudal disk flat, each scale with 1-2 very prominent keels; terminal scute sharply bicuspid, the points side by side; subcaudals 7-8. Back black, very iridescent, each scale girt with a narrow white rim; belly orange-yellow, with very irregular broad black markings, which sometimes meet and form cross bars.

Hab. "High Wavy" mountain, Madura district, elevation 5500 feet.

5. A Note on *Pæoptera lugubris*, Bp.

By R. BOWDLER SHARPE, F.L.S., F.Z.S.

[Received August 15, 1878.]

(Plate XLIX.)

This species was first described by Prince Bonaparte, in the 'Comptes Rendus' for 1854, as *Pæoptera lugubris*, as he thought it was the Abyssinian *Muscicapa lugubris* of Müller (Beitr. Orn. Afr. Taf. ii.); and it was on account of this confusion of names that Dr. Brüggemann wrote his note in the 'Annals of Natural History' for 1877 (xx. p. 244), and suggested that the species should be called *Pæoptera cryptopyrrha* (Cabanis). When he states, however, that the species had no name of its own until 1876, he is mistaken; for the title "*lugubris*, Bonap." was adopted for the species by Dr. Hartlaub (Orn. Westaf. p. 69), which was sufficient to fix the specific name. But on reading Bonaparte's description again, I find that I missed the point of it, and Dr. Brüggemann does not appear to have consulted the original description, having been incited to write his notice probably by the footnote to the genus *Pæoptera* in my 'Catalogue,' wherein I hinted that Bonaparte had so confused his species with Müller's *Muscicapa lugubris* that the title ought perhaps to be rejected. I am sorry to have led Dr. Brüggemann wrong, for I had overlooked the fact that when Bonaparte described the *Pæoptera* he added:—"Nous appellerons l'espèce *lugubris*, qu'elle



4
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J.G. Keulemans lith.

Hanhart imp

PŒOPTERA LUGUBRIS.



soit ou non la *lugubris*, Müller;” and I am glad that I followed Hartlaub, and did not alter the name, as I had felt inclined to do. Dr. Brüggemann was also mistaken in supposing that he was the first to inform me of the probable identity of the species described by Cabanis with Bonaparte’s *Pœoptera lugubris*; for I had finished my synonymy of this bird for my ‘Catalogue’ long before the casual conversation to which he alludes.

After all, however, it appears that both Dr. Brüggemann and myself were wrong in our facts, and *Myiopsar cryptopyrrhus* of Cabanis is *not* synonymous with *Pœoptera lugubris* of Bonaparte. Dr. Peters having very kindly sent me from Berlin some of the new species of birds lately described by Drs. Cabanis and Reichenow for examination, has added the type of *Myiopsar*, and asked me to compare it with our examples of *Pœoptera lugubris*. I am surprised to find it specifically distinct; and so the subjoined modification must take place in the synonymy of the genus as given by me in the ‘Catalogue.’

Genus PŒOPTERA.

<i>Pœoptera</i> , Bp. Comptes Rendus, xxxviii. p. 381	Type.
(1854)	<i>P. lugubris</i> .
<i>Myiopsar</i> , Cabanis, J. f. O. 1876, p. 93	..... <i>P. cryptopyrrha</i> .
<i>Range.</i> West Africa, from the Gold Coast to the Congo.	

Key to the Species.

- a. Purple; edges of secondaries whity brown, forming a light band down the wing; inner webs of quills dark brown, scarcely lighter than the outer web. *P. lugubris*.
- b. Violet-blue with somewhat of a greenish gloss; no whity-brown edges to the wing; quills rufous on the inner web, forming a red lining to the wing *P. cryptopyrrha*.

1. PŒOPTERA LUGUBRIS. (Plate XLIX.)

Pœoptera lugubris, Bp. C. R. xxxviii. p. 381; Hartl. Orn. W.-Afr. p. 69 (1857); Sharpe, Cat. B. iii. p. 281 (1877).

Thamnobia lugubris, Gray, Hand-l. B. i. p. 212 (1869).

Pœoptera crptopyrrha, Brügg. Ann. N. H. (4) xx. p. 244 (1877, nec Cabanis).

Hab. From the Gold Coast to Gaboon.

Since the publication of the Catalogue, I have discovered in the British Museum a third specimen, a male, put away by mistake along with the species of *Thamnobia*, according to Gray’s classification. It was only discovered this month (August 1878), during a re-arrangement of the specimens of Chats.

2. PŒOPTERA CRYPTOPYRRHA.

Myiopsar cryptopyrrhus, Cab. J. f. O. 1876, p. 93.

Adult male (type of species).—General colour above glossy violet blue, with here and there a slight shade of steel-green; least

and median wing-coverts like the back, the remainder, as well as the quills, dark brown, with slightly paler edges; the primaries rufous for the greater portion of their length, this red colour concealed when the wing is shut; tail-feathers black, edged with dull violet-blue; sides of face and entire under surface of body glossy violet-blue, a little duller than the upper surface; under wing-coverts like the breast; quills dusky brown below, the inner webs broadly rufous for a great portion of their extent. Total length 7·5 inches, culmen 0·6, wing 3·5, tail 3·3, tarsus 0·75. (*Mus. Berol.*)

Hab. Congo district.

6. On a Collection of Marine Shells from the Andaman Islands. By EDGAR A. SMITH, F.Z.S., Zoological Department, British Museum.

[Received August 16, 1878.]

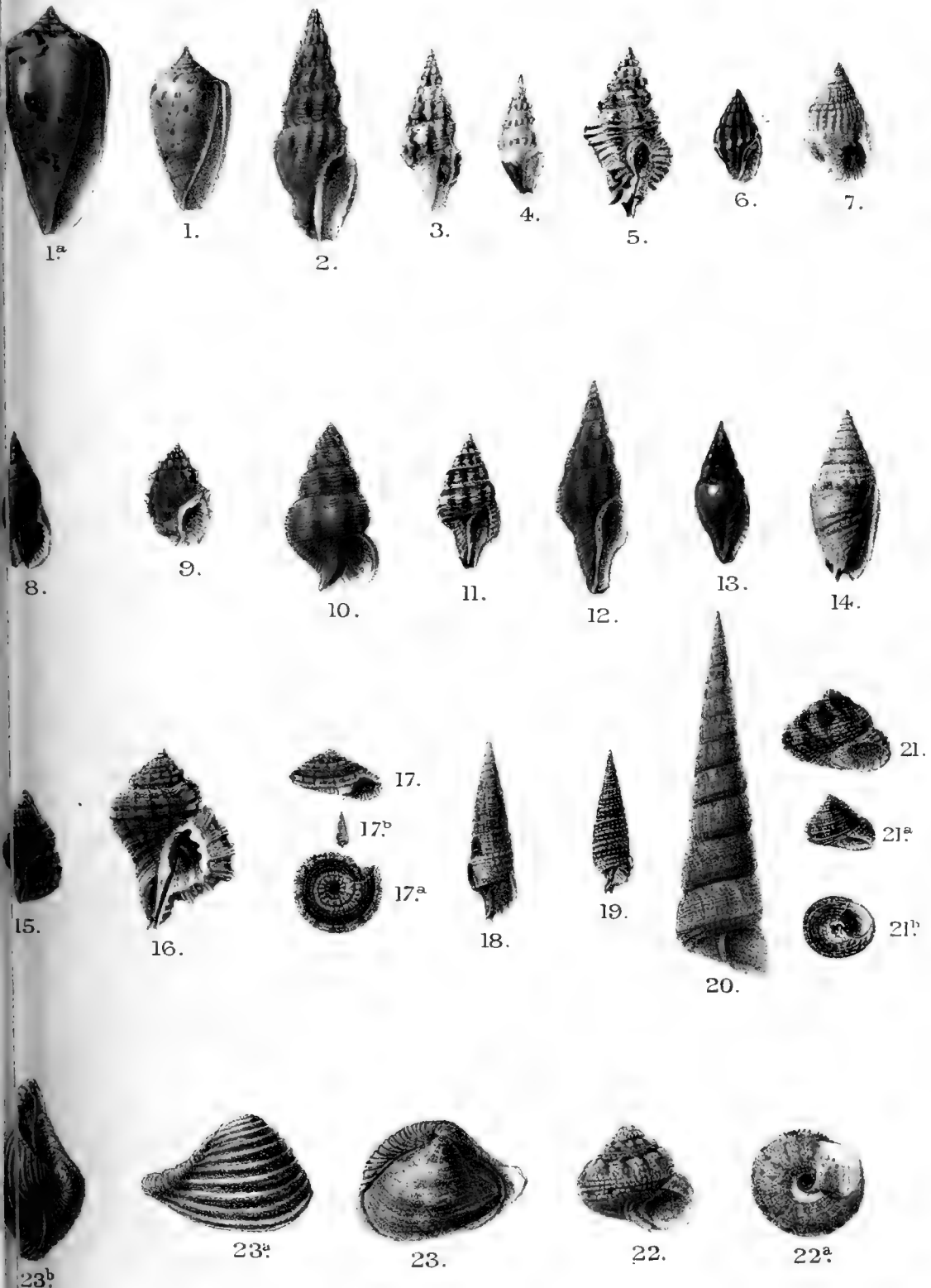
(Plate L.)

The shells treated upon in this paper form part of a series recently presented to the British Museum by Capt. L. Worthington Wilmer, by whom they were dredged whilst stationed at the Andaman Islands. All, with one or two exceptions, were obtained at the depth of a few fathoms off Port Blair. The collection contains about half a dozen new forms, the most interesting of which is a remarkable shell which I have provisionally located in the genus *Fusus*. After each species I have quoted the locality first assigned to it, and others have been added on the authority of specimens in the Museum, in order to give at a glance the known geographical distribution, which is always interesting, and calculated to assist materially in the identification of the various forms.

1. *CONUS ANDAMANENSIS*. (Plate L. figs. 1, 1 a.)

Shell subcylindrical, with somewhat convex lateral outlines, pale pinkish white, marked irregularly with small brown spots and lines, and covered with a very thin, smooth, greyish epidermis: spire elevated concave, composed of ten whorls; the two nuclear ones subglobose, semidiaphanous, smooth, the four following slightly turreted, and the rest obliquely planulated, spirally sculptured with two to three fine revolving striæ; the markings on the spire are in the form of short brown lines following a radiating direction (that is, across the whorls): the last whorl has the upper angle rather obtuse, and is sulcated at the base with about twelve transverse grooves. Aperture rather narrowed above, and a little widened towards the base, white within. Lip thin, with a small situation at the upper extremity. Length 22 mill., diam. 11.

This pretty little species, which I am unable to place as the young state of any larger form, is remarkable on account of the fine brown dots or lines, which are irregularly scattered over its surface of a





delicate pale pink. The spire too is peculiar, on account of the few first whorls being suddenly elevated into a little prominent cone.

Since writing the above description I have seen a larger specimen from the collection of Dr. Hungerford. It measures 31 millims. in length and 15 in diameter; and the markings are rather larger, certain spots a little above the middle of the last whorl taking the form of a transverse interrupted band (fig. 1 *a*).

2. *CONUS CEYLANENSIS*, Hwass.

Hab. Red Sea, Ceylon, Rodriguez Island; varieties at Sandwich Islands, Lord Hood's Island, &c.

3. *PLEUROTOMA (DRILLIA) VARIABILIS*, Smith, *Annals & Mag. Nat. Hist.* 1877, vol. xix. p. 495. (Plate L. figs. 2 & 3.)

There is a non-adult variety of this species, which does not exhibit at this stage of growth any indication of the slight umbilical rimation which is characteristic of the mature shell. It is whitish dotted with brown beneath the suture, and stained with a darker tint above it in the spaces between the short costæ; and the spiral liræ are also dotted with brown. The body-whorl is encircled around the middle by a broad brownish band, which is darker at the edges, and below this it is entirely white.

4. *PLEUROTOMA (DRILLIA) WILMERI*. (Plate L. fig. 4.)

Shell subfusiform, not rimate, white, dotted with brown beneath the sutural line, and with a series of brown dots or (in other words) an interrupted line around the middle, the dots being situated just above the interspaces between the nodules, which form a series a little below the middle of the whorls. The lower half of the body-whorl dark brown; and a spot of the same colour stains the shell at the superior sinus; the apex is also brown. Whorls ten, broadly concave above, and somewhat acutely noded below; nodules eleven in number on the penultimate whorl, the last volution transversely striated, the basal striæ being stronger than elsewhere; aperture rather small, white, stained with dark brown at the short basal canal; labrum thin, arcuate when viewed laterally, deeply and broadly sinuated at the suture, with a second small sinus or indentation near the base; columella but little curved or sinuous, covered with a thin brown callosity, terminating above in a large white tubercle. Length 16 mill., diam. 6.

This shell is very distinguishable from its congeners, on account of the peculiarity of its painting, and the series of sharpish tubercles encircling the whorls. I have much pleasure in naming it after Capt. Wilmer, its discoverer.

5. *TEREBRA AFFINIS*, Gray.

Hab. Philippines, Fiji, Tahiti.

6. *TEREBRA EXIGUA*, Deshayes.

Hab. East Australia.

It is interesting to obtain authentic examples of this species from

the Andaman Islands, as the type shells were described as East-Australian. The specimen before me, which is apparently adult, has a length of 21 millims., and the last whorl is 4 in diameter. The costæ (about 18 on a whorl) are thickest at the upper extremity, above the sulcus which parts off the infrasutural belt, gradually attenuating downwards, and at length become quite obsolete at the extreme base of the body-whorl.

7. MUREX (MURICIDEA) CIRROSUS, Hinds.

Hab. Straits of Macassar (*Hinds*).

Some small specimens of this charming shell were dredged by Capt. Wilmer, one of which possesses an unusually long canal.

8. MUREX (MURICIDEA) RUSTICUS, Reeve. (Plate L. fig. 5.)

Hab. —?

I feel uncertain whether the Andamanese shell is without doubt the same species as that figured by Reeve. It agrees very well with the description, but exhibits some difference from the figure, which is very coarsely executed. The number of transverse ridges is greater, the mouth a little smaller; and the fronds, although a little broken and worn, would not I think, if perfect, be as long as those represented in the figure.

9. MUREX (MURICIDEA) BARCLAYANA, H. Adams.

Coralliophila barclayana, H. Ad. P. Z. S. 1873, p. 205, pl. 23. fig. 1.

Hab. Mauritius (*H. Ad.*).

The Andamanese specimen of this species, the type of which is now in the British Museum, is only 21 millims. in length, yet apparently full-grown. Its coloration is much less brilliant than the representation of the described shell, being pale pinkish white, with the lateral varix and the termination of the canal tinged with brown, the aperture being light purple.

10. MUREX (OCINEBRA) BREVICULUS, Sowerby, Proc. Zool. Soc. 1840, p. 146; Conchol. Illustr. fig. 37.

M. tetragonus, Reeve (non Broderip), Conch. Icon. iii. fig. 118.

Hab. —?

A single, much worn, yet undoubted example of this species is valuable as indicating the habitat of so interesting a form. Reeve considers it a short variety of Broderip's *M. tetragonus*, the figure he gives of the latter representing a typical *breviculus*. *M. tetragonus* proper is well figured by Sowerby in his 'Conchological Illustrations,' fig. 25. Judging from the specimens of the two species which I have examined, all of them unfortunately in a more or less worn and faded condition, I am of opinion that they are specifically distinct. Besides the much stouter and less-produced form of *M. breviculus*, its aperture is larger and more circular, white or slightly blotched with brown far within; the transverse costæ, especially on the obtuse varices, are also brown. *M. tetragonus*, on the other

hand, is white, or very pale purple, and the aperture, the interior of the basal channel, and the columella, are of a uniform light purple. It is true, however, that the sculpture in both is remarkably similar.

11. *COLUMBELLA* (*ANACHIS*) *NIGRICOSTATA*. (Plate L. fig. 6.)

Shell acuminate ovate, subturreted; beneath a thin dirty yellowish epidermis, white, with black ribs, with a series of white spots on the costæ a little above the middle of the last whorl, and with a black elongate spot or line in each of the interstices between the ribs, those towards the labrum being produced downwards to the base in a rather zigzag manner. Whorls 8, a little convex, with about 12 thinnish ribs on each. Body-whorl a little flattened or even concave at its broadest part; the ribs in front are produced somewhat below the middle; and on the back four or five nearest the lip are developed only a short distance from the suture, leaving the whorl below them smooth. At the base it is transversely grooved, the eight or nine ridges or liræ between the sulci being spotted with black. These spots are the continuation of the colouring of the longitudinal costæ. Aperture small, narrow, bluish white within; labrum exteriorly thickened, thin at the edge and bearing about 8 tubercles within, of which the three or four upper ones are the largest; columella sub-erect, slightly convex at the middle, covered with a thin callosity, with a free margin, through which the transverse ridges which wind round the end or cauda of the whorl appear somewhat in the form of nodules. Length $12\frac{1}{2}$ mill., diam. 6.

This species is well characterized by its coloration, the black costæ contrasting conspicuously with the pale interstices. It is considerably like *C. terpsichore*, Sowerby, in form and sculpture, but different in colour.

12. *COLUMBELLA* (*ATILIA*) *PUELLA*, Sowerby; Reeve, Conch. Icon. xi. sp. 65.

Hab. Philippines.

The plicæ on the back of the body-whorl are almost obsolete; but immediately behind the labrum three are well developed and situated very close together, thus forming a very strong postlabral varix. The denticulation within the aperture consists of about eight short fine liræ. The columella is coated with a thickish enamel, and is armed with about seven fine, short, transverse lirations.

13. *ENGINA* *ASTRICTA*, Reeve.

Ricinula astricta, Reeve, Conch. Icon. iii. fig. 31.

Hab. —? (*Rve*).

14. *NASSA* *ELEGANS*, Kiener; Reeve, Conch. Icon. viii. pl. 2. fig. 10 (not good); Kiener, Coq. Viv. pl. 24. fig. 97.

Hab. Indian Ocean.

15. *NASSA* *CRENULATA*, Bruguière; Reeve, Conch. Icon. sp. 2; Kiener, Coq. Viv. pl. 23. fig. 90.

Hab. Philippines.

16. *NASSA TÆNIA*, Gmelin, Syst. Nat. p. 3493; Knorr, Vergnüg. v. pl. 10. fig. 3.

N. olivacea, Bruguière, Reeve, fig. 19; Kiener, pl. 15. fig. 53.

Hab. "West Indies" (*Lamarck and Reeve*); Ceylon and Chili (*Kiener*).

"West Indies," which is cited by some authors as the home of this species, is doubtless erroneous; for it is scarcely possible that any species of Mollusca living on the shore between tide-marks could be found inhabiting such remote localities as the Andaman Islands and the West Indies. It was collected by Cuming on mud banks in the Bay of Manilla; and the specimens obtained by Capt. Wilmer were found on the mud in mangrove-swamps.

17. *NASSA LURIDA*, Gould, Proc. Boston Soc. Nat. Hist. 1849, vol. iii. p. 153; Atlas, Wilkes's Explor. Exped. pl. 19. fig. 325 *a, c*; Otia, p. 68.

N. dispar, A. Adams, P. Z. S. 1851, p. 96; Reeve, Conch. Ic. fig. 45.

Hab. Samoa Islands (*Gould*); Philippines (*Reeve*).

18. *NASSA BIFARIA*, Baird, Cruise of the Curaçoa, p. 436, pl. 38. figs. 1, 2. (Plate L. fig. 7.)

Hab. New Caledonia

The type of this species was brought from New Caledonia. The Andaman specimens differ from that form in a few respects: the plicæ on the body-whorl are more numerous and more developed towards the base; and the transverse sulci on the central portion are generally more pronounced.

19. *NASSA MONILE*, Kiener, Coq. Viv. pl. 11. fig. 40; Reeve, Conch. Ic. fig. 38.

Hab. Philippines.

20. *NASSA MARGARITIFERA*, Dunker.

Buccinum margaritiferum, Dkr., Philippi's Abbild. vol. iii. pl. 1. fig. 12. (Non *Nassa margaritifera*, Dkr., Reeve, figs. 59 *a, b*.)

N. costellifera, A. Adams, P. Z. S. 1851, p. 113; Reeve, figs. 58 *a, b*.

Hab. Rocks below Ross Island; Port Blair (*Wilmer*).

The shell figured by Reeve as *margaritifera* of Dunker certainly is distinct from that species, and may possibly be a closely ribbed variety of *Nassa marginulata*, Lamarck.

21. *NASSA STIGMARIA*, A. Adams, P. Z. S. 1851, p. 96; Reeve, Conch. Icon. sp. 42.

Hab. "Dredged in deep water, Port Blair" (*Wilmer*). Other localities are Japan, Philippines, and New Caledonia.

The specimens from the Andaman Islands are very much smaller than that figured by Reeve, having only a length of 10 to 13 millims. In all other respects they agree very well, varying one from another

in the length of the spire, the proximity of the series of granules, and the size of them.

A peculiarity of this species consists in the manner in which some of the yellowish tubercules are as it were set in an irregular darker-coloured ring, or, in other words, are surrounded by a dark line at their base.

22. *NASSA GEMMULIFERA*, A. Adams, P. Z. S. 1851, p. 99; Reeve, Conch. Icon. viii. figs. 132 *a*, *b*.

Hab. Philippines (*Cuming*).

23. *NASSA ALBESCENS*, Dunker.

Buccinum albescens, Philippi's Abbild. neuer Conch. iii. pl. 2. fig. 15.

Nassa albescens, Reeve, Conch. Icon. viii. fig. 100.

Hab. West Indies (*Dunker and Reeve*); Sandwich Islands.

This species is undoubtedly an East- and not West-Indian species. It has been found at the Sandwich Islands by Pease, and also at other localities in the Pacific.

24. *NASSA (ARCULARIA) GLOBOSA*, Quoy and Gaimard.

Buccinum globosum, Q. and G. Voy. Astrolabe, pl. 32. figs. 25-27.

Nassa globosa, Reeve, Conch. Icon. viii. figs. 62 *a*, *b*.

Hab. Vanikoro Island and New Ireland (*Quoy*).

25. *NASSA MARRATII*, Smith, Journ. Linn. Soc. xii. p. 543, pl. 30. fig. 4. (Plate L. fig. 8.)

Hab. Solomon Islands.

This species I described from specimens collected at the Solomon Islands. The shells from the Andaman Islands are a trifle larger, having a length of 19 millims; with the exception of this difference, they agree perfectly with the typical shells. In the above-quoted figure of this species the form of the aperture is not at all correctly drawn. The columella has not such a long curve; and the labrum should be more expanded at basal end.

26. *NASSA (HIMA) SISTROIDEA*, G. and H. Nevill, Journ. Asiatic Soc. Bengal, 1874, xliii. part 2, pl. 1. fig. 6.

Hab. "Found in one spot below the rocks near the barracks, Ross Island, very local" (*Wilmer*).

In their description of this interesting species, Messrs. Nevill do not remark upon the curious way in which the costæ on the body-whorl are trinodose through the prominence of some of the transverse liræ at intervals. The uppermost row of nodulous projections borders the depression or elevation at the top of the whorl; the median series is situated about the middle, and the lowermost a little below that. This I take to be a specific character, as it is present in all the adult specimens which I have seen, and the above-named figure of their type also exhibits this peculiarity. The whitish band which is seen within the aperture runs between the uppermost and median series of nodules.

Besides the two or three "plaits," which perhaps should rather be termed elongate tubercles, at the base of the columella, there is a small one at the upper part, usually present in most species of *Nassa*.

N. trinodosa of Smith has the same nodulation on the last whorl, but, however, is quite distinct from this species. It differs in colour, has fewer longitudinal costæ, which are less granulous; and the spiral thread-like liræ which cross them are fewer and less prominent.

N. subspinosa of Lamarck is another allied species of much the same form, and having the same character of sculpture; only the nodules are much more prominent and the ribs less numerous.

27. *NASSA* (*ARCULARIA*) *GRANIFERA*, Kiener, Coq. Viv. pl. 27. fig. 111; Reeve, Conch. Ic. viii. fig. 72.

Hab. Philippines (*Reeve*).

28. *NASSA* (*ARCULARIA*) *BIMACULOSA*, A. Ad. P. Z. S. 1851, p. 102; Reeve, Conch. Icon. viii. sp. 61.

Hab. Philippines (*Cuming*); "Andaman Islands, on sand banks at low tide; very active animal" (*Wilmer*).

29. *NASSA* (*ARCULARIA*) *CALLOSPIRA*, A. Ad. P. Z. S. 1851, p. 102; Reeve, Conch. Icon. viii. figs. 66 *a*, *b*; G. and H. Nevill, Journ. Asiatic Soc. Bengal, 1874, vol. xliii. pt. 2, pl. figs. 5, 5 *a*.

Hab. Andaman Islands (*Nevill and Wilmer*); Philippines (*Cuming*).

On comparing an Andaman specimen with the type of the species, I do not hesitate for a moment with regard to its identity.

30. *NASSA HORRIDA* Dunker.

Buccinum horridum, Dkr., Philippi's Abbild. neuer Conch. iii. pl. 2. fig. 8.

Nassa horrida, Dkr., Reeve, Conch. Icon. viii. figs. 69 *a*, *b*.

N. curta, Gould, Otia, p. 69; Atlas, Wilkes's Explor. Exped. pl. 19. figs. 326 *a*, *b*.

Hab. Samoa Islands (*Gould*).

31. *NASSA ECHINATA*, A. Adams, P. Z. S. 1851, p. 101; Reeve, Conch. Icon. viii. fig. 131. (Plate L. fig. 9.)

Hab. Philippines.

The Andaman specimens are all shorter than the type, which is figured by Reeve; and not one of them has the fifth or lowermost series of nodules on the body-whorl, which is very closely approximated to the fourth row. In other respects they agree perfectly with the typical shells said to have been found at the Philippine Islands. This species is allied to *N. muricata* of Quoy and Gaimard, yet is perfectly distinct. It differs from that species in being almost quite smooth in the interstices between the nodules, there being only the faintest indication of spiral striæ in some specimens. The aperture, too, is less elongate, and the margin of the basal canal is stained with dark brown. This

is very characteristic, and, although not referred to by Reeve or Adams, is constant in all the specimens which I have seen.

The colour is whitish, with the oblique longitudinal costæ usually pale brown; and the tips of the rather acute nodules are white. *Nassa gruneri*, Dunker, is another closely allied form, yet readily distinguished by its colour and sculpture.

32. PHOS SENTICOSUM, Linn.

Hab. Philippines.

This beautiful and well-known species varies very considerably in colour, from white with dark transverse bands to uniform rich purple-brown, with some of the spiral thread-like liræ yellow.

33. PHOS ROSEATUM, Hinds.

Hab. Philippines, Moluccas, &c.

34. PHOS TEXTUM, Gmel.

Buccinum blainvillei, Deshayes.

B. cancellatum, Quoy & Gaimard.

Phos cyanostoma, Sowb. (not of A. Ad.), Thes. fig. 46.

Hab. Philippines.

The shell figured by Sowerby as *P. cyanostoma* of A. Adams is a slight variety of *P. textum*, differing in having a somewhat elongated spire and the body-whorl a trifle shorter than usual, and constricted just above the raised ridge which encircles the extreme base or cauda of the whorl. The painting is precisely the same in both forms. The true *cyanostoma* (described in the Proc. Zool. Soc. 1850, p. 155) is very like this variety in form and sculpture, but is distinguished by the margins of the columella and labrum and the tip of the body-whorl being stained with violet.

35. FUSUS? ABNORMIS. (Plate L. fig. 10.)

Shell imperforate, oblong, turreted, pale yellowish-brown; whorls 9, very convex, divided by a deep channelled suture, obliquely plicated; plicæ or costæ rounded, swollen, gradually increasing in size from the apex downwards and becoming less prominent, crossed by numerous slender finely-scaled liræ, which are alternately coarser and finer, numbering about 15 on the penultimate and about 40 on the last whorl; aperture small, irregularly pyriform, about one third as long as the entire shell, dirty white within, with the outer lip simple, with 10 fine thread-like liræ, which extend within as far as can be observed, but do not attain quite to the edge of the lip: basal canal short, narrow, oblique, and a little recurved. Length 23 mill., diam. 11½.

This species is totally unique in form and sculpture; and it is with considerable doubt that I have placed it among the species of *Fusus*. It also exhibits some affinity with *Coralliophila*, which genus, as generally accepted, contains a group of species which are usually inhabitants of Madrepores, and are characterized by the white or purplish colour, and the scaly nature of the transverse ridges, and the shortish open channel at the base of the aperture, which is

lirate within. The present species is remarkable for the great convexity of the whorls, and the fineness of the spiral scaly liræ. The aperture also is unusually short in proportion to the whole length; and the liræ within are very fine, and produced as far as the eye can trace inwards.

36. *SISTRUM MARGARITICOLA*, Bruguière.

Hab. Singapore; Lord Hood's Island; Natal.

37. *LATIRUS DECORATUS*, A. Adams, P. Z. S. 1854, p. 316; Kuster, Con. Cab. Ad. 2, pl. 25. figs. 12, 13 (as *Turbinella*). (Plate L. fig. 11.)

Hab. New Zealand (*Adams*).

The Andaman variety of this species has the longitudinal costæ much thicker, and consequently fewer in a whorl, than the New-Zealand form; and the colour is a little different. The general tint is whitish with a blush of rose, the two granulous liræ beneath the suture light brown, interstices between the costæ dark brown, the body-whorl with a rose-coloured band bordered on each side by a white liration around the middle, the tip of the canal blackish, the columella and outer lip pinkish, and the apex of the spire pink. The colour of this species ("alba castaneo varie picta") given by Adams does not at all describe the variety of painting. There are two specimens in the Cumingian collection, both pinkish white with a rosy apex and a pinkish aperture; and one, probably the type, has the dark brown tip to the canal. The shell figured in the Conchylien-Cabinet is larger than the type or the Andaman specimens. The former is 18 mill. long, 17 in diameter, and the largest of the latter 20 in length and 8 in width.

38. *LATIRUS FASTIGIUM* (Reeve). (Plate L. fig. 12.)

Turbinella fastigium, Reeve, Conch. Ic. iv. figs. 72 a, b.

Hab. Ceylon.

Of this species the British Museum possesses three specimens—one from Ceylon, the type (the habitat of which is unknown), and the third presented by Capt. Wilmer, from the Andaman Islands. Two of them have six longitudinal costæ, whilst the type has only five. The latter is an immature shell; and consequently the figure of it in the 'Conchologia Iconica' does not convey a true idea of the aperture in the adult. When perfect the canal is a little longer and the columella is covered with a callosity, the edge of which is produced, and at the base of the shell forms an umbilical fissure.

Reeve does not mention that one or two of the spiral liræ just beneath the suture are conspicuously scabrous; nor does he point out that 4 or 5 of them around the cauda of the body-whorl are also scabrous and thicker than the rest, which are frequently alternately coarser and finer. The plaits on the columella are somewhat indistinct and about five in number; and the aperture is finely lirate within, the liræ terminating at some distance from the margin of the labrum.

39. *LATIRUS INCARNATUS* (Deshayes), var.

Turbinella incarnatus, Desh., Kiener, Coq. Viv. pl. 18. fig. 3; Reeve, Conch. Icon. iv. fig. 55.

Hab. Philippines; Australia.

The shell from the Andaman Islands, which I consider a variety of this species, is light brown and darker between the ribs; the apex of the spire is pinkish; and the body-whorl has two spiral whitish or yellowish liræ, one above and the other below the middle of it, the former being visible on the penultimate and antepenultimate whorls. The aperture and columella are pinkish, the outer lip finely lirate within; and the columella has one or two rather indistinct plicæ at the base.

40. *MITRA MÆSTA*, Reeve, Conch. Icon. ii. sp. 323. (Plate L. fig. 13.)

Hab. Philippine Islands.

Shell fusiform, turreted, olive-brown, subimate. Whorls 10 or 11, shortly tabulated above, but very slightly convex at the sides, spirally grooved with three narrow subequidistant sulci, the uppermost one at the top of the whorls, dividing off a thickened edge to the tabulation, which is channelled; this thickened belt is of a brighter brown colour than the rest of the shell. Last whorl transversely sulcated throughout; sulci about 11 in number; a few of the superior ones, with the exception of the uppermost, more or less obsolete; those below the middle broader and deeper, leaving raised ridges or liræ between them. Aperture narrow, brownish within, a little less in length than half the entire shell; columella furnished with a thickish callosity, with a raised free edge forming in the umbilical region a slight fissure; plaits 4, the uppermost thickest, the others in turn by degrees finer; basal channel and tip of the whorl dark brown. Length 19 mill., diam. $6\frac{1}{2}$.

This species is remarkable on account of the turreted character of the spire. The tabulation of the whorls, however, is narrow and shallowly channelled. The Andaman specimen differs from the type in having the whorls more distinctly turreted; the spiral sulci are not so pronounced; and the colour is somewhat different. In the type (which is a worn shell), the upper part of the whorls is white, whilst in the specimen above described it is light brown.

41. *MITRA MARIÆ*, A. Adams, Proc. Zool. Soc. 1851, p. 140. (Plate L. fig. 14.)

Hab. Eastern Seas.

In describing this species Adams writes, "*labro intus sulcato.*" I have carefully examined the type specimens in Cuming's collection and also the Andamese shell, and do not find a trace of sulcation within the labrum of any of them, and therefore conclude that the observation of Mr. Adams was incorrect.

The body-whorl has two broad purplish-brown bands indistinctly separated by a faint light zone occupying the greater part of the whorl. Beneath the suture there is a greyish-white band. The entire surface

is variegated with fine white zigzag lines and small brownish spots, principally on the upper edges of the transverse liræ. The superior margin of the upper purplish-brown band is interrupted by opaque white blotches edged on one side by dark brown. In the Monograph of this genus (*Thesaurus Conchyl.* iv.) Sowerby considers this species a variety of *M. incisa*, Ad. & Reeve. However, I think there are sufficient differences to separate them. The form of the latter is narrower, the whorls proportionally higher, the transverse ridges on the spire flatter, and the spire itself is less acutely conical.

42. MITRA (CANCILLA) ANNULATA, Reeve, *Conch. Icon.* ii. sp. 103.

M. nitens, Kiener, *Coq. Viv.* pl. 29. fig. 96.

Hab. Zanzibar (Reeve).

The plaits on the columella are not invariably five in number, some specimens being furnished with a sixth. The shells from the Andaman Islands have less of the brown markings than appear in Reeve's figure, and in this respect resemble more the specimen delineated by Kiener.

43. MITRA (CANCILLA) PHILIPPINARUM, A. Adams, *P. Z. S.* 1851, p. 141.

M. flammea, Reeve (not of Quoy & Gaimard), *Conch. Icon.* ii. fig. 120.

Hab. Philippine Islands.

This species, when in fine condition, has the transverse costæ prettily marked with small, close-set, olive-brownish dots. These are not mentioned by Reeve or Adams, owing to the fact that the specimens in Cuming's collection which they described are somewhat worn or over-cleaned; however, they are traceable when closely searched for.

44. MITRA (CHRYSAME) TABANULA, Lamk., Kiener, *Coq. Viv.* pl. 9. fig. 27; *Voy. Astrolabe*, pl. 45 bis, figs. 10-13; Reeve, *Conch. Icon.* ii. fig. 332.

Hab. Philippines (Reeve); Vanikoro (Quoy).

The specimen of this species from the Andamans is rather small, and of a uniform deep brown colour. The three plaits on the columella are whitish, the aperture olivaceous; and the outer lip has three or four conspicuous tubercular teeth at a short distance from the upper extremity.

45. MITRA (CYLINDRA) UNDULOSA, Reeve, *Conch. Icon.* species 193, fig. 192.

Hab. Philippines (Cuming).

A very short stunted variety was obtained by Capt. Wilmer. It has eight plaits on the columella, whereof the uppermost is much thicker than the rest.

46. MITRA (CALLITHEA) ACUPECTA, Reeve, *Conch. Icon.* fig. 76.

The Andaman shell agrees precisely in form with the type from Zanzibar; but the longitudinal costæ are less numerous.

47. MITRA (CALLITHEA) OBELISCUS, Reeve, Conch. Icon. ii. fig. 107.

A small specimen, not quite adult, from the Andaman Islands, agrees with those from the Philippines in all respects, but has the second white band below the middle of the body-whorl more conspicuous than usual.

48. MITRA (COSTELLARIA) EXASPERATA, Chemnitz; Reeve, Conch. Icon. fig. 162.

M. torulosa, Lamk., Kiener, Coq. Viv. pl. 25. fig. 77.

Hab. Java; Philippines.

49. MITRA (COSTELLARIA) DESHAYESII, Reeve, Conch. Icon. fig. 170.

Hab. New Caledonia (*Mus. Cuming*).

Capt. Wilmer tells me that the orange-scarlet markings on this pretty species fade considerably after death. One of the specimens he collected is 25 millims. long. The mouth is purplish black within, with a single white zone; and the lip is white within at the margin.

50. RANELLA PUSILLA, Broderip, P. Z. S. 1832, p. 194; Sowerby, Conchol. Illustr. fig. 1*, fig. 1a, var.; Reeve, Conch. Icon. ii. figs. 44 a, b (both varieties). (Plate L. fig. 15).

Triton laciniatum, Mighels, fide Pease, Amer. Journ. Conch. iv. p. 107.

Var. = *R. rosea*, Reeve, l. c. fig. 46.

Var. = *Bursa concinna*, Dkr. P. Z. S. 1862, p. 239.

Hab. Lord Hood's Island and Philippine Islands; Red Sea.

R. rosea, Reeve, and *concinna*, Dkr., which I consider varieties of this species, are distinguished from the normal form almost solely on account of a difference in colour. If this were tenable, the Andaman shell would constitute a third species; for it certainly varies in this respect either from *R. pusilla*, *concinna*, or *rosea*. The principal colour is reddish brown; the lowermost series of granules on the upper whorls, the fourth and fifth series from the top of the body-whorl, and the second rib from the suture on each varix, on all the whorls, are yellow. The columella is purple, with three or four transverse whitish nodules, and within the outer lip near its edge there are about eight white bead-like granules on a dark-purple ground. The interior of the aperture is purple-brown, with the exterior yellow zone visible.

The normal form of the species described by Broderip is white in every part. In the Museum series of nearly 40 specimens there are various intermediate and connecting gradations between this and the pink form (*rosea*) or the brown variety (*concinna*). In fact, the differences are so subtle, that I feel it impossible to draw a line of distinction any where between these varieties. The difference in specimens apparently adult is very striking. The largest example of

the variety (*rosea*) measures 22 millims. in length, whilst a very small one is only 9 millims. long.

The tuberculation is also subject to considerable variation. The number of the transverse series of granules appears to be very constant, there being invariably three principal rows in the upper whorls, and seven in the body-whorl, but the size and number of the granules differ in various examples; and this difference is not peculiar to each form, but exists in shells belonging to the same variety.

Reeve describes the tubercle-like nodules on the angle of *rosea* as bipartite. This is scarcely correct; for there certainly are two series at this point; and being situated rather closely together, they might be considered single nodules subdivided.

51. TRITON (SIMPULUM) STRANGEI, A. Adams & Angas, P. Z. S. 1864, p. 35. (Plate L. fig. 16.)

Hab. Moreton Bay, East Australia.

The whorls in this species are seven in number, and not four as described by the authors of it. The four apical or nuclear volutions are smooth, convex, and horn-colour; the remaining three are somewhat concave beneath the suture, of a pale brown colour; and the varix on the labrum between the spiral ridge is stained with bright red, and the canal with brown.

The transverse costæ are described by Adams and Angas as being trisulcate. This, however, is not the case; for there are only two sulci, making each of the ridges trilirate, the central liration being most prominent. The costæ are prettily undulated, owing to their being prominent at intervals where they cross the longitudinal sub-plications; there are two of them round the middle of the penultimate whorl, and the one preceding it, and five on the last. The aperture is white, and the columella furnished with a tubercle at both extremities; the Andaman specimen, besides these, has a few intermediate ones. The labrum is strongly varicose, and has six coarse lirations within.

52. TORINIA PERSPECTIVIUNCULUS, var. (Plate L. figs. 17-17 b.)

Hab. Red Sea, Seychelles Islands, Philippines, Pacific Islands, &c.

The Andaman and Seychelles specimens of this widely distributed and very diversely shaped species are very depressed in form, similar to the variety (*planulata*) figured by Hanley in Sowerby's 'Thesaurus Conchyliorum,' vol. iii. pl. 254. fig. 63.

The operculum is very elongate-conical, having a marked resemblance in form to a small *Triphoris*.

53. CYPREÆ GANGRÆNOSA, Solander.

Hab. Zanzibar, Mozambique.

54. LITORINA UNULATA, Gray, Philippi's Abbild. ii. pl. 5. figs. 17, 18; Reeve, Conch. Icon. figs. 67 b-d (? fig. 67a).

Hab. North Australia, Philippines, and Society Islands.

55. *LITORINA VENTRICOSA*, Philippi, Abbild. iii. pl. 6. fig. 19 ;
Reeve, Conch. Icon. fig. 93.

Hab. Pulo Penang.

L. nova-zealandiæ, Reeve, and *L. melanacme*, Smith, have a somewhat similar ventricose form, but differ in colour and the absence of the granulation on the transverse ridges between the sulci.

56. *CERITHIUM (VERTAGUS) KOCHI*, Philippi, Abbild. iii. pl. 1.
fig. 3 ; Conch. Icon. figs. 26 *a, b*. (Plate L. fig. 18.)

Hab. East Africa, Philippines, Japan.

The Andaman specimens are small, but agree very closely in detail of sculpture with more typical ones, yet differ rather in colour. They are pale horn-colour, with the granules, varices, and a band at the top of the whorls whitish. Behind the varices they are blotched with dark brown ; and their entire surface is irregularly dotted and spotted with brown, and the transverse thread-like striæ are also of the same colour ; the liration below the middle of the body-whorl, which is more prominent than the rest, is white, ornamented with brown dots.

57. *CERITHIUM (VERTAGUS) TURRITUM*, Sowerby, Thesaurus,
ii. pl. 180. fig. 101 ; Reeve, Conch. Icon. xv. fig. 58 ; Smith, Annals
& Mag. Nat. Hist. 1875, xvi. p. 106. (Plate L. fig. 19.)

Hab. Philippines, Japan.

The shells in the present collection are in colour and sculpture exactly like those which I described in the Annals and Mag. Nat. Hist., from Japan, but a trifle smaller.

58. *TRIPHORIS SCULPTUS*, Hinds, Voy. Sulphur, pl. 8. fig. 3.

Hab. Straits of Malacca (*Hinds*).

59. *TURRITELLA INFRACONSTRICTA*. (Plate L. fig. 20.)

Shell subulate, subturreted, brownish white, ornamented with countless minute reddish-brown dots. Whorls about 20, somewhat convex at the top and sides, and slopingly narrowed at the base, thus making the width at the suture considerably less than a little distance above it, transversely finely lirated ; liræ varying in thickness, a few being a trifle coarser than the rest, two especially—the upper, situated very near the middle of the whorl, and the lower one at the broadest part of it, being conspicuous and forming indistinct angles ; they are all minutely dotted with brown. Last whorl excavated beneath, finely lirated, and of a uniform brownish white or pale pink tint, with a rather acute ridge circumscribing the base. Aperture irregularly obliquely quadrate, of the same colour as the exterior ; but the flattened base is coated with a thin pale rose-coloured enamel. Columella slightly oblique and a little arcuate. Length 50 millims., diam. 12.

This species, like most others in the genus, is chiefly distinguished by the form of the whorl, the character of the markings, and the spiral liration. The dottings on the ridges are very small, and are

arranged under one another in oblique and more or less flexuous lines. In other words, the whorls are ornamented with fine oblique or flexuous lines, which are interrupted by numerous spiral sulci, thus producing series of dots. Through the prominence, although slight, of the two principal liræ, the whorls between them appear somewhat concave, and the ridge around the base of the last whorl passes just above the labrum and winds up the spire at the sutural line.

60. *AMALTHEA AUSTRALIS*, Lamarck.

Hab. Kangaroo Island, Australia, Philippines.

61. *GLADIUS (RIMELLA) CANCELLATUS*, Lamarck ; Kiener, Coq. Viv. (*Rostellaria*), pl. 3. f. 3.

Hab. "Chili and Moluccas" (*Kiener*).

62. *XENOPHORA SOLARIOIDES*, Reeve.

Phorus solaroides, Reeve, Conch. Icon. i. fig. 8.

Hab. Philippine Islands.

272. 1857 63. *TROCHUS (CLANCULUS) MICRODON*, A. Adams, P. Z. S. 1851, p. 162. (Plate L. figs. 21-21*b*.)

Hab. — ?

This species, the habitat of which was not hitherto known, is not very fully described by Adams. The colour is subject to considerable variation. The series of granules are usually lightish brown, and the interstices almost black. This simplicity of colour is destroyed by broad, irregular, white patches radiating from the suture; and many of the granules, especially on the base, are white. Two or three of the series of the interstices between them around the umbilicus are white, only a few of the granules being brown. The whorls are six in number and rather convex.

64. *TROCHUS (MONILEA) CALYCVLUS*, Wood, Index Test. Suppl. pl. 6. f. 44 ; Adams, Gen. Rec. Moll. iii. pl. 49. figs. 3-3*b*.

Trochus (Monilea) masoni, G. & H. Nevill, Journal Asiat. Soc. Bengal, 1874, vol. xliii. part 2, pl. 1. figs. 1, 1*a*.

Hab. Eastern Seas (*A. Adams*, P. Z. S. 1851).

On comparing Andaman specimens of this species with the type presented to the British Museum by the late Dr. Gray, I have not the slightest doubt of their specific identity.

65. *TROCHUS (FORSKÅHLIA) PULCHERRIMUS*, A. Adams, Gen. Rec. Moll. i. p. 432. (Plate L. figs. 22, 22*a*.)

Gibbula pulcherrima, A. Ad. P. Z. S. 1854, p. 39.

Hab. China Sea.

The colour of this beautiful species varies in some examples, but appears to be constant in its distribution. The oblique arcuate pink or scarlet stripes on the upper part of the body-whorl, which in some specimens are black, generally terminate a little above the middle. At this part the whorl is encircled by two close-set gra-

nulous liræ, with a furrow on each side, whereof the lower is the more conspicuous. Immediately below this the colour of the interrupted scarlet stripes changes to black, and they assume the form of somewhat quadrate spots, but towards the aperture become more flame-like and merge into scarlet.

66. HALIOTIS VARIA, Linné.

H. varia, Linn., teste Reeve, Conch. Icon. iii. sp. 4.

Hab. Philippines.

67. ATYS CYLINDRICA, Helbling; Sowerby, Thesaurus, ii. pl. 125. f. 114.

Var. = *Bulla solida*, Brug. Ency. Méth. pl. 360. f. 2; Thesaurus, pl. 124. figs. 112, 113.

Var. = *Atys elongata*, A. Ad.; Sowerby, Thesaurus, ii. pl. 125. fig. 121.

Hab. Philippines, Ceylon.

68. CARDIUM HYSTRIX, Reeve, Conch. Icon. ii. figs. 40 *a*, *b*.

Hab. Philippines (*Cuming*).

The Andaman specimen of this lovely shell belongs to Reeve's var. β , being pure white, with the exception of a pale tint of pink on the posterior side near the ligament.

69. CARDIUM (LÆVICARDIUM) AUSTRALE, Sowerby, Proc. Zool. Soc. 1840, p. 105; Conch. Illust. figs. 12, 12* (overcoloured); Reeve, Conch. Icon. ii. fig. 97.

C. pulchrum, Reeve, Conch. Icon. fig. 98.

Hab. Philippines, China, Ceylon.

The differences of form, sculpture, and colouring which Reeve considered sufficient to distinguish his *C. pulchrum* from *C. australe* are, in my opinion, hardly sufficient to constitute a variety. The form in almost every species of *Cardium* is subject to considerable variation, and likewise the colour. Reeve does not mention that the anterior dorsal area in his type is blotched with purple at the extremity, as is the case in *C. australe*. The sculpture of both forms is identical: both have the groove on the posterior side, which, within the valves, forms a raised oblique ridge; but in some specimens it is more conspicuous than in others. The Andaman examples are rather young and bear the remains of their epidermis, which takes the form of very thin, short, irregular yellowish lamellæ arising from the radiating striæ. Their colour is whitish or yellow, marked with subconcentric irregular yellowish brown bands, which are more purple-brown within the valves and towards the umbones. The latter at the tips and the hinge-margin are purple; and within, a line of the same colour extends from the umbo to about the middle of the valves.

70. CORBULA FORTISULCATA. (Plate L. figs. 23–23*b*.)

Shell very inequivalve, inequilateral, somewhat triangular, dirty white, solid, rounded at the posterior extremity and beaked anteriorly:

upper valve slightly carinate from the umbo to the posterior margin, the keel terminating a little above the middle, rather smooth, finely concentrically striated by the lines of growth and sulcated at the umbo; covered with a thin greyish epidermis, a trifle laminated towards the margin; and from the umbo about four rather indistinct ridges radiate down the posterior half of the valve, becoming obsolete about the middle of it, and again conspicuous in some specimens at the margin: lower valve vastly larger than the other, very deeply and widely concentrically sulcated; sulci fine and close together at the umbo; ridges between the sulci very thick and prominent, thicker anteriorly than at the opposite extremity, and terminated in front by a sulcus or depression extending from the umbo downwards at a little distance from the margin, which is raised, taking the form of a stout marginal ridge which terminates the beaked end of the valve; transverse grooves finely striated in the same direction: one tooth in each valve, that of the upper bifurcate; pallial sinus small; anterior scar subrotund, posterior more elongate. Diam. 14 mill., length 10, thickness $8\frac{1}{2}$; the lower valve of another larger specimen is $23\frac{1}{2}$ mill. in diameter and 16 long.

For many years several lower valves of this species have been in the British Museum with the locality "Jack's Island, South Sea," attached to them. Others were presented by J. B. Jukes, Esq., in 1845, who dredged them at Port Essington in 7 fathoms, from a muddy bottom; and two specimens in the Cumingian Collection are from the same place. The form, the coarse costæ (which, however, are sometimes rather close together), and the anterior raised and beaked margin of the lower valve well distinguish the species.

71. *CRASSATELLA RADIATA*, Sowerby; Reeve, Conch. Icon. i. fig. 12.

Hab. Singapore.

72. *ARCA (SCAPHARCA) MYRISTICA*, Reeve, Conch. Icon. ii. sp. 42.

Hab. Philippine Islands (*Cuming*).

73. *PECTEN ALBOLINEATUS*, Sowerby, Thesaurus Conch. pl. 14. figs. 69, 70.

Hab. Philippine Islands.

74. *ISOGNOMON SAMOENSIS*, Baird.

Perna (Isognomon) samoensis, Baird, 'Cruise of the Curaçoa,' p. 454, pl. 42. fig. 8.

Hab. Tutuila, Samoa Islands.

BRACHIOPODA.

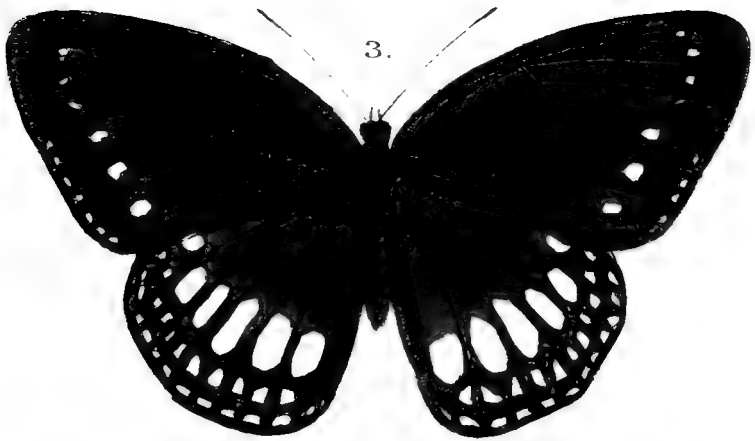
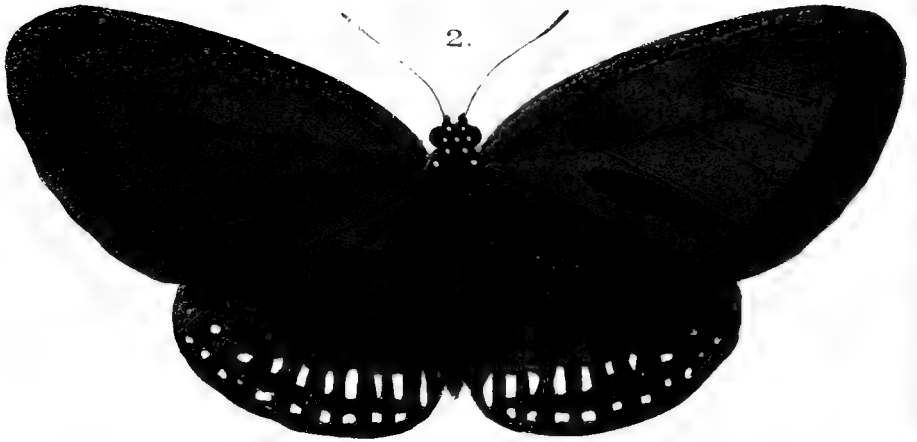
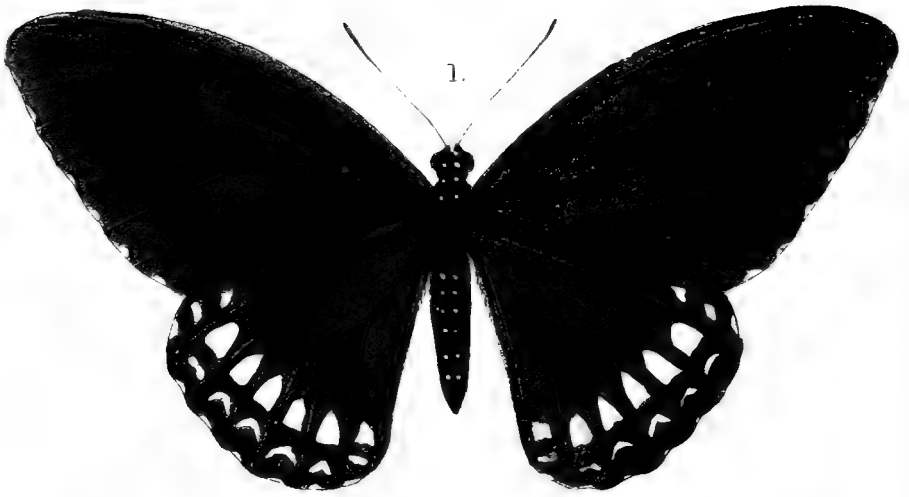
75. *LINGULA HIANS*, Swainson; Sowerby, Thesaurus, i. pl. 67. fig. 4.

Hab. China.

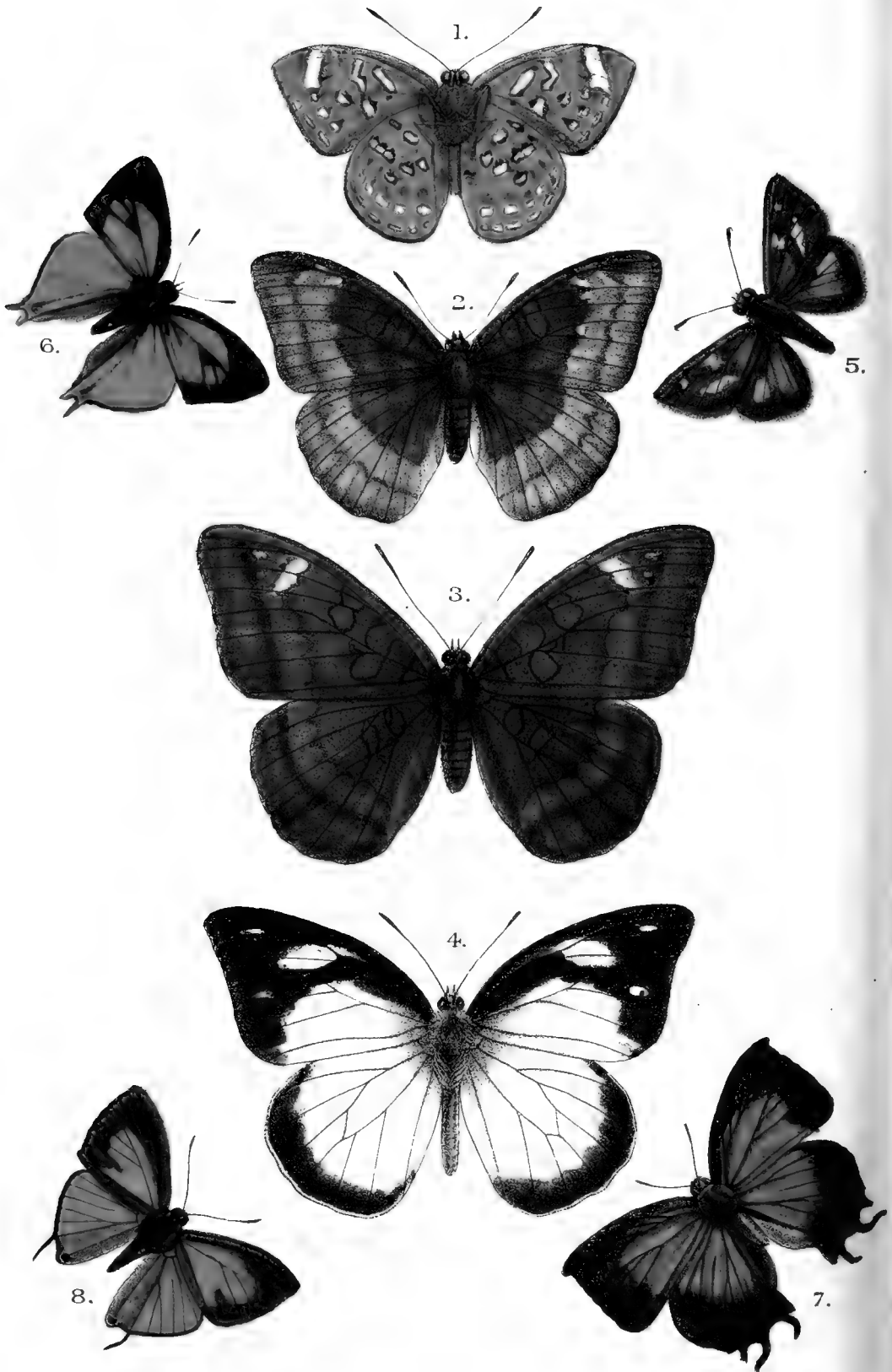
Capt. Wilmer's notes on this species are as follows:—

"It lives in mud or sandy clay at low-water mark, the shell being buried about a foot from the surface. It is very easily alarmed, and

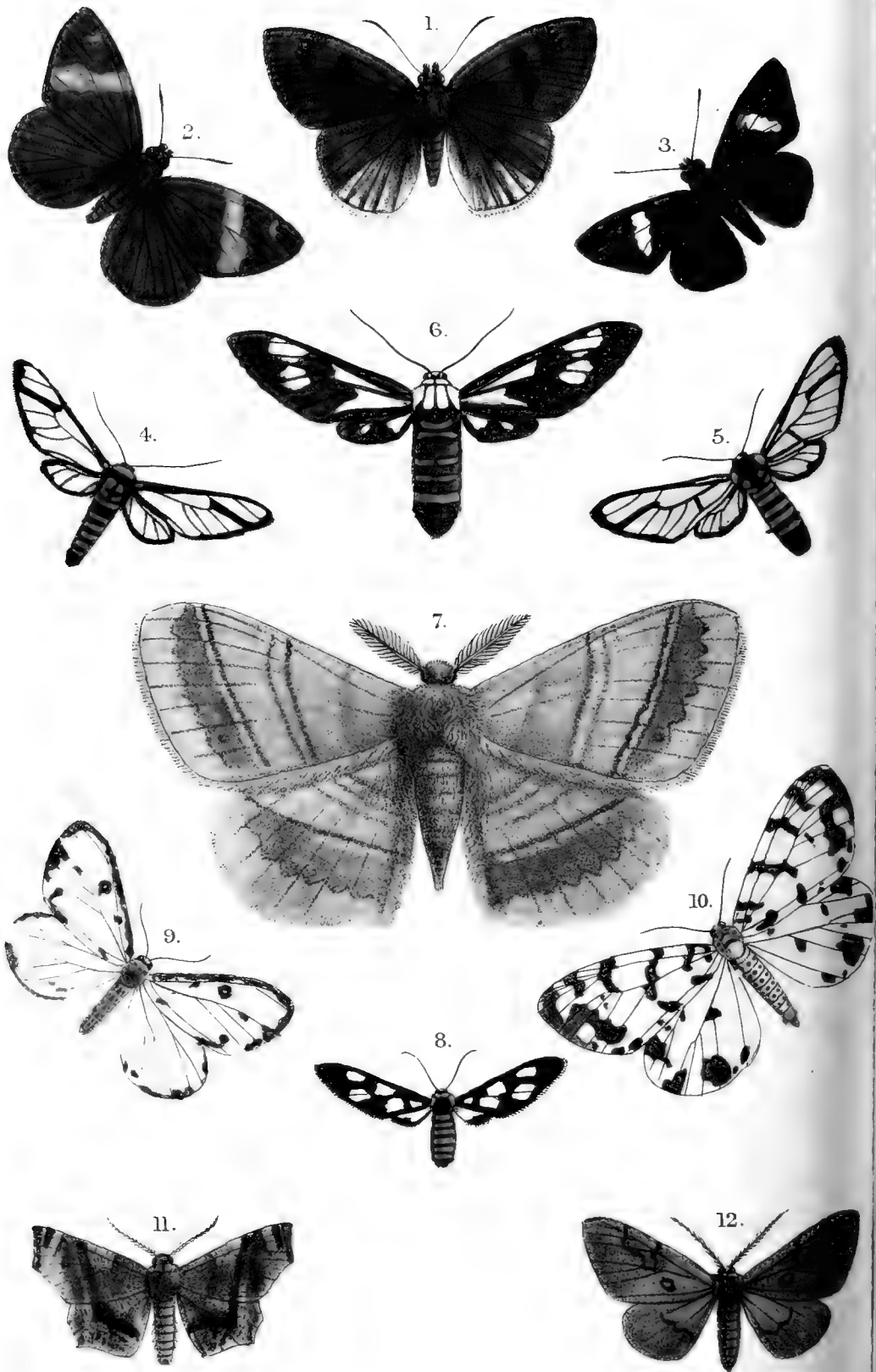












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LEPIDOPTERA FROM UPPER TENASSERIM.

retreats rapidly downwards. In order to collect specimens, I searched for oval orifices in the mud ; and having found one, a spade was plunged very deeply in and the mud turned up, the hands then being used to go deeper ; yet, still, in many cases, the creature was too quick for the diggers."

EXPLANATION OF PLATE L.

- Fig. 1, 1 a. *Conus andamanensis*, p. 804.
 2. *Pleurotoma (Drillia) variabilis*, p. 805.
 3. — (—) *variabilis*, var. p. 805.
 4. — (—) *wilmeri*, p. 805.
 5. *Murex (Muricidea) rusticus*, p. 806.
 6. *Columbella (Anachis) nigricostata*, p. 807.
 7. *Nassa bifaria*, p. 808.
 8. — *marratii*, p. 809.
 9. — *echinata*, p. 810.
 10. *Fusus abnormis*, p. 811.
 11. *Latirus decoratus*, p. 812.
 12. — *fastigium*, p. 812.
 13. *Mitra mæsta*, p. 813.
 14. — *maria*, p. 813.
 15. *Ranella pusilla*, var., p. 815.
 16. *Triton (Simpulum) strangei*, p. 816.
 17. *Torinia perspectiviunculus*, front view, p. 816.
 17 a. Ditto, basal view.
 17 b. Ditto, operculum.
 18. *Cerithium (Vertagus) kochi*, p. 817.
 19. — (—) *turritum*, p. 817.
 20. *Turritella infraconstricta*, p. 817.
 21. *Trochus (Clanculus) microdon*, p. 818.
 21 a. Ditto, variety.
 21 b. Ditto, base.
 22. *Trochus (Forskählia) pulcherrimus*, p. 818.
 22 a. Ditto, base.
 23. *Corbula fortisulcata*, upper view, p. 819.
 23 a. Ditto, lower valve.
 23 b. Ditto, top view.

7. A List of the Lepidopterous Insects collected by Mr. Ossian Limborg in Upper Tenasserim, with Descriptions of new Species. By F. MOORE, F.Z.S., Assistant Curator, India Museum, London.

[Received September 17, 1878.]

(Plates LI.—LIII.)

This list comprises the Lepidopterous portion of the collection made on and around the Moulayet range in Upper Tenasserim by Mr. Limborg, who was accompanied by Mr. Wood-Mason's native collector, Motiram. The party proceeded, about the middle of December 1876, from Moulmein up the Hougnduran, collecting as they went along to the Hills, on and around which, and along the banks of the river leading to them, the whole collection was made.

The expedition was organized and the funds provided by the Marquis of Tweeddale, President of the Zoological Society, Mr. W. T. Blanford, Lt.-Col. Godwin-Austen, Sir E. Clive Bayley, President, and Mr. J. Wood-Mason, Natural-History Secretary of the Asiatic Society, Calcutta, Mr. R. Lydekker, Dr. J. Anderson, Director of the Indian Museum, Calcutta, and others.

PAPILIONES.

Fam. NYMPHALIDÆ.

Subfam. DANAINÆ.

DANAIS SEPTENTRIONIS.

Danais septentrionis, Butler, Ent. Mo. Mag. xi. p. 163 (1874).
Ahsown; Meetan, 3000 feet; Hatsiega; Hougnduran source.

DANAIS AGLEA.

Danais aglea, Cramer, Pap. Exot. iv. tab. 377. f. E (1782).
Ahsown; Hatsiega; Naththoung to Paboga; Moolai, 3000-6000 feet.

DANAIS VULGARIS.

Danais vulgaris, Butler, Ent. Mo. Mag. xi. p. 164 (1874).
Ahsown; Moulmein to Meetan; Hougnduran source.

DANAIS MELANEUS.

Papilio melaneus, Cram. Pap. Exot. i. tab. 30. f. D (1775).
Ahsown; Moulmein to Meetan.

DANAIS TYTIA.

Danais tytia, Gray, Lep. Ins. Nepal, p. 9, pl. 9. f. 2 (1846).
Moolai to Moolat, 4500 feet.

DANAIS PLEXIPPUS.

Papilio plexippus, Linn. Syst. Nat. i. 2, p. 767 (1767).
Ahsown; above Ahsown; Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000-5000 feet.

DANAIS CHRYSIPPUS.

Papilio chrysippus, Linn. Syst. Nat. i. 2, p. 767 (1767).
Ahsown.

SALPINX RHADAMANTHUS.

Papilio rhadamanthus, Fabr. Ent. Syst. iii. 1, p. 42 (1793).
Ahsown, 2000 feet; Meetan, 3000 feet; Hatsiega; Hougnduran source; Naththoung to Paboga.

SALPINX CRASSA.

Euplæa crassa, Butler, Proc. Zool. Soc. 1866, p. 278.
Ahsown; Moulmein to Meetan; Hatsiega; Naththoung to Paboga; Taoo, 3000-5000 feet.

SALPINX MASONI, n. sp.

Male. Allied to *S. crassa*, Butler (Proc. Zool. Soc. 1866, p. 278), but differing in its darker colour, in the basal area of the fore wing being bright glossy blue, and the marginal spots on this wing confined more to the apex; hind wing less convex along the exterior margin; otherwise similarly marked.

Expanse $3\frac{1}{4}$ inches.

Taoo, 3000-5000 feet; above Ahsown. In coll. Wood-Mason.

From *S. klugii*, Moore, this species may be distinguished by the blue gloss being confined to the basal area, whereas in *S. klugii* it is more brilliant and suffuses the entire wing.

SALPINX MARGARITA.

Euplœa margarita, Butler, Proc. Zool. Soc. 1866, p. 279.

Hatsiega; Hougnduran source.

TREPSICHROIS MIDAMUS.

Papilio midamus, Linn. Syst. Nat. i. 2. p. 765 (1767).

Ahsown, 2000 feet; Moulmein to Meetan; Hatsiega; Hougnduran; Naththoung to Paboga.

CRASTIA CUPREIPENNIS, n. sp.

Allied to *C. modesta*, Butler, P. Z. S. 1866, p. 273, from Siam.

Upperside cupreous brown, the outer borders broadly paler, basal area of fore wing blue-glossed; cell and contiguous area of hind wing also blue-glossed; the two marginal series of spots larger.

Expanse $3\frac{1}{8}$ inches.

Hatsiega; Hougnduran source. In coll. Wood-Mason.

EUPLŒA LIMBORGII, n. sp. (Plate LI. fig. 2.)

Male. Differs from *E. deione*, Westw., in the fore wing having some very indistinct submarginal white spots, and the hind wing having two marginal rows of prominent white spots similar to but smaller than those in *E. margarita*, Butler.

Expanse $3\frac{3}{4}$ inches.

Ahsown, 2000 feet; above Ahsown; Hatsiega; Hougnduran. In coll. J. Wood-Mason.

EUPLŒA ALCATHOË.

Euplœa alcathœ, Godt. Enc. Méth. ix. p. 178 (1819).

Ahsown, 2000 feet.

EUPLŒA SUBDITA, n. sp.

Allied to *E. core*, Cram. Pap. Exot. pl. 266. figs. E, F.

Male. Fore wings shorter, broader, and the posterior margin more convex: upperside paler, basal area slightly blue, glossed in the fore wing; markings similar, smaller and paler, those on the fore wing indistinct.

Expanse $3\frac{1}{8}$ inches.

Hatsiega. In coll. J. Wood-Mason.

EUPLŒA GODARTII.

Euplœa godartii, Lucas, Rev. Zool. 1853, p. 319.

Ahsown; Moulmein to Meetan; Hatsiega; HOUNGDURAN; NATHTHOUNG to Paboga.

STICTOPLŒA GROTEI.

Euplœa grotei, Felder, Reise Nov., Lep. ii. p. 339, tab. 49. 1, ♀.

Ahsown; above Ahsown; Hatsiega to HOUNGDURAN.

Subfam. SATYRINÆ.

LETHE ARCADIA.

Papilio arcadia, Cram. Pap. Exot. ii. tab. 116. f. E, F (1779).

Ahsown.

LETHE MEKARA.

Debis mekara, Moore, Catal. Lep. Mus. E.I. C. i. p. 219 (1857)

Ahsown, 2000 feet; Taoo, 3000-5000 feet.

LETHE ROHRIA.

Papilio rohria, Fabr. Mant. Ins. ii. p. 45 (1787).

Hatsiega; NATHTHOUNG to Paboga; Taoo, 3000-5000 feet.

LETHE VERMA.

Satyrus verma, Kollar, Hügel's Kasch. iv. p. 447, tab. 16. f. 1, (1844).

Moolai, 3000-6000 feet.

MELANITIS ISMENE.

Papilio ismene, Cram. Pap. Exot. i. tab. 26. f. A, B (1775).

Ahsown, 2000 feet; Moulmein to Meetan; Meetan, 3000 feet; NATHTHOUNG to Paboga; Moolai, 3000-5000 feet.

MELANITIS BELA.

Melanitis bela, Moore, Catal. Lep. Mus. E.I. C. i. p. 223 (1857).

Ahsown; Meetan, 3000 feet, April; NATHTHOUNG to Paboga; Moolai, 3000-6000 feet; Moolai to Moolat, 4500 feet.

ZETHERA DIADEMOIDES, n. sp. (Plate LI. fig. 3.)

Male and female. Upperside dark brown: fore wing with a submarginal series of seven small bluish-white spots, which decrease in size to the costa; a marginal series of smaller less distinct spots, two between each vein: hind wing with a series of six large broad oval spots; a submarginal series of small reversely triangular spots, and a marginal series of smaller narrow spots, the two latter series with two of these spots disposed between the veins. Underside as above.

Expanse, ♂ 3, ♀ 3¼ inches.

Taoo, 3000-5000 feet, March; Moulai, 3000-6000. In coll. J. Wood-Mason.

MYCALESIS MINEUS.

Papilio mineus, Linn. Syst. Nat. i. 2, p. 768 (1767).

Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000-5000 feet, March.

MYCALESIS PERSEUS.

Papilio perseus, Fabr. Syst. Ent. p. 488 (1775); Butler, Proc. Zool. Soc. 1867, p. 719, fig. 2.

Moulmein to Meetan.

MYCALESIS BLASIUS.

Papilio blasius, Fabr. Ent. Syst. Suppl. p. 426 (1798); Butler, Proc. Zool. Soc. 1867, p. 718, fig. 4.

Moulmein to Meetan.

MYCALESIS ANAXIAS.

Mycalesis anaxias, Hewitson, Exot. Butt. iii. *Myc.* pl. 4. f. 25, 26 (1862).

Ahsown; Moolai, 3000-6000 feet.

MYCALESIS RUNEKA.

Mycalesis runeka, Moore, Catal. Lep. E.I. C. i. p. 234 (1857).

Ahsown; Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

CULAPA, n. g.

Differs in form from *Mycalesis*, having a greater length of fore wing, less convexity of the costa, the apex being more produced and the exterior margin more oblique; the hind wing is somewhat acutely angled at the apex, and the exterior margin produced before the anal end, thus giving this wing a quadrate appearance. In form it more resembles the American genus *Anchiphlebia*.

CULAPA MNASICLES.

Mycalesis mnasicles, Hewits. Exot. Butt. iii. *Myc.* pl. 5. f. 32, 33 (1864).

Ahsown, 2000 feet; Meetan, 3000 feet, April.

YPHTHIMA BALDUS.

Papilio baldus, Fabr. Syst. Ent. App. p. 809 (1775); Donovan. Ins. Ind. t. 36. f. 2.

Moulmein to Meetan.

YPHTHIMA METHORA.

Ypthima methora, Hewitson, Trans. Ent. Soc. 1865, p. 291, pl. 18. f. 20, 21.

Naththoung to Paboga.

ERITES ANGULARIS, n. sp.

Male. Wings longer than in *E. madura*, Horsf. (from Java);

the fore wing being more produced at the apex and the hind wing posteriorly. Underside similarly marked, excepting that the yellow-bordered black spot on the fore wing is more oval, and the spots on the hind wing smaller, this wing also having the inner yellow band acutely angled in the middle.

Expanse $2\frac{1}{5}$ inches.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

ELYMNIAS TINCTORIA, n. sp.

Allied to *E. undularis*, of India.

Male. Upperside dark blue-black, the marginal blue spots on fore wing larger; border of hind wing dusky purple, with a series of small white spots. *Female* with prominent blue-black borders and white markings.

Expanse 3 inches.

Meetan, 3000 feet, April; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

ELYMNIAS VASUDEVA.

Elymnias vasudeva, Moore, Catal. Lep. E.I. C. i. p. 238 (1857).

Taoo, 3000–5000 feet.

DYCTIS LEUCOCYMA.

Biblis leucocyma, Godt. Enc. Méth. ix. p. 326 (1819).

Ahsown.

Subfam. NYMPHALINÆ.

AMATHUSIA PHIDIPPUS.

Papilio phidippus, Linn. Syst. Nat. i. 2, p. 752 (1767); Cramer, Pap. Exot. i. tab. 69. f. A, B.

Meetan, 3000 feet, April.

ZEUXIDIA MASONI, n. sp.

Allied to *Z. amethystus*, Butler, P. Z. S. 1865, p. 485, from Sumatra.

Female. Differs in the paler colour of the wings, and in the greater breadth of the yellow oblique band, the band entire and terminating at the middle median branch, below which are two similar-coloured spots; a small pale patch before apex of the wing; hind wing pale cinnamon-brown broadly along outer border.

Expanse $4\frac{1}{2}$ inches.

Meetan, 3000 feet, April. In coll. J. Wood-Mason.

DISCOPHORA TULLIA.

Papilio tullia, Cramer, Pap. Exot. i. tab. 81. f. A, B (1779).

Above Ahsown.

DISCOPHORA ZAL.

Discophora zal, Westw. Gen. D. Lep. p. 331 (1851); Trans. Ent. Soc. 1858, p. 188, pl. 21. f. 5, 6.

Taoo, 3000–5000 feet; Moolai, 3000–6000 feet.

DISCOPHORA NECHO.

Discophora necho, Felder, Reise Nov., Lep. iii. p. 462 (1867).

D. celinde, Horsf. Catal. Lep. E.I. C. pl. 6. f. 6.

Houngduran source.

CLEROME ARCESILAÜS.

Papilio arcesilaus, Fabr. Mant. Ins. ii. p. 28 (1787); Donovan. Ins. Ind. pl. 30. f. 2.

Above Ahsown.

ÆMONA LENA.

Æmona lena, Atkinson, Proc. Zool. Soc. 1871, p. 215, pl. 12. f. 1.

Moolai, 3000–6000 feet.

XANTHOTÆNIA BUSIRIS.

Xanthotænia busiris, Westw. Trans. Ent. Soc. 1858, p. 187.

Moolai, 3000–6000 feet.

THAUMANTIS LOUISA.

Thaumantis louisa, Wood-Mason, Proc. As. Soc. Beng. 1877, p. 163; id. Journ. As. Soc. Beng. 1878, pl. xii.

Tao, 3000–6000 feet.

Allied to *T. howqua*, but differs in having the upper surface white instead of fulvous, and in having five red spots instead of ocelli on the underside of the fore wings, and only two well-developed ocelli (the anterior and posterior) on the hind wings, instead of three and five ocelli respectively.

CIRROCHROA SURYA, n. sp.

Allied to *C. lanka* (Moore, P. Z. S. 1872, p. 557) of Ceylon.

Male differs above on the fore wing in the narrower marginal band, a single sinuous line extending with fulvous interspaces to near the apex; hind wing with the submarginal line more sharply sinuous; other markings similar. Underside purplish fulvous grey; the discal transverse band broader, and pale bluish purple on the fore wing, bluish purple-white on hind wing, its outer border being dark blue, and its inner border red and waved; other markings red. *Female* darker above, the discal black line sinuous at the costal end; a double sinuous marginal line; other markings and underside as in male.

Expanse, ♂ $1\frac{7}{8}$ to $2\frac{2}{8}$, ♀ $2\frac{4}{8}$ inches.

Moulmein to Meetan; Tao, March, 3000–5000 feet; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

MESSARAS ERYMANTHIS.

Papilio erymanthis, Drury, Ill. Exot. Ent. i. pl. 15. f. 3, 4 (1773).

Moolai to Moolat; Hatsiega.

AELLA SINHA.

Terinos sinha, Kollar, Hügel's Kasch. iv. p. 438 (1844).

A melanoid variety. Moulmein.

JUNONIA LAOMEDIA.

Papilio laomedia, Linn. Syst. Nat. i. 2, p. 772 (1767); Drury, Ill. Exot. Ent. pl. 5. f. 3.

Ahsown, 2000 feet; Moulmein to Meetan; Naththoung to Paboga.

JUNONIA LEMONIAS.

Papilio lemonias, Linn. Syst. Nat. i. 2, p. 770 (1767).

Ahsown, 2000 feet; Moulmein to Meetan; Meetan, 3000 feet; Taoo, 3000-6000 feet (March); Naththoung to Paboga.

JUNONIA ORITHYIA.

Papilio orithyia, Linn. Syst. Nat. i. 2, p. 770 (1767); Cram. Pap. Exot. i. tab. 19. f. C, D, tab. 32. f. E, F.

Moulmein to Meetan.

JUNONIA ALMANA.

Papilio almana, Linn. Syst. Nat. i. 2, p. 769 (1767); Cram. Pap. Exot. i. tab. 58. f. F, G.

Ahsown, 2000 feet; Moulmein to Meetan; Taoo, 3000-5000 feet.

PRECIS IPHITA.

Papilio iphita, Cram. Pap. Exot. iii. tab. 209. f. C, D.

Moolai, 3000-6000 feet.

DOLESCHALLIA PRATIPA.

Doleschallia pratipa, Felder, Wien. ent. Mon. iv. p. 399 (1860); Reise Nov., Lep. iii. p. 206.

Hatsiega.

KALLIMA LIMBORGII, n. sp.

Differs from *K. inachis*, from Sikkim. Male and female of a deeper and more uniform steel-blue colour above; the fore wing is not angled on the hindward part of the exterior margin; the apex more produced in the male and less so in the female, the discal hyaline spot small, and almost circular; the hind wing also is less convex on the exterior margin, and has a much shorter tail.

Expanse, ♂ $3\frac{3}{4}$, ♀ 4 inches.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

CYRESTIS THYODAMAS.

Cyrestis thyodamas, Boisd. Cuv. Règ. Anim. Ins. ii. t. 138. f. 4 (1836).

Amathusia ganescha, Kollar, Hügel's Kasch. iv. p. 430, tab. 7. f. 3, 4.

Moolai, 3000-6000 feet.

CYRESTIS COCLES.

Papilio cocles, Fabr. Mant. Ins. ii. p. 7 (1787); *Donov. Ins. Ind.* pl. 23. f. 2.

Hatsiega.

CYRESTIS RISA.

Papilio risa, Doubleday, Gen. D. Lep. pl. 32. f. 4 (1850).

Moulmein to Meetan; Moolai, 3000-6000 feet.

HERONA ANGUSTATA, n. sp.

Female. Similar to *H. marathus* from the Khasia hills. Differs from same sex of that species in having all the maculated bands narrower, these being but half the width of those in the former species.

Expanse 3 inches.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

PENTHEMA DARLISA, n. sp.

Male and Female. Differs from *P. lisarda*, Doubleday (Gen. D. L. pl. 39. f. 3), on the fore wing in all the markings, except the streak along posterior margin, being bluish white and smaller, those within the cell oval, two at the base and two near the end; the discal series also are short and conical (not continuing outward to the inner transverse series), the streak between the lower median and submedian vein only being elongated. On the hind wing the pale luteous interspaces between the veins are deeply excavated at their end and partly coalesce with the inner transverse series of spots (the spots being larger), the outer row are also larger, conical, and deeply excavated externally; a black streak traverses the cell.

Expanse 5 inches.

Meetan, 3000 feet (April). In coll. J. Wood-Mason.

PARTHENOS APICALIS, n. sp.

Distinguished from *P. gambrisius* by the fore wing having the white band quite diaphanous, without any borders to the veins, and extending broadly and uninterruptedly to the costal margin, thence continuing along it to the extreme apex.

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

Above Ahsown; Taoo, 3000-5000 feet. In coll. J. Wood-Mason.

LEBADEA ATTENUATA, n. sp.

Male and Female. Differ from *L. ismene*, Doubleday (Gen. D. Lep. pl. 34. f. 2), in being smaller and of a brighter colour, the white medial transverse band narrower, the apical portion on fore wing more angular in position and extending to the costa, the outer series of narrow lunules being present on the hind wing in both sexes.

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

Hatsiega; Naththoung to Paboga. In coll. J. Wood-Mason.

NEPTIS ADARA, n. sp. ✓

Allied to *N. varmona*, from S. India. Differs above in the maculated bands being narrower, the discoidal terminal spot broader and less pointed, the discal series of spots more oval in shape, and the submarginal series not so prominent. On the underside the ground-colour is much brighter, and the markings are less black-bordered.

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

Moulmein to Meetan; Ahsown; Naththoung to Paboga; Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

NEPTIS MEETANA, n. sp.

Allied to the preceding (*N. adara*), but with the markings above more like those in *N. andamana*. It is a somewhat narrower-winged insect, the spots of the discal band relatively narrower in both sexes, the underside of a brighter red, and the markings less black-bordered.

Expanse, ♂ 2, ♀ $2\frac{1}{8}$ inches.

Meetan 3000 feet, March; Taoo, 3500 feet. In coll. J. Wood-Mason.

NEPTIS JUMBA.

Neptis jumba, Moore, Catal. Lep. Mus. E. I. C. i. p. 167 (1857).

Moulmein to Meetan.

NEPTIS ADIPALA.

Neptis adipala, Moore, Proc. Zool. Soc. 1872, p. 563, pl. 22. f. 8.

Moulmein to Meetan; Hatsiega.

NEPTIS PLAGIOSA, n. sp.

Allied to *N. hordonia*, Stoll, Cram. Pap. v. pl. 33. f. 4.

Differs on the upperside in all the ferruginous bands being broader, the fore wing having the lengthened discoidal band spreading over the median vein, the marginal line also broader and very distinct; hind wing with the submarginal band nearly as broad as the discal. On the underside the strigæ are more numerous and darker, covering both bands on the hind wing.

Expanse, ♂ $1\frac{4}{8}$, ♀ $1\frac{7}{8}$ inch.

Naththoung to Paboga. In coll. J. Wood-Mason and F. Moore.

ADOLIAS LEPIDEA.

Adolias lepidea, Butler, Ann. Nat. Hist. 1868, i. p. 71.

Meetan, 3000 feet, April.

ADOLIAS SATROPACES.

Adolias satropaces, Hewitson, Entom. Monthly Mag. 1876, p. 150; id. Desc. Lep. Coll. Atk. Asiat. Soc. Bengal, p. 1, pl. 1. f. 6, 7, 8 (1878).

Meetan, 3000 feet, April.

ADOLIAS PARVATA, n. sp. (Plate LII. fig. 3.)

Female allied to *A. sedeva*, Moore, Trans. Ent. Soc. 1859, p. 68, pl. 4. f. 3. Differs above on the fore wing in the discal band being narrower, the costal portion only partially whitish, and the lower portion without the whitish inner border. Underside with the band on fore wing only partially white anteriorly, the lower portion with a slight white lunule to the inner border, and white point with black tip to outer border.

Expanse $2\frac{3}{4}$ inches.

Hab. Meetan, 3000 feet, April. In coll. J. Wood-Mason.

ADOLIAS DISCISPILOTA, n. sp. (Plate LII. fig. 2.)

Allied to *A. kesava*, Moore, Trans. Ent. Soc. 1859, p. 67, pl. 3. f. 5.

Female. Smaller in size: upperside with the borders uniformly greyish brown; the transverse discal band with less sinuous dusky outer border; the whitish spot between the lower subcostal branches and the spot between the upper median branches prominent. Underside paler; markings similar, with less blue along abdominal border.

Expanse $2\frac{2}{10}$ inches.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

ADOLIAS JAHNU.

Adolias jahnu, Moore, Catal. Lep. Mus. E.I. C. i. p. 192 (1857); Trans. Ent. Soc. 1859, p. 74, pl. 7. f. 1.

Hatsiega; Taoo, 3000-5000 feet.

ADOLIAS TAOOANA, n. sp.

Allied to *A. iva* (Moore, Trans. Ent. Soc. 1857, pl. 8 f. 2). Fore wing with the oblique discal maculated band with shorter lower portions, the penultimate spot quite oval, the last being short and conical; the two contiguous spots beneath are also smaller, and the two before the apex closer together; on the hind wing the three sub-apical spots are contiguous, the two upper being large, quadrate, and excavated externally.

Expanse 4 inches.

Taoo, 3000-5000 feet. In coll. J. Wood-Mason.

CHARAXES SAMATHA, n. sp.

Smaller than Indian examples of *C. athamas*, the yellow band on both wings one third less in width, the subapical spot smaller, and the apical either minute or obsolete.

Expanse $2\frac{3}{8}$ inches.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

CHARAXES MARMAX.

Charaxes marmax, Westwood, Cab. Orient. Ent. p. 43, pl. 21. f. 3-5 (1848).

Moolai, 3000-6000 feet.

CHARAXES DESA, n. sp.

Male. Allied to *C. marmax*, Westw. Cab. Orient. Ent. pl. 21. f. 3. Differs on fore wing above in the marginal black band being broader and extending at the apex further along the costa, the inner submarginal lunular line is closer to the band; the black maculated band on the hind wing is formed of larger angled spots. Underside purplish ochreous; hind wing with a transverse black lunular fascia, which is also further from the outer margin.

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

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Also distinct from *C. lunawara*, Butler.

CHARAXES AGNA, n. sp.

Male. Allied to *C. harpax*, Feld. Nov. Voy., Lep. iii. p. 444. Differs in its larger size, broader marginal black band on the fore wing, and in the hind wing having a less black apical patch, the marginal series of spots also being much smaller.

Expanse $3\frac{1}{4}$ inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

CHARAXES HARPAX.

Charaxes harpax, Felder, Reise Nov., Lep. iii. p. 444 (1867).

Moulmein to Meetan; Moolai, 3000–6000 feet.

PROTHOË FRANCKII.

Nymphalis franckii, Godt. Enc. Méth. ix. Suppl. p. 825; Horsf. Catal. Lep. E.I. C. (1829), pl. 5 f. 4, 4 a.

Meetan, 3000 feet, April.

Subfam. LIBYTHEINÆ.

LIBYTHEA MYRRHA.

Libythea myrrha, Godt. Enc. Méth. ix. p. 171; Boisd. Sp. Gén. Lép. i. t. 10. f. 8.

Moulmein to Meetan; Hatsiega.

Fam. ERYCINIDÆ.

ZEMEROS FLEGYAS.

Papilio flegyas, Cram. Pap. Exot. iii. pl. 280. f. E, F (1782).

Ahsown, 2000 feet.

TAXILA FASCIATA, n. sp. (Plate LII. fig. 1.)

Allied to *T. drupadi*, Horsf. Catal. Lep. Mus. E.I. C. 1828, pl. 2. f. 3, from Java.

Male. Differs above in the apex of the fore wing being less suffused with red, and having an oblique subapical indistinct whitish fascia. Underside similarly marked, with the subapical fascia distinct, well-defined, and pure white.

Expanse $1\frac{7}{8}$ inch.

Above Ahsown. In coll. J. Wood-Mason.

ABISARA NEOPHRON.

Sospita neophron, Hewitson, Exot. Butt. ii. *Sosp.* pl. i. f. 3 (1861).

Moolai, 3000–6000 feet.

ABISARA ANGULATA, n. sp.

From *A. kausambi*, Felder, of the Malay peninsula, this species differs in the male above being paler plum-colour, the fore wing showing the transverse discal fasciæ, and the hind wing the apical and anal black spots; the female above is also paler purple-brown, the inner discal band is angled at the middle of its inner border on both wings, and is only slightly paler at its costal end. On the underside, the discal bands are angled in the middle, the inner band being narrowly bordered with brownish white at its costal end only in the male, its entire length in the female.

Expanse $1\frac{1}{2}$ inch

Above Ahsown; Hatsiega; Naththoung to Paboga. In coll. J. Wood-Mason:

An entirely different insect from the Andaman *A. bifasciata*, Moore, P. Z. S. 1877, p. 587, pl. 58. f. 1.

Fam. LYCÆNIDÆ.

CASTALIUS ROXUS.

Lycæna roxus, Godt. Enc. Méth. ix. p. 659 (1823); Horsf. Catal. Lep. E.I. C. 1828, p. 70, pl. 2. f. 4.

Moulmein to Meetan.

LAMPIDES ALEXIS.

Papilio alexis, Stoll, Suppl. Cramer's Pap. Exot. pl. 38. f. 3 (1790).

Moulmein to Meetan; Naththoung to Paboga.

LAMPIDES ÆLIANUS.

Papileo ælianus, Fabr. Ent. Syst. iii. 1, p. 280 (1793).

Moulmein to Meetan.

LAMPIDES ELPIS.

Lycæna elpis, Godt. Enc. Méth. ix. p. 654 (1823); Horsf. Catal. Lep. E.I. C. 1828, p. 96, pl. 1. f. 4.

Ahsown; Moulmein to Meetan.

LAMPIDES KANDARPA.

Lycæna kandarpa, Horsf. Catal. Lep. Mus. E.I. C. 1828, p. 82.

Moulmein to Meetan

HYPOLYCÆNA LISIAS.

Papilio lisias, Fabr. Mant. Ins. p. 65 (1787); Donovan. Ins. Ind. pl. 40. f. 1; Boisduval. Spec. Gén. Léop. i. t. 22. f. 2.

Ahsown; Meetan, April; Moolai 3000–6000 feet.

MYRINA FREJA.

Papilio freja, Fabr. Ent. Syst. iii. 1, p. 263 (1793); Butler, P. Z. S. 1867, pp. 34, 36, f. 1.

Ahsown; Moulmein to Meetan; Taoo, 3000–5000 feet.

THAMALA, n. g.

Male and Female. Fore wing short, broad, trigonate; costa convex at base, apex moderately acute, exterior margin slightly oblique and recurved, posterior margin nearly straight, angle acute; cell broad, short; subcostal vein four-branched, first, second, and third arising before end of the cell, fourth at its end; discocellulars slightly curved outward; radial from their middle; median vein three-branched, two upper contiguous at base from end of the cell: hind wing elongated posteriorly, narrow and quadrate below anal margin; with two narrow lengthened tails, one at each angle; exterior margin slightly waved. Body moderate; antennæ stout, uniformly thickened to apex; palpi long, squamous, second joint projecting half its length beyond the head, apical joint slender; legs squamous, femora slightly pilose beneath.

Differs from *Deudorix* (*D. melampus* (*jarbas*, Fabr.) and *D. epijarbas*) in its shorter and broader fore wings and longer hind wings, the fore wings having only four subcostal branches (there being five in both the above species), and in the antennæ being more robust.

THAMALA MINIATA, n. sp. (Plate LII. fig. 6.)

Male and Female. Upperside deep scarlet-vermilion: fore wing with the base, costal and the outer border broadly black, confining the red colour to a circular area; veins also black-lined, the median prominently so and forming a slight streak at the base of its branches: hind wing black at the extreme base, along abdominal border and slightly along median veins; exterior border narrowly black, some black speckles ascending between lower median branch and submedian vein; tails red, black-margined and white-tipped in female. Underside luteous-yellow in male, ochreous-yellow in female: both wings with indistinct dusky discal zigzag-lunular line terminating above anal angle in a white-speckled patch: fringe of hind wing black, the margin also black-lined from the angle; space above the tails black- and white-speckled. Body beneath, legs, and palpi white, speckled with black, tip of palpi black.

Expanse, ♂ $1\frac{2}{3}$, ♀ $1\frac{4}{10}$ inch.

Taoo, 3500 feet. In coll. J. Wood-Mason.

DEUDORIX SUFFUSA, n. sp. (Plate LII. fig. 8.)

Allied to *D. xenophon*, male. Wings slightly broader: upperside of fore wing with broader outer band, the red colour suffused with dusky-brown; hind wing also duller red. Underside dull sulphur-yellow; transverse lunular line more curved, the zigzag end at anal angle black and with an additional similar line above its end.

Expanse $1\frac{4}{10}$ inch.

Taoo, 3000–5000 feet. In coll. J. Wood-Mason.

LOXURA ATYMNUS.

Papilio atymnus, Cram. Pap. Exot. iv. t. 331. f. D, E (1782).
Ahsown; Meetan, 3000 feet, April; Moolai, 3000–6000 feet.

AMBLYPODIA TAOOANA, n. sp.

Differs from *A. narada* and *A. anita* in its larger size, the upper-side being of a very brilliant blue colour as in *A. silhetensis*, and the outer black marginal band twice the width of that of those species. Underside purplish-ochreous, the transverse black-speckled band and basal speckled markings prominent, the band on fore wing being much curved, the outer markings also prominent.

Expanse 2 inches.

Taoo, 3500 feet. In coll. J. Wood-Mason.

NARATHURA, n. g.

Wings broad: fore wing very convex at base of costa, exterior margin rounded, even: hind wing very convex externally, with even margin; a very slender tail at end of lower median vein (so delicate that in most cabinet specimens it is broken off); anal angle not lobed.

Type *N. hypomuta* (*Amblypodia hypomuta*, Hewits. Catal. Lyc. B. M. p. 11, pl. 6. figs. 63, 64, 1862).

NARATHURA MOOLAIANA, n. sp.

Amblypodia epimuta, Hewitson, Catal. Lyc. B. M. p. 11, pl. 6. f. 59, 60 (1862).

Taoo, 3000–5000 feet. Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

This is a distinct species from *N. epimuta*, Moore, Catal. Lep. Mus. E. I. C. i. p. 42, the type of which is from Borneo.

ARHOPALA NAKULA, Feld. Wien. ent. Monats. iv. p. 395 (1860).

Taoo, 3000–5000 feet.

ARHOPALA VIHARA, Feld. Wien. ent. Monats. iv. p. 395 (1860).

Taoo, 3000–5000 feet.

SURENDRA, n. g.

Allied to *Thaduka*. Sexes dissimilar in colour above: fore wing short, broad, costa slightly arched, apex acute, exterior margin in female very convex in the middle, less so in male; hind margin nearly straight: hind wing short, somewhat quadrate; anterior margin nearly straight, apex angled; exterior margin nearly straight anteriorly, truncate posteriorly, and in male with one tail situated at end of lower median vein, in female with two tails, one at the lower, the other at the middle median vein, anal lobe large. Venation similar to *Thaduka*. Palpi long, slender; legs short; antennæ uniformly thickened.

SURENDRA QUERCETORUM.

Amblypodia quercetorum, Moore, Catal. Lep. Mus. E.I. C. i. p. 42, pl. 1 a. f. 7 (1857).

THADUKA, n. g.

Allied to *Mahathala*. Fore wing short, broad, costa very convex at base, apex acutely angled; exterior margin erect, scalloped; posterior angle lobular; hind margin same length as costal, concave in the middle: hind wing short, broad, anterior margin convex, apex and exterior margin very convex, sinuous, with three prominent tails, the middle one longest, and large anal lobe; abdominal margin very concave above anal lobe. Venation similar to *Mahathala* (*Amblypodia ameria*, Hewitson). Body short, stout; antennæ uniformly thickened to end; palpi slender; legs short.

THADUKA MULTICAUDATA, n. sp. (Plate LII. fig. 7.)

Female. Upperside purple-black, basal area bright smalt-blue. Body and abdominal border greyish, thorax blue. Underside dark vinous-brown; fore wing with short subbasal, medial, and an entire discal, purple-black maculate bands, and an outer marginal series of lunules: hind wing with three irregular curved transverse purplish-black maculate bands, and indistinct marginal lunules; a narrow metallic-green lunule above the tails.

Expanse $1\frac{5}{8}$ inch.

Tao, 3000–5000 feet. In coll. J. Wood-Mason.

Fam. PAPILIONIDÆ.

Subfam. PIERINÆ.

TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. 2, p. 763 (1767).

Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

TERIAS SUAVA.

Terias suava, Boisd. Spec. Gén. Léop. p. 670 (1836).

Moulmein to Meetan.

TERIAS SILHETANA.

Terias silhetana, Wallace, Trans. Ent. Soc. 1867, p. 324.

Moulmein to Meetan; Hatsiega to Hougnduran; Naththoung to Paboga.

TERIAS FORMOSA.

Eurema formosa, Hübn. Zutr. exot. Schmett. f. 979 (1837).

Hatsiega.

TERIAS LÆTA.

Terias læta, Boisd. Spec. Gén. Léop. i. p. 674 (1836).

Moulmein to Meetan.

NYCHITONIA XIPHIA.

Papilio xiphia, Fabr. Spec. Gén. Lép. ii. p. 43.

P. nina, Fabr. Ent. Syst. iii. 1, p. 194.

Ahsown; above Ahsown.

CALLIDRYAS CATILLA.

Papilio catilla, Cram. Pap. Exot. iii. t. 229. f. D, E (1782);
Butler, Lep. Exot. i. p. 24, pl. 9. f. 7-10.

Hatsiega to Hougnduran; Naththoung to Paboga; Moolai, 3000-6000 feet.

CALLIDRYAS CROCALE.

Papilio crocale, Cram. Pap. Exot. i. t. 52. f. C, D (1779);
Butler, Lep. Exot. i. p. 22, pl. 9. f. 1, 2.

Moolai to Meetan.

HEBOMOIA GLAUCIPPE.

Papilio glaucippe, Linn. Syst. Nat. i. 2, p. 762 (1767).

Hougnduran source.

IXIAS PALLIDA, n. sp.

Nearest to *I. andamana*, Moore, P. Z. S. 1877, p. 590. Upper-side of the same pale colour, the orange band on fore wing slightly wider, and having a more convex outer margin, the inner black border also broader, and the marginal band on hind wing wide and of equal width throughout. Underside differs in having a uniform series of delicate black strigæ and a cell-spot on both wings.

Expanse $2\frac{3}{8}$ inches.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

From *I. latifasciata*, Butler, this species differs in its much paler colour above and beneath, and in the absence of the dark blotches on the underside.

IXIAS CITRINA, n. sp.

Male. Allied to the preceding; the orange band comparatively narrower and shorter hindward, its black inner border also narrower, and the marginal band on hind wing only half its width. Underside darker, with more prominent black strigæ and cell-spot, and with a submarginal series of brown-speckled spots with whitish centre.

Expanse 2 inches.

Houndurang source. In coll. J. Wood-Mason.

This also may be distinguished from *I. latifasciata*, by the colour above and by the narrow band on the hind wing.

IXIAS MOULMEINENSIS, n. sp.

Male and Female. Near to *I. pirenassa*, Wallace, from Madras. Upperside of the same bright yellow, the orange band in male much broader anteriorly; pale blackish band on hind wing narrow and not extending to posterior angle. Underside dull ochreous-yellow, with

delicate dark strigæ, and submarginal brown spots centred with white. Female with moderately broad orange band.

Expanse, ♂ 2, ♀ $1\frac{3}{4}$ inch.

Moulmein to Meetan. In coll. J. Wood-Mason.

ERONIA LUTESCENS, Butler.

Moulmein to Meetan.

CATOPHAGA NEOMBO.

Pieris neombo, Boisd. Spec. Gén. Lép. i. p. 539 (1836); Moore, Catal. Lep. Mus. E.I. C. i. pl. 2A. f. 3.

Moulmein to Meetan (a single female).

CATOPHAGA PAULINA.

Pieris paulina, Cram. Pap. Exot. ii. t. 110. f. E, F (1779).

Moulmein to Meetan; Hatsiega to Hougnduran; Naththoung to Paboga.

(All males.)

CATOPHAGA LAGELA, n. sp. (Plate LII. fig. 4.)

Allied to *C. lalage*, Doubleday, D. Lep. pl. 6. f. 3.

Male and Female. Smaller. Upperside differing on the fore wing in the black apical border terminating in both sexes before reaching the posterior angle, and the medial portion partly excavated outside the lower end of the cell and thence extending across the end to its base; hind wing with a broad marginal continuous band (as in *C. pandione*, Hübn.). Underside—fore wing with the black band terminating as above; the apex and hind wing greyish-yellow, speckled with purple in male, and brownish-grey with darker speckles in female, the speckles numerous across the disk, and forming zigzag fasciæ.

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

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

APPIAS LEA.

Pieris lea, Doubleday, Ann. Nat. Hist. 1846, p. 23.

P. clemathe, Doubleday, Gen. D. Lep. pl. 6. f. 3.

Moolai, 3000–6000 feet.

APPIAS NAMA.

Pieris nama, Moore, Catal. Lep. Mus. E.I. C. i. p. 76 (1857); Proc. Zool. Soc. 1857, p. 102, pl. 44. f. 1, 2.

Hougnduran source; Taoo, 3000–5000 feet (March); Moolai, 3000–6000 feet; Moolai to Moolat, 4000–5000 feet.

APPIAS DAPHA, n. sp.

Allied to *A. zeuzippe*, Cram.

Male differs on the upperside in being white; the apical band on the fore wing more like that of *A. nama*, narrower, deeply scalloped within; anterior spots obsolete; and the contiguous discal spots

between the two upper median branches scarcely perceptible; marginal spots on hind wing indistinct, speckles disconnected. Underside white; apex of fore wing slightly dusky grey; subcostal and median vein within the cell, and all the veins of hind wing with dusky borders.

Female also white; apical band on fore wing without anterior spots; other markings similar but less prominent.

Expanse $1\frac{7}{8}$ inch.

Moulmein to Meetan. In coll. J. Wood-Mason.

APPIAS ZELMIRA.

Papilio zelmira, Cram. Pap. Exot. iv. t. 320. f. C, D (1782).

Moulmein to Meetan.

APPIAS AMBA.

Pieris amba, Wallace, Trans. Ent. Soc. 1867, p. 340.

Moulmein to Meetan; Hougnduran source.

APPIAS VACANS.

Appias vacans, Butler, Trans. Ent. Soc. 1870, p. 490, ♀.

Moulmein to Meetan; Hatsiega to Hougnduran.

DELIAS PASITHOË.

Papilio pasithoë, Linn. Syst. Nat. i. 2, p. 755 (1767).

Ahsown, 2000 feet; Taoo, 3000–5000 feet (March).

DELIAS INDICA.

Thyca indica, Wallace, Trans. Ent. Soc. 1867, p. 351.

Above Ahsown; Moulmein to Meetan. Moolai, 3000–6000 feet.

DELIAS DESCOMBESI.

Pieris descombesi, Boisd. Spec. Gén. Léop. i. p. 465.

Ahsown; Moolai, 3000–6000 feet.

PRIONERIS WATSONI.

Prioneris watsoni, Hewitson, Trans. Ent. Soc. 1868, p. 100.

Moulmein to Meetan; Hougnduran source.

PRIONERIS CLEMANTHE.

Pieris clemathe, Doubleday, Ann. Nat. Hist. 1846, p. 23.

P. helferi, Felder, Reise Nov., Lep. ii. p. 161, t. 25. f. 10.

Hougnduran source; Naththoung to Paboga.

Subfam. PAPILIONINÆ.

PAPILIO TELEARCHUS.

Papilio telearchus, Hewitson, Trans. Ent. Soc. 1852, p. 22, pl. 6. f. 3.

Hatsiega.

PAPILIO XENOCLES.

Papilio xenocles, Doubleday, Gray's Zool. Misc. p. 74; Gen. D. Lep. pl. 1*. fig. 2; Westw. Arc. Ent. ii. pl. 79. f. 2.

Hatsiega.

PAPILIO MEGARUS.

Papilio megarus, Westwood, Arc. Ent. ii. pl. 72. f. 2 (1845).

Houngduran source.

PAPILIO ONPAPE, n. sp.

Differs from specimens of Himalayan *P. panope* Linn. (Cram. Pap. Exot. iv. pl. 295. f. E, F) in having comparatively shorter wings, smaller and less-prominent spots on the fore wing, smaller marginal lunules, and much shorter dentate submarginal streaks on the hind wing.

Expanse $3\frac{6}{8}$ inches.

Hatsiega; Houngduran source; Naththoung. In coll. J. Wood-Mason and F. Moore.

PAPILIO PAMMON.

Papilio pammon, Linn. Syst. Nat. i. 2, p. 746 (1767).

P. polytes, Linn. Syst. Nat. i. 2, p. 746.

Ahsown, 2000 feet; Meetan, 3000 feet (March); Taoo, 3000-5000 feet (March).

PAPILIO ARISTOLOCHIÆ.

Papilio aristolochiæ, Fabr. Syst. Ent. p. 443 (1775).

P. diphilus, Esper, Ausl. Schmett. pl. 40 v. f. 1.

Moulmein to Meetan; Hatsiega; Naththoung to Paboga.

PAPILIO PHILOXENUS.

Papilio philoxenus, Gray, Zool. Misc. p. 32 (1831); Lep. Ins. Nepal, p. 5, pl. 2.

Moulmein to Meetan; Moolai to Moolat, 4500 feet.

PAPILIO DOUBLEDAYI.

Papilio doubledayi, Wallace, Trans. Ent. Soc. 1865, p. 42.

Moulmein to Meetan.

PAPILIO HELENUS.

Papilio helenus, Linn. Syst. Nat. i. 2, p. 745; Cram. Pap. Exot. ii. t. 153. f. A, B.

Hatsiega; Moolai to Moolat, 4500 feet.

PAPILIO MAHADEVA, n. sp. (Plate LI. fig. 1.)

Male. Allied to *P. castor*, but with shorter hind wings, which are of the same form as in *P. panope*. Upperside dark brown, nemerously covered with minute ferruginous scales; fore wing with a marginal series of very small white lunular spots, one between

each vein; hind wing with a discal series of seven short conical yellowish-white spots, a submarginal series of narrow dentate lunules, and a marginal very narrow lunular line, one between each vein. Underside paler, more numerous covered with ferruginous scales; the markings as above; the fore wing also having a second marginal series of very small white spots, and a spot at the end of the cell.

Expanse 4 inches.

Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

A specimen, labelled "Eastern Bengal," from Mr. A. Grote's collection, of what I believe to be the female of *P. mahadeva*, differs from that sex of *P. castor* in the fore wings having very small and less-distinct submarginal white spots, no spot at the end of the cell, and no white speckles between the discal interspaces; the hind wings on both sides also have the discal streaks shorter and confined to the middle of the wing, there being none either at the base or in the cell, thus forming a transverse medial band similar in position to that of the male above described; the submarginal dentate marks are less defined.

PAPILIO ANDROGEOS.

Papilio androgeos, Cram. Pap. Exot. i. pl. 91.

Ahsown, 2000 feet; above Ahsown.

PAPILIO ZELEUCUS.

Papilio zeleucus, Hewitson, Exot. Butt. iii. Pap. pl. 8. f. 24, 25 (1865).

Moulmein to Meetan.

PAPILIO SARPEDON.

Papilio sarpedon, Linn. Syst. Nat. i. 2, p. 747 (1767).

Hatsiega; Hougnduran source.

PAPILIO AGAMEMNON.

Papilio agamemnon, Linn. Syst. Nat. i. 2, p. 748 (1767).

Moulmein to Meetan; Hatsiega; Hougnduran source.

PAPILIO ANTIPHATES.

Papilio antiphates, Cram. Pap. Exot. i. t. 72. f. A, B (1779).

Hougnduran source.

LEPTOCIRCUS VIRESCENS.

Leptocircus virescens, Butler, Catal. Fabr. Lep. B. M. p. 259 (1870).

Ahsown; Moulmein to Meetan; Hougnduran source; Moolai, 3000-6000 feet.

Fam. HESPERIDÆ.

ISMENE BENJAMINI.

Hesperia benjamini, Guér. Deless. Voy. Inde, ii. p. 79, pl. 22. f. 2 (1843).

Above Ahsown.

ISMENE DRUNA.

Ismene druna, Moore, Proc. Zool. Soc. 1865, p. 784; Hewitson, Exot. Butt. iv. *Hesp.* pl. 2. f. 26.

Taoo, 3000–5000 feet.

TAGIADES PRALAYA.

Tagiades pralaya, Moore, Proc. Zool. Soc. 1865, p. 779.

Ahsown.

TAGIADES MEETANA, n. sp. (Plate LIII. fig. 1.)

Male. Allied to *T. obscurus*, Mabille, from Java: fore wing above similar: hind wing differs in the marginal area of the anal angle being only slightly white-speckled between the veins; the cilia below it dark brown with a very narrow whitish inner line; on the underside there is less white, and the black border more lengthened and prominent, the cilia also being brown.

Expanse $1\frac{6}{8}$ inch.

Meetan, 3000 feet (April). In coll. J. Wood-Mason.

ASTICTOPTERUS DIOCLES.

Nisoniades diocles, Moore, Proc. Zool. Soc. 1865, p. 787.

Meetan, 3000 feet.

ASTICTOPTERUS SUBFASCIATUS, n. sp.

Male and Female. Upperside uniform vinous-brown. Underside—fore wing with a short vinous-grey streak and two small ochreous-grey spots from the apex, three small ochreous-grey spots obliquely from the costa before the apex; hind margin pale ochreous-brown; hind wing with a short, broad, medial and a subbasal vinous-grey band; abdominal margin broadly pale ochreous-brown; some indistinct spots between the bands and at the base also pale ochreous-brown. Palpi, body, and legs beneath pale ochreous-brown.

Expanse $1\frac{4}{8}$ inch.

Ahsown. In coll. J. Wood-Mason.

A specimen of this species from S. India is also in the collection of the British Museum.

PAMPHILA BAMBUSÆ.

Pamphila bambusæ, Moore, Proc. Zool. Soc. 1878, p. 691, pl. 45. f. 11, 12.

Hatsiega.

PAMPHILA MASONI, n. sp. (Plate LII. fig. 5.)

Male. Upperside dark olive-brown; cilia brownish ochreous, palest on hind wing; fore wing with a yellow semidiaphanous sinuous spot at end of the cell, two spots before the apex, and a band of three oblique discal spots, the lower one elongated; hind wing with an opaque yellow discal patch, the basal hairs green. Underside dark ochreous-yellow: fore wing with the basal area black; spots as above,

the lower discal portion broad: hind wing with an indistinct series of marginal and submarginal brown spots. Front of head, palpi, legs, and body beneath yellow.

Expanse $1\frac{4}{10}$ inch.

Hatsiega. In coll. J. Wood-Mason.

PAMPHILA MATHIAS.

Hesperia mathias, Fabr. Ent. Syst. Suppl. p. 433 (1798); Butler, Catal. Fabr. Lep. B. M. pl. 3. f. 6.

Moulmein to Meetan.

HESPERIA MOOLATA, n. sp.

Male and Female. Upperside dark vinous-brown, slightly olive, brown at the base; cilia cinereous-yellow: fore wing with a single small semidiaphanous white spot at lower end of the cell, two smaller spots obliquely before the apex, and three below on the disk, the lowest being the largest and angular; the female with two spots at end of the cell, and a small opaque yellowish spot between lower median branch and submedian vein. Underside brighter-coloured, marked as above, the yellow discal lower spot in female larger.

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

Ahsown (2000 feet), March. Moolai to Moolat.

This species is allied to *H. kumara*, Moore, from South India, and to *H. cahira* from the Andamans.

PLESIONEURA AURIVITTATA, n. sp. (Plate LIII. fig. 2.)

Male and Female. Upperside dark golden olive-brown: fore wing with a broad oblique golden-yellow discal band curving from middle of the costa to posterior angle, the band semiopaque from the costal vein to lower median branch; a small curved yellow streak composed of three vein-crossed spots before the apex. Cilia of both wings brown. Underside duller brown: fore wing as above: hind wing slightly yellow-speckled, and with a very indistinct yellowish streak at the end of the cell.

Expanse $1\frac{7}{10}$ inch.

Hab. Above Ahsown. In coll. J. Wood-Mason and F. Moore.

Allied to *P. dhanada*, Moore, P. Z. S. 1865, p. 789. Distinguished by the oblique transverse band being very broad throughout and extending to the posterior angle, also in the cilia of hind wing being entirely brown.

PLESIONEURA ALBIFASCIA, n. sp. (Plate LIII. fig. 3.)

Male. Differs from *P. alysos*, Moore, in its narrower fore wing and smaller hind wing; the oblique semidiaphanous white band is shorter and straight, the portion beneath the lower median branch being very small, this part on the underside showing only as a suffused white patch; and there are no subapical spots.

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

Hatsiega. In coll. J. Wood-Mason.

A specimen of this species, collected by Mr. Buxton, probably in Sumatra, is in my own collection.

ISOTEINON SUBTESTACEUS, n. sp.

Male and Female. Upperside dark olive-brown; cilia cinereous-brown, with a brown inner line and indistinct bars; fore wing with a semidiaphanous spot at end of the cell, a curved series of three subapical contiguous spots, and two larger contiguous spots on the disk. Underside brownish ochreous, grey-speckled: fore wing with the basal area below the cell and the disk fuliginous black; spots as above; male with a black tuft on hind margin: hind wing with a curved discal series of six small white spots, and four subbasal spots, the two lower of the latter being contiguous, the third at the end of the cell, and the fourth above the cell. Palpi and body beneath ochreous-white; legs brownish ochreous. Allied to *I. atkinsoni*, from Darjiling.

Expanse $1\frac{2}{8}$ inch.

Ahsown. In coll. J. Wood-Mason.

SPHINGES.

Fam. SPHINGIDÆ.

Subfam. MACROGLOSSINÆ.

MACROGLOSSA ORIENTALIS.

Macroglossa orientalis, Butler, Trans. Linn. Soc. x. p. 528 (1876).

Ahsown.

MACROGLOSSA LUTEATA.

Macroglossa luteata, Butler, Proc. Zool. Soc. 1875, p. 241, pl. 37. f. 5.

Ahsown.

Subfam. AMBULYCINÆ.

AMBULYX SUBSTRIGILIS.

Ambulyx substrigilis, Westwood, Cab. Orient. Ent. pl. 30. f. 2. Taoo, 3000–5000 feet.

BOMBYCES.

Fam. ZYGÆNIDÆ.

Subfam. SYNTOMINÆ.

SYNTOMIS GROTEI.

Syntomis grotéi, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 4.

Taoo, 3000–5000 feet, March.

SYNTOMIS SLADENI.

Syntomis sladeni, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 5.

Moolai to Moolat, 4500 feet.

SYNTOMIS ATKINSONI.

Syntomis atkinsoni, Moore, Proc. Zool. Soc. 1871, p. 245, pl. 18. f. 2.

Above Ahsown; Naththoung to Paboga.

SYNTOMIS LIBERA.

Syntomis libera, Walker, Catal. Lep. Het. B. M. Suppl. p. 78.

Above Ahsown; Meetan, 3000 feet, April.

SYNTOMIS MASONI, n. sp. (Plate LIII. fig. 4.)

Allied to *S. vitreata*, H.-Sch. Lep. Spec. Nov. f. 247. Distinguished by having the hyaline spaces broader, by the space between the lower subcostal and upper median branch being black, and the front of the head white.

Expanse, ♂ $1\frac{7}{12}$, ♀ $1\frac{9}{12}$ inch.

Moolai, 3000-6000 feet; Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

SYNTOMIS DISRUPTA, n. sp. (Plate LIII. fig. 5.)

Similar to *S. divisa*, Walker. Differs in its more pointed fore wing, the hyaline spaces extending throughout to the exterior margins, the black borders being narrower.

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

Moolai, 3000-6000 feet; Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

SYNTOMIS BERINDA, n. sp. (Plate LIII. fig. 8.)

Allied to *S. fenestrata* (H.-Sch. Lep. Spec. Nov. f. 270). Smaller, the hyaline spots on fore wing shorter, those on the hind wing narrower and pale orange-colour. Front of head, collar, a spot on tegulæ, and a spot on hind part of thorax orange-red; the orange bands on abdomen narrow; anal segment black; tarsi with a white band.

Expanse, ♂ $1\frac{1}{10}$, ♀ $1\frac{3}{10}$ inch.

Ahsown, 2000 feet; above Ahsown.

SYNTOMIS ALBIFRONS, n. sp. (Plate LIII. fig. 6.)

Allied to *S. diaphana*, Kollar, and *S. melas*, Walker. Dark purple-black: fore wing with the basal area of the cell, five large elongated discal spots, a small spot between the two lower median veins (obsolete in some specimens), and a narrow indented space from the base above the submedian vein hyaline: hind wing with three short hyaline spots, the outer small, and in some specimens obsolete: front of head, collar above, and four streaks down the thorax white; an orange band on hind part of thorax; abdomen glossy greyish blue, with an orange band on the first and fifth segments, and a lateral band on third and fourth segments; legs slaty blue.

Expanse $2\frac{2}{10}$ inches.

Above Ahsown; Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

Fam. CHALCOSIIDÆ.

RETINA RUBRIVITTA.

Retina rubrivitta, Walker, Catal. Lep. Het. B. M. ii. p. 439 (1854).

Moolai to Moolat, 4000–5000 feet.

HISTIA PAPILIONARIA.

Gynautocera papilionaria, Guérin, Mag. Zool. 1836, p. 12.

Moolai, 3000–6000 feet.

Fam. EUSCHEMIDÆ.

EUSCHEMA MILITARIS.

Phalæna militaris, Linn. [Cram. Pap. Exot. i. pl. 29. f. B].

Moolai, 3000–6000 feet; Moolai to Moolat, 4500 feet.

EUSCHEMA EXCUBITOR, n. sp.

Male and Female. Differs from *E. militaris* in its much smaller size and more angular outer margin of hind wing; the basal markings are linear and very narrow, those on the hind wing smaller, the discal zigzag band and marginal marks also very narrow, the submarginal spots much smaller, and continuing in a separated series to the subcostal branch.

Expanse $2\frac{3}{8}$ to $2\frac{5}{8}$ inches.

Tao, 3000–5000 feet, March; Houngduran source. In coll. J. Wood-Mason.

This species is also an inhabitant of the Khasia hills.

EUSCHEMA AURILIMBATA, n. sp.

Allied to *E. malayana*, Guér. Deless. Voy. l'Inde, pl. 23. f. 2, from the Malay coast.

Male pale blue: fore wing with the bands broad and partly confluent: hind wing with the marginal area beyond the zigzag band, and the abdominal border, bright chrome-yellow. Abdomen at base above, tufted sides, body beneath, and legs chrome-yellow.

Expanse $3\frac{1}{4}$ inches.

Ahsown. In coll. J. Wood-Mason.

EUSCHEMA HORSFIELDI.

Euschema horsfieldi, Moore, Catal. Lep. Mus. E.I. C. ii. p. 334, pl. 8A. f. 7.

Ahsown, 2000 feet; Moolai, 3000–6000 feet.

Fam. NYCTEMERIDÆ.

NYCTEMERA LATISTRIGA.

Nyctemera latistriga, Walker, Catal. Lep. Het. B. M. ii. p. 397 (1854).

Ahsown.

PITASILA MOOLAICA, n. sp. (Plate LIII. fig. 10.)

Male and Female. Smaller than *P. varians* (*Nyctemera varians*, Walker); markings similar, those on fore wing narrower and disconnected, the transverse bands broken; and there is also a small white spot at the extreme apex of the wing; those on the hind wing are also smaller.

Expanse 2 inches.

Moolai, 3000–6000 feet. In coll. J. Wood-Mason.

Fam. LITHOSIIDÆ.

ANAGNIA SUBFASCIATA.

Anagnia subfasciata, Walker, Catal. Lep. Het. B. M. ii. p. 446 (1854).

Ahsown, 2000 feet; Moolai to Moolat, 4500 feet.

PERIDROME ORBICULARIS.

Peridrome orbicularis, Walker, Catal. Lep. Het. B. M. ii. p. 445 (1854).

Aganopsis subquadrata, H.-Sch. Lep. Spec. Nov. p. 70, f. 501 (1856).

Above Ahsown; Taoo, 3000–5000 feet.

DAMALIS PLAGINOTA.

Damalis plaginota, Butler, Trans. Ent. Soc. 1875, p. 320.

Above Ahsown.

DAMALIS ALCIPHON.

Phalena alciphron, Cramer, Pap. Exot. ii. pl. 133. f. E.

Moulmein to Meetan; Moolai to Moolat, 4500 feet.

HYPSA SUBSIMILIS.

Hypsa subsimilis, Walker, Catal. Lep. Het. B. M. Suppl. p. 212 (1864).

Ahsown.

NEOCHERA MARMOREA.

Neochera marmorea, Walker, Catal. Lep. Het. B. M. vii. p. 1674 (1856).

Above Ahsown; Taoo, 3000–5000 feet; Moolai, 3000–6000 feet.

ÆONISTIS ENTELLA.

Phalena entella, Cramer, Pap. Exot. iii. pl. 208. f. D.

Moulmein to Meetan.

Fam. ARCTIIDÆ.

ATTATHA, n. g.

Allied to *Euplagia* (*E. hera* of Europe). Fore wing elongated, narrow; costa straight; apex bluntly angular; exterior margin ob-

lique, angle connex; posterior margin convex at base. Hind wing oval, exterior margin very convex. Venation similar to that of *E. hera*. Body elongated; abdomen extending beyond hind wing: antennæ slender, minutely setose. Legs long, femora and tibia slightly pilose. Palpi long, slender, porrect.

ATTATHA REGALIS.

Hypercompa regalis, Moore, P. Z. S. 1872, p. 575, pl. 33. f. 7.
Meetan, 3000 feet, March.

Fam. LIPARIDÆ.

ARTAXA VARIANS.

Artaxa varians, Walker, Catal. Lep. Het. B. M. iv. p. 796 (1855).

Ahsown.

PERINA BASALIS.

Perina basalis, Walker, Catal. Lep. Het. B. M. iv. p. 966 (1855).
Above Ahsown.

Fam. LASIOCAMPIDÆ.

DREATA TAOOENSIS, n. sp. (Plate LIII. fig. 7.)

Allied to *D. petola*, Moore, Catal. Lep. Mus. E. I. C. ii. pl. 10 a. f. 2, from Java.

Male. Upperside ochreous-grey; three medial transverse very indistinct dusky lunular lines, a slightly darker discal line and a narrow outer sinuous line, with brighter interspace between the two lines, the point between the two lower median branches only with dusky centre. Underside as above.

Expanse $3\frac{1}{4}$ inches.

Tao, 3000–5000 feet. In coll. J. Wood-Mason.

TRABALA VISHNU.

Gastropacha vishnu, Lefebvre, Zool. Journ. iii. p. 207 (1827).
Tao, 3000–5000 feet.

NOCTUES.

Fam. OPHIDERIDÆ.

POTAMOPHORA MANLIA.

Phalæna manlia, Cram. Pap. Exot. pl. 92. f. A.
Above Ahsown.

Fam. EREBIDÆ.

ARGIVA HIEROGLYPHICA.

Phalæna hieroglyphica, Drury, Exot. Ins. ii. pl. 2. f. 1.
Moulmein to Meetan.

ARGIVA CAPRIMULGUS, Fab.

Phalæna caprimulgus, Fab. (Guén. Noct. iii. p. 180).
Moolai, 3000–6000 feet.

NYCTIPAO CREPUSCULARIS.

Phalæna crepuscularis, Linn. (Clerck, Icones, pl. 53. f. 1).
Meetan, 3000 feet, April.

Fam. HYPOPYRIDÆ.

SPIRAMA HELICINA.

Speiredonia helicina, Hübn. Zutr. f. 437.
Moolai, 3000–6000 feet.

ENTOMOGRAMMA FAUTRIX.

Entomogramma fautrix, Guén. Noct. iii. p. 204.
Naththoung to Paboga.

Fam. OPHIUSIDÆ.

ARTENA SUBMIRA.

Artena submira, Walker, Catal. Lep. Het. B. M. xiv. p. 1389.
Above Ahsown.

FODINA STOLA.

Fodina stola, Guén. Noct. iii. p. 275.
Ahsown; Tao, 3000–5000 feet.

CALESIA FLABELLIFERA, n. sp.

Smaller than *C. comesa*, Guén. Noct. iii. p. 258; wings somewhat brighter-coloured, the lappet of hairs on fore wing also smaller and composed of shorter hair; fore tarsi densely clothed with black hair.

Expanse $1\frac{5}{8}$ inch.

Ahsown. In coll. J. Wood-Mason.

CALESIA GASTROPACHOIDES.

Calesia gastropachoides, Guén. Noct. iii. p. 258.
Above Ahsown.

PYRALES.

Fam. SPILOMELIDÆ.

ZEBRONIA PLUTUSALIS.

Zebronia plutusalis, Walker, Catal. Lep. Het. B. M. xvii. p. 478.
Ahsown.

Fam. MARGARONIDÆ.

GLYPHODES BIVITRALIS.

Glyphodes bivitralis, Guén. Delt. et Pyral. p. 293.
Houngduran source.

GLYPHODES STOLALIS.

Glyphodes stolalis, Guén. Delt. et Pyral. p. 293, pl. 3. f. 11.
Moulmein to Meetan; Houngduran source; Naththoung to Paboga.

CYDALIMA CONCHYLALIS.

Margarodes conchylalis, Guén. Delt. et Pyral. p. 303, pl. 8. f. 9.
Hatsiega.

PACHYARCHES VERTUMNALIS.

Margarodes vertumnalis, Guén. Delt. et Pyral. p. 309.
Houngduran source; Naththoung to Paboga.

PACHYARCHES MARTHESIUSALIS.

Margaronia marthesiusalis, Walker, Catal. Lep. Het. B. M. xviii. p. 531.
Houngduran source.

SISYROPHORA PFEIFFERÆ.

Sisyrophora pfeifferæ, Lederer, Wien. ent. Monat. vii. p. 399,
pl. 13. f. 13.
Moulmein to Meetan; Houngduran source; Naththoung to
Paboga.

EUGLYPHIS PROCOPIALIS.

Phalæna procopialis, Cram. Pap. Exot. iv. pl. 368. f. E.
Ahsown, 2000 feet.

Fam. BOTYDÆ.

BOTYS JOPASALIS.

Botys jopasalis, Walker, Catal. Lep. Het. B. M. xviii. p. 652.
Houngduran source.

BOTYS CALDUSALIS.

Botys caldusalis, Walker, Catal. Lep. Het. B. M. xviii. p. 650.
Naththoung to Paboga.

BOTYS VINACEALIS.

Botys vinacealis, Moore, Proc. Zool. Soc. 1877, p. 619.
Moulmein to Meetan; Houngduran source.

BOTYS UNITALIS.

Botys unitalis, Guén. Delt. et Pyral. p. 349.
Moulmein.

GEOMETRES.

Fam. URAPTERIDÆ.

URAPTERYX PODALIRIATA.

Urapteryx podaliriata, Guén. Phal. i. p. 32 (1857).
Above Ahsown.

Fam. ENNOMIDÆ.

HYPERYTHRA LIMBOLARIA.

Hyperythra limbolaria, Guén. Phal. i. p. 101, pl. 3. f. 3, 4.
Ahsown.

HYPERYTHRA ANGULIFASCIA, n. sp. (Plate LIII. fig. 11.)

Male. Upperside purple-grey, traversed by short black strigæ; a broad greenish-grey band crossing both wings, its outer border brown, and angled before the costa and at the middle of hind wing; inner border curved; apex of fore wing with a brown and black patch, and a blackish discal patch on hind wing below angle of the band. Underside pale yellow traversed by several short brown strigæ, crossed by a narrow discal brown line, bordered outwardly with purple-brown; posterior angles of both wings greyish-white; body beneath and legs yellow.

Expanse $1\frac{2}{5}$ inch.

Moolai to Moolat, 4500 feet. In coll. J. Wood-Mason.

OMIZA SCHISTACEA, n. sp. (Plate LIII. fig. 12.)

Male. Upperside vinous-grey: fore wing with two zigzag black lines from the costa, terminating across end of the cell; a black speckled spot below the cell: hind wing with a black wavy discal line. Underside bright ochreous-yellow; apex of fore wing purple; antennæ and palpi grey; legs grey above, yellow beneath.

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

Above Ahsown. In coll. J. Wood-Mason.

Fam. FIDONIDÆ.

CORYMICA ARNEARIA.

Corymica arnearia, Walker, Catal. Lep. Het. B. M. xx. p. 231 (1860).

Ahsown.

TINOLEUS EBURNEIGUTTA.

Tinoleus eburneigutta, Walker, Catal. Lep. Het. B. M. iii. p. 621.
Moolai, 3000-6000 feet.

Fam. PALYADÆ.

EUMELEA ROSALIA.

Phalena rosalia, Cramer, Pap. Exot. iv. pl. 368. f. F.
Above Ahsown.

Fam. MACARIDÆ.

MACARIA NORA.

Macaria nora, Walker, Catal. Lep. Het. B. M. xxiii. p. 934.
Moolai, 3000-6000 feet.

Fam. ACIDALIDÆ.

BITHIA EXCLUSA.

Bithia exclusa, Walker, Catal. Lep. Het. B. M. xxii. p. 320.
Ahsown.

ACIDALIA ATTENTATA.

Acidalia attentata, Walker, Catal. Lep. Het. B. M. xxii. p. 734
(1861).
Ahsown.

Fam. MICRONIDÆ.

MICRONIA GRAMMEARIA.

Micronia grammearia, Geyer, Hübn. Zutr. p. 36, f. 761.
Hatsiega; Taoo, 3000-5000 feet; Moolai, 3000-6000 feet.

MICRONIA ACULEATA.

Micronia aculeata, Guén. Phal. ii. p. 26, pl. 13. f. 8 (1857).
Moolai, 3000-6000 feet.

MICRONIA VAGATA.

Micronia vagata, Moore, Proc. Zool. Soc. 1877, p. 622, pl. 60.
f. 18.
Ahsown; above Ahsown; Moolai, 3000-6000 feet.

Fam. ZERENIDÆ.

POTERA, n. gen.

Male. Fore wing somewhat trigonal; costa arched at base; apex convex; exterior margin oblique; costal vein extending to near apex; subcostal vein four-branched, first and second branches before the end of the cell, second bifid, fourth from the end of the cell; discocellulars bent inward, radial from their middle; median vein three-branched; submedian extending to above posterior angle. Hind wing oval; costal vein extending to apex; subcostal vein two-branched from the end of the cell; other veins as in fore wing. Body slender; antennæ minutely pectinated; palpi very small, slender; legs slender, squamose.

POTERA MARGINATA, n. sp. (Plate LIII. fig. 9.)

Male. White; cilia black: fore wing with the costal and exterior borders narrowly and irregularly black-bordered; a very large black spot also at the end of the cell, a smaller spot on the disk beyond, another near base of posterior margin, and a curved streak at the posterior angle: hind wing with black marginal line and spots. Body and legs yellow, spotted with black; antennæ brown.

Expanse $1\frac{5}{8}$ inch.

Moolai, 3000-6000 feet. In coll. J. Wood-Mason.

Tabular List showing the Geographical Distribution of the Lepidoptera of Tenasserim.

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Knasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
PAPILIONES.													
Nymphalidæ.													
DANAINÆ.													
Danaïx plexippus	*	..	*	*	*	*	..	*	*	*	*
— chrysippus	*	*	*	*	*	*	*	*
— melaneus	*	*	*	*	*
— tytia	*	..	*	..	*
— aglea	*	..	*
— vulgaris	*	*	*
— septentrionis	*	..	*	*	*	*	..	*	*	*	*
Salpix rhadamanthus	*	*	*	*
— crassa	*	*	*
— masoni, n. sp.	*
— margarita	*	*
Trepsichrois midamus	*	*	*	..	*	..	*
Crastia cupreipennis, n. sp.	*
Stictoplea grotei	*	*
Euplea godartii	*	*	*	*
— aicathoë	*	*
— limborgii, n. sp.	*
— subdita, n. sp.	*
SATYRINÆ.													
Lethe arcadia	*	*
— mekara	*	*
— robria	*	..	*	..	*	*	*
— verma	*	*	*	*
Melanitis ismene	*	*	*	*	..	*	*	*	..
— bela	*	*	*	*
Zethera diademoides, n. sp.	*
Mycalesis mineus	*	*	*	..
— perseus	*	..	*
— blasius	*	*	*	*	*	..
— anaxias	*	*	*	*
— runeka	*	..	*	*	..	*
Oulapa mnasicles	*
Ypthima methora	*	*	*
— baldus	*	*	*	*
Erites angularis, n. sp.	*
Elymnias tinctoria, n. sp.	*
— vasudeva	*	*	*
Dyctis leucocyma	*	*	*

Tabular List (continued).

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
Erycinidæ.													
Zemerus flegyas	*	*	*	*	*				
Taxila fasciata, n. sp.	*	*	..										
Abisara neophron	*	*	..	*	*	*							
— angulata, n. sp.	*												
Lycanidæ.													
Castalius roxus.....	*	*				*
Lampides alexis	*	..	*	*	*	*			*
— kandarpa	*	..	*	*	*				*
— elpis	*	*				*
— ælianus.....	*	..	*	*	*	*				*
Hypolycæna lisias	*												
Myrina freja.....	*	*	*			
Deudorix suffusa, n. sp.	*												
Thamala miniata, n. sp.	*												
Loxura atymnus	*	*	*										
Amblypodia taooana, n. sp.	*												
Narathura moolaiana, n. sp.	*												
Arhopala nakula	*	*			*		
— vihara	*	*					
Surendra quercetorum	*	*	*	*	*	*
Thaduka multicaudata, n. sp.....	*												
Papilionidæ.													
PIERINÆ.													
Nychitonia xiphia	*	..	*	*	*	*	*			*	
Terias hecabe	*	*	..	*	*	*	*			*	
— silhetana	*	..	*	*	*	*	*			*	
— formosa	*	*	*	*	*		*		
— læta	*	*	*	*	*				
Eronia lutescens	*	*	*			
Callidryas catilla	*	*	*	*	*	*	..	*	*		*	*	*
— crocale	*	*	*	*	*	*	..	*	*		*	*	*
Hebomoia glaucippe	*	*	..	*	*	*	*	*	..	*
Ixias citrina, n. sp.	*												
— pallida, n. sp.	*												
— moulmeinensis, n. sp.	*												
Catophaga neombo	*	*	*			*	
— paulina	*	..	*	..	*	*	*				
— lagela, n. sp.	*												
Appias lea	*	*											
— nama	*	*	*	*	*			
— dapha, n. sp.	*												
— amba	*												
— zelmira	*	..	*	*	..	*				
— vacans	*	*											

Tabular List (continued).

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district).	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunnan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
<i>Delias pasithoë</i>	*	*	*	*	*	*							
— <i>indica</i>	*	*	*	*	*	*							
— <i>descombesi</i>	*	*	*	*	*	*							
<i>Prioneris watsoni</i>	*	*	*	*	*	*							
— <i>clemanthe</i>	*	*	*	*	*	*							
PAPILIONINÆ.													
<i>Papilio telearchus</i>	*	*	*	*	*	*							
— <i>xenocles</i>	*	*	*	*	*	*							
— <i>megarus</i>	*	*	*	*	*	*							
— <i>onpape</i> , n. sp.	*	*	*	*	*	*							
— <i>pammon</i>	*	*	*	*	*	*		*					
— <i>aristolochiæ</i>	*	*	*	*	*	*		*	*				
— <i>philoxenus</i>	*	*	*	*	*	*		*				*	*
— <i>doubledayi</i>	*	*	*	*	*	*		*				*	*
— <i>helenus</i>	*	*	*	*	*	*		*				*	*
— <i>alcmenor</i>	*	*	*	*	*	*		*				*	*
— <i>mahadeva</i> , n. sp.	*	*	*	*	*	*		*				*	*
— <i>androgeos</i>	*	*	*	*	*	*		*				*	*
— <i>zeleucus</i>	*	*	*	*	*	*		*				*	*
— <i>sarpedon</i>	*	*	*	*	*	*		*				*	*
— <i>agamemnon</i>	*	*	*	*	*	*		*				*	*
— <i>antiphates</i>	*	*	*	*	*	*		*				*	*
<i>Leptocircus virescens</i>	*	*	*	*	*	*		*	*			*	*
Hesperidæ.													
<i>Ismene benjamini</i>	*	*	*	*	*	*		*				*	*
— <i>druna</i>	*	*	*	*	*	*		*				*	*
<i>Tagiades pralaya</i>	*	*	*	*	*	*		*	*			*	*
— <i>meetana</i> , n. sp.	*	*	*	*	*	*		*				*	*
<i>Astictopterus diocles</i>	*	*	*	*	*	*		*	*			*	*
— <i>subfasciatus</i> , n. sp.	*	*	*	*	*	*		*				*	*
<i>Pamphila bambusæ</i>	*	*	*	*	*	*		*				*	*
— <i>masoni</i> , n. sp.	*	*	*	*	*	*		*				*	*
— <i>mathias</i>	*	*	*	*	*	*		*	*			*	*
<i>Hesperia moolata</i> , n. sp.	*	*	*	*	*	*		*				*	*
<i>Plesioneura aurivittata</i> , n. sp.	*	*	*	*	*	*		*				*	*
— <i>albifascia</i> , n. sp.	*	*	*	*	*	*		*				*	*
<i>Isosteinon subtetaceus</i> , n. sp.	*	*	*	*	*	*		*				*	*
SPHINGES.													
<i>Macroglossa orientalis</i>	*	*	*	*	*	*		*				*	*
— <i>luteata</i>	*	*	*	*	*	*		*				*	*
<i>Ambulyx substrigilis</i>	*	*	*	*	*	*		*				*	*

Tabular List (continued.)

	Upper Tenasserim.	Pegu.	Lower Bengal (Calcutta district),	Eastern Bengal (Silhet, Khasias).	Sikkim, Himalayas.	Western Yunnan.	Siam.	Malay Peninsula or Penang.	Java.	Sumatra.	Andamans.	Ceylon.	S. India (W. Ghats).
<i>Pachyarches vertumnalis</i>	*	..	*	**
— <i>marthesiusalis</i>	*	..	*	**
<i>Sisyrophora pfeifferæ</i>	*	*
<i>Euglyphis procopialis</i>	*	*	*	*
<i>Botys jopasalis</i>	*	..	*	*	..
— <i>caldusalis</i>	*	*
— <i>vinacealis</i>	*	*
— <i>unitalis</i>	*	..	*
GEOMETRES.													
<i>Urapteryx podaliriata</i>	*	..	*	*
<i>Hyperythra limbolaria</i>	*	..	*	*	..	*
— <i>angulifascia</i> , n. sp.	*
<i>Corymica arnearia</i>	*	*	*
<i>Omiza schistacea</i> , n. sp.	*
<i>Tinoleus eburneigutta</i>	*	*	*	..
<i>Eumelea rosalia</i>	*	*	..	*	*
<i>Macaria nora</i>	*	*	*
<i>Bithia exclusa</i>	*	*
<i>Acidalia attentata</i>	*	*
<i>Micronia grammearia</i>	*	*	*	*
— <i>aculeata</i>	*	..	*	*	..	*	..	*
— <i>vagata</i>	*	*
<i>Potera marginata</i> , n. sp.	*

EXPLANATION OF PLATES LI.-LIII.

PLATE LI.

- Fig. 1. *Papilio mahadeva*, n. sp., p. 840.
 2. *Euplexa limborgii*, n. sp., p. 823.
 3. *Zethera diademoides*, n. sp., p. 824.

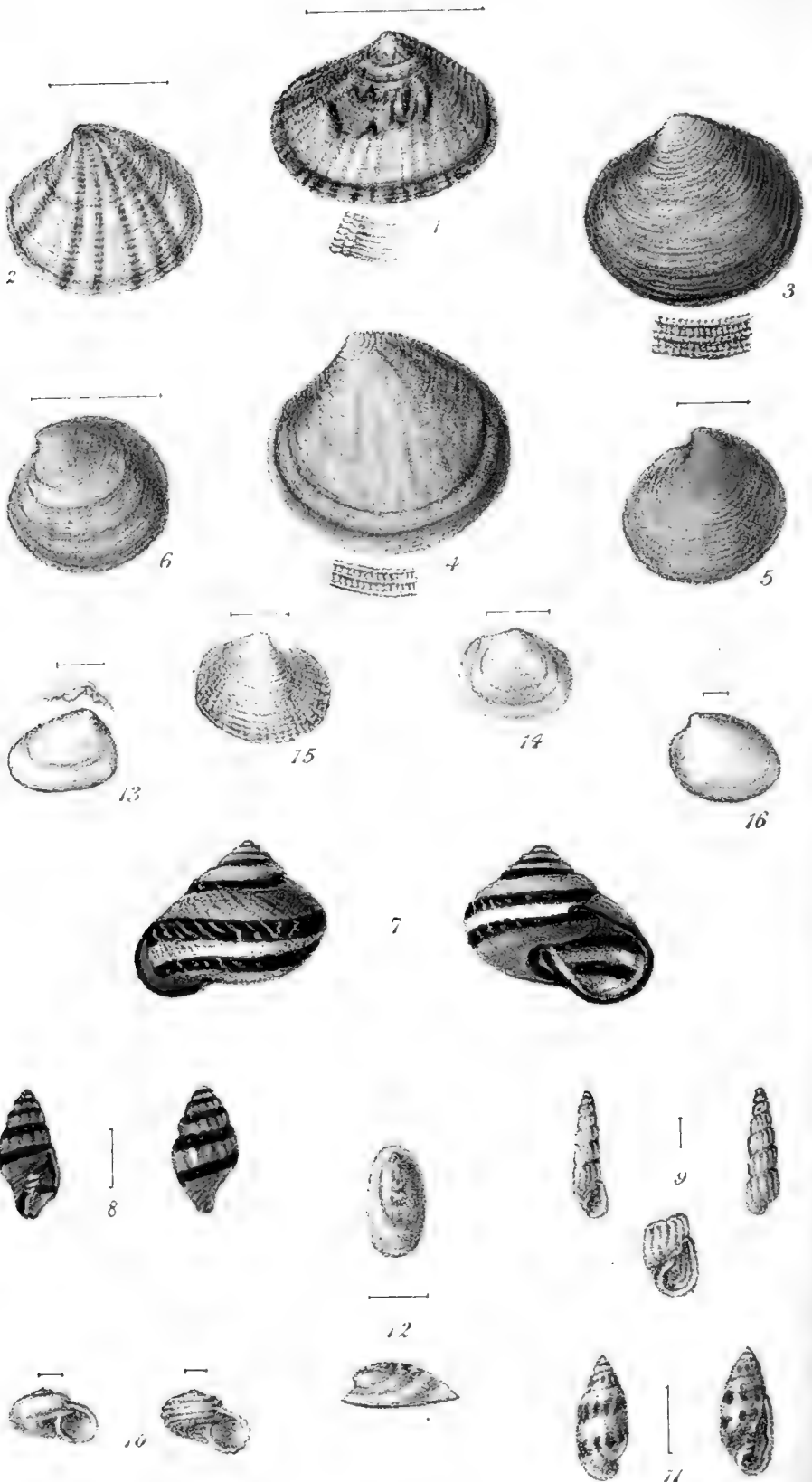
PLATE LII.

- Fig. 1. *Taxila fasciata*, n. sp., p. 832.
 2. *Adolias discipilota*, n. sp., p. 831.
 3. *Adolias parvata*, n. sp., p. 831.
 4. *Catophaga lagela*, n. sp., p. 838.
 5. *Pamphila masoni*, n. sp., p. 842.
 6. *Thamala miniata*, n. sp., p. 834.
 7. *Thaduka multicaudata*, n. sp., p. 836.
 8. *Deudorix suffusa*, n. sp., p. 834.

PLATE LIII.

- Fig. 1. *Tagiades meetana*, n. sp., p. 842.
 2. *Plesioneura aurivittata*, n. sp., p. 843.
 3. — *albifascia*, n. sp., p. 843.
 4. *Syntomis masoni* ♂, n. sp., p. 845.
 5. — *disrupta*, n. sp., p. 845.





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NEW SHELLS.

Hannhart imp.

- Fig. 6. *Syntomis albifrons*, n. sp., p. 845.
 7. *Dreata taoensis*, n. sp., p. 848.
 8. *Syntomis berinda*, n. sp., p. 845.
 9. *Potera marginata*, n. sp., p. 852.
 10. *Pitasila moolaica* ♂, n. sp., p. 847.
 11. *Hyperythra angulifascia*, n. sp., p. 851.
 12. *Omiza schistacea* ♂, n. sp., p. 851.

8. Descriptions of six Species of Bivalve Shells in the Collection of Mr. Sylvanus Hanley, F.L.S., and of a *Helix* from the Solomon Islands. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

(Plate LIV.)

SEMELE HANLEYI, n. sp. (Plate LIV. fig. 1.)

Shell transversely ovate, subequilateral, solid, cream-coloured, tinged with violet below the umbones, with narrow irregular descending white rays towards the base, with several zigzag purplish markings near the centre of the valves; sculptured all over with narrow prominent close-set, somewhat flattened, transverse ridges, which become rather sharp and irregular posteriorly and erectly scabrous at the margin, whilst radiating from the umbones close to the anterior dorsal margin are six close-set ribs, upon which the transverse ridges become nodulous at the points of intersection; umbones prominent, sharp, approximate; posterior dorsal margin nearly straight, anterior one very slightly incurved, ventral margin acute; dorsal area stained with deep purple; valves slightly gaping and flexuous posteriorly; interior of the valves yellow in the middle, stained with rays of violet and rose-colour.

Long. 11, alt. 8, lat. 4 lines.

Hab. Japanese seas (*Belcher*). Collection of Hanley.

A very charming shell; the sculpture of the anterior portion reminding one of certain species of *Psammobia*.

SEMELE APHRODITE, n. sp. (Plate LIV. fig. 2.)

Shell orbicular, nearly equilateral, rather thin, white, with the posterior half of the umbones tipped with rose-colour, from which descend four or five irregular bundles of more or less narrow, faint pink rays, which become a little deeper in colour at the lines of growth and near the base; concentrically sculptured with narrow, thread-like, somewhat distant lamellæ, the spaces between which are crossed with exceedingly fine, close-set, regular hair-like descending striæ; umbones rather tumid, sharp, approximate; dorsal margin posteriorly very slightly arched, anteriorly a little incurved; dorsal area freckled with a few reddish spots; ventral margin strongly arcuate.

Long. 7, alt. 6, lat. 3 lines.

Hab. China seas? (*Belcher*). Coll. Hanley.

An exquisitely sculptured species of great beauty, unique in the collection of Mr. Hanley.

✓ SEMELE ASPASIA, n. sp. (Plate LIV. fig. 3.)

Shell orbicularly ovate, nearly equilateral, subequivalve, moderately thin, yellowish white, concentrically very finely and regularly sculptured with close-set erect frilled laminae, the interstices being crossed by fine thread-like descending striæ that correspond to the undulations of the transverse frills; concentric ridges smooth and more distant at the umbones; interior of the valves very faintly tinged with flesh-colour.

Long. $12\frac{1}{2}$, alt. 10, lat. 6 lines.

Hab. —? In coll. Hanley.

This species differs from *S. phryne* in being thinner, more ovate, and less tumid in form, and in the transverse sculpture consisting of elegantly undulating frilled erect laminae, whilst the interstices between the descending striæ are not squares but narrow parallelograms.

✓ SEMELE PHRYNE, n. sp. (Plate LIV. fig. 4.)

Shell suborbicular, subequilateral, equivalve, somewhat tumid, solid, white, very finely regularly concentrically sculptured with close-set thread-like striæ, the interstices of which are crossed throughout by similar thread-like descending striæ, giving the surface of the valves a beautifully neat and regular reticulated appearance, excepting at the umbones, where the concentric ridges are more distant and the descending striæ finer and nearly obsolete; posterior side very slightly truncate and sinuate below, with a nearly obsolete flattened ridge extending upwards towards the umbo on the right valve; interior slightly tinged with flesh-colour towards the base.

Long. 15, alt. 14, lat. 8 lines.

Hab. —? In coll. Hanley.

A solid, white, somewhat tumid species, very regularly and finely latticed throughout, the interstices taking the exact form of minute squares.

✓ LUCINA CITRINA, n. sp. (Plate LIV. fig. 5.)

Shell quadrately orbicular, very inequilateral, equivalve, rather thin, primrose-yellow, paler towards the base, concentrically sculptured with very fine thread-like striæ, that become more distant as they approach the base; lunule very small, depressed; umbones tumid; beaks small, incurved; anterior side produced and somewhat flexuous above; interior of valves crenate at the edge, pale yellow.

Long. 4, alt. $3\frac{1}{2}$, lat. $2\frac{1}{2}$ lines.

Hab. —? Coll. Hanley.

A small species, of a peculiar primrose-yellow colour.

LUCINA ROSEA, n. sp. (Plate LIV. fig. 6.)

Shell elongately orbicular, equivalve, inequilateral, a little tumid,

moderately solid, whitish tinged with pale rose-colour towards the umbones; encircled by close-set, subgranular, spreading, flattened ridges, that become broader and closer towards the base; lunule large, triangular, convex; umbones tumid; beaks small, pointed, incurved; interior of valves pink, the edges crenate within.

Long. 8, alt. 8, lat. 5 lines.

Hab. Natal. In coll. Hanley.

In this pretty shell the sculpture of the valves approaches that of *L. pennsylvanica*; and, as in that species, small fragments of grit and shell are to be found lodging between the overlapping ridges.

HELIX BRENCHLEYI, n. sp. (Plate LIV. fig. 7.)

Shell imperforate, depressedly trochiform, rather thin, obliquely, irregularly, and obscurely striated, yellowish white, with two dark chocolate bands, thickly crossed with white diaphanous zigzag markings encircling the last whorl, the uppermost band the broadest; spire obtusely conical, apex white; whorls 5, flatly convex, sutures impressed, last whorl descending in front, base a little tumid anteriorly; aperture oblique, subrhomboidal; peristome very slightly thickened and expanded, and but little reflexed, the right margin moderately sinuated; columellar margin somewhat flattened and dilated, with a straight abrupt callus; the umbilical region and the inner edge of the lip with the reflected portion brown, immediately behind which is a band of pigment-like deposit of a brilliant orange-colour.

Diam. maj. 11, min. 9, alt. $6\frac{1}{2}$ lines.

Hab. Ysabel Island; Solomon Group. Collected by the late Mr. Brenchley.

A singular shell, having the orange colouring of *H. boivini* behind the outer lip, but differing from that species in its other characters.

9. Descriptions of ten Species of Marine Shells from the Province of South Australia. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

(Plate LIV.)

MITRA TATEI, n. sp. (Plate LIV. fig. 8.)

Shell ovately fusiform, solid, shining, ochraceous, with a broad deep-chocolate-coloured band next below the sutures, and a second similar band towards the lower part of the last whorl; whorls $5\frac{1}{2}$, stoutly and distantly longitudinally ribbed, the ribs becoming obsolete towards the base of the last whorl, which is encircled by three or four transverse ridges; aperture narrowly ovate; outer lip simple; columella 4-plaited.

Long. $3\frac{1}{2}$, lat. $1\frac{1}{2}$ lines.

Hab. Living, in two fathoms water, Surveyor's Point ; among shell-sand, Holdfast and Aldinga Bays and Salt Creek.

PARTHENIA GRACILIS, n. sp. (Plate LIV. fig. 9.)

Shell elongately turreted, moderately thin, white, regularly longitudinally ribbed, the interstices crossed with very fine hair-like striæ ; whorls $7\frac{1}{2}$, slightly convex, contracted above and below the sutures ; sutures strongly impressed ; aperture quadrately ovate ; outer lip subarcuate, slightly angled above ; inner lip with a single sharp tooth about the middle of the columella.

Alt. $2\frac{1}{2}$, diam. $\frac{1}{2}$ line.

Hab. Shell-sand, Glenelg, St. Vincent's Gulf.

CYCLOSTREMA TATEI, n. sp. (Plate LIV. fig. 10.)

Shell widely and deeply umbilicated, orbicular, depressedly turbinated, moderately thin, under the lens very finely transversely striated, shining pearly white ; whorls 4, rounded, flattened and slightly excavated next below the suture, with one, or sometimes two, narrow thread-like keels at the upper part, and strongly keeled round the umbilical region ; sutures distinct ; apex rounded, obtuse ; aperture subcircular ; lip simple.

Diam. maj. $1\frac{1}{4}$, min. 1, alt. $\frac{3}{4}$ line.

Hab. Shell-sand, Holdfast Bay ; found alive in the estuary of the Sturt.

The above is the normal condition of the species ; but examples occur which are thinner and have a greater number of keels, sometimes as many as seven or eight. At first I was inclined to regard the many-keeled variety as specifically distinct ; but on the examination of a large series by Professor Tate, he assures me that the number of keels varies so greatly that it would be impossible to separate them. The thin hyaline examples with many keels are probably younger shells.

BUCCINULUS INTERMEDIUS, n.sp. (Plate LIV. fig. 11.)

Shell elongately ovate, solid, shining, white, painted with two bands of irregular descending brown flames and spots ; spire acuminate, pointed at the apex, the same length as the aperture ; whorls $6\frac{1}{2}$, encircled by numerous grooved and finely punctured striæ, that become obsolete on the centre of the last whorl ; sutures strongly impressed ; outer lip simple, thin, non-arcuate ; columella with a strong bilobed fold near the base, and a smaller projecting plate above it ; inner lip with a broad spreading callus.

Long. $4\frac{1}{2}$, lat. $1\frac{1}{2}$ line.

Hab. Aldinga Bay.

This, the only species of *Buccinulus* as yet discovered in South Australia, is allied to *B. affinis*, A. Ad., from New South Wales, from which it differs somewhat in form, and also in the style of coloration.

NACELLA PARVA, n. sp. (Plate LIV. fig. 12.)

Shell depressedly conical, cap-shaped, semipellucid, nearly smooth,

or with very fine concentric lines of growth, pale horn-colour, with a single row of pale blue spots and crescent-shaped opaque markings extending from the apex centrally, more or less along the outer arc of the shell; apex anterior, recurved, submarginal; aperture narrowly ovate, margin simple, entire; interior pearly white, shining.

Diam. maj. 3, min. $1\frac{1}{2}$, alt. 1 line.

Hab. Holdfast Bay and Aldinga Bays; parasitic on seaweed.

MYSELLA DONACIFORMIS, n. sp. (Plate LIV. fig. 13.)

Shell quadrately cuneate, moderately solid, equivalve, very inequilateral, subventricose, compressed towards the base, white, shining, finely concentrically ridged; dorsal margin slightly arcuate posteriorly, short and abruptly descending anteriorly; ventral margin a little convex; umbones somewhat tumid; beaks distinct, incurved, approximate.

Long. 3, alt. 2, lat. 1 line.

Hab. Holdfast and Aldinga Bays, St. Vincent's Gulf.

In the 'Proceedings' of this Society for 1877, page 176, I gave the diagnosis of the genus *Mysella*, for the reception of a small bivalve from Port Jackson, which I described as *Mysella anomala*. I have subsequently received from Professor Tate one or two examples of the same species from South Australia, together with a second form of the genus, of a more cuneate shape than the type, now described above as *M donaciformis*.

LEPTON AUSTRALIS, n. sp. (Plate LIV. fig. 14.)

Shell quadrately orbicular, compressed, equivalve, nearly equilateral, thin, very slightly gaping at the sides, white, very finely concentrically striated; dorsal margin arched, ventral margin nearly straight; beaks small, produced and acute.

Long. 4, alt. 3, lat. $\frac{1}{2}$ line.

Hab. Glenelg, and Port Creek.

Belonging to the typical form of the genus, with the surface of the valves finely striated but not shagreened.

LUCINA (CODAKIA) TATEI, n. sp. (Plate LIV. fig. 15.)

Shell quadrately ovate, subventricose, moderately solid, subequilateral, white, concentrically ridged, the ridges closer near the umbones, and more distant towards the base, and crossed on both sides with radiating ribs, that become slightly nodulous at the intersections; dorsal margin deeply excavated in front, nearly straight and rapidly descending behind; ventral margin arcuate, rounded in front, forming an obtuse angle where it joins the dorsal excavation; umbones very acute, incurved and approximate.

Long. 4, alt. 3, lat. $1\frac{3}{4}$ lines.

Hab. East side of St. Vincent's Gulf, and Cape Northumberland.

This little species is quite distinct from *L. quadrata*, Angas (P. Z. S. 1877, p. 176), from Port Jackson, although of a somewhat similar form.

NUCULA MICANS, n. sp. (Plate LIV. fig. 16.)

Shell minute, obliquely and triangularly ovate, subventricose, very inequilateral, moderately solid, white, shining, very finely concentrically striated, the striæ occasionally running into each other; dorsal margin somewhat arched posteriorly, short and descending in front; ventral margin moderately arcuate; umbones tumid, smooth, pearly, and approximate.

Long. 1, alt. $\frac{3}{4}$, lat. $\frac{1}{2}$ line.

Hab. Shell-sand, Salt Creek; Glenelg, St. Vincent's Gulf.

Somewhat allied to *Nucula pusilla*, Ang. (P. Z. S. 1877, p. 177), from Port Jackson, but possessing a different style of sculpture.

EXPLANATION OF PLATE LIV.

- Fig. 1. *Semele hanleyi*, p. 859.
 2. — *aphrodite*, p. 859.
 3. — *aspasia*, p. 860.
 4. — *phryne*, p. 860.
 5. *Lucina citrina*, p. 860.
 6. — *rosea*, p. 860.
 7. *Helix brenchleyi*, p. 861.
 8. *Mitra tatei*, p. 861.

- Fig. 9. *Parthenia gracilis*, p. 862.
 10. *Cyclostrema tatei*, p. 862.
 11. *Buccinulus intermedius*, p. 862.
 12. *Nacella parva*, p. 862.
 13. *Mysella donaciformis*, p. 863.
 14. *Lepton australis*, p. 863.
 15. *Lucina (Codakia) tatei*, p. 863.
 16. *Nucula micans*, p. 864.

10. A List of additional Species of Marine Mollusca to be included in the Fauna of the Province of South Australia; with Notes on their Habitats and Local Distribution.
 By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received September 19, 1878.]

In the year 1865 I published in the 'Proceedings' of this Society a list of all the species of marine Mollusks that had been met with on the shores of the Province of South Australia up to that date, numbering about 231 Gasteropods and 97 Conchifera. Since that period other species have come to light, several of them hitherto only known as inhabiting the New-South-Wales and Tasmanian seaboard; whilst others have proved to be new to science, and have been described by me recently. I am indebted to Professor Ralph Tate and Mr. W. T. Bednall, of Adelaide, for several interesting additions to my list—which includes 54 Gasteropoda, and 21 Conchifera, &c., hitherto unrecorded as occurring in South Australia, thus making a grand total of 403 species.

GASTEROPODA.

1. MUREX ANGASI.

Typhis angasi, Crosse, Journ. de Conch. 1863, p. 86, pl. 1. fig. 2, Port Lincoln (*Bednall*).

2. TRITON (EPIDROMUS) BEDNALLI.

Triton bednalli, Brazier, Proc. Linn. Soc. N. S. W. 1875, p. 6. Guichen Bay (*Bednall*).

3. COMINELLA LACTEUM.

Buccinum lacteum, Reeve, Conch. Icon. pl. 14. fig. 117.
Port Elliot and Port Wallaroo (*Stansbury*).

4. NASSA JACKSONIANA.

Buccinum jacksonianum, Kiener, Mon. Bucc. pl. 19. fig. 73.
Holdfast and Aldinga Bays (*Bednall*); also Port Jackson.

5. NASSA INTERMEDIA.

Nassa intermedia, Dunker, 'Novara' Exp. Moll. tab. 1. fig. 2.
Port Lincoln (*Bednall*); also Port Jackson.

6. AMALDA MARGINATA.

Ancillaria marginata, Lam., Reeve, Conch. Icon. pl. 3. fig. 8.
Port Lincoln; South Coast (*Bednall*). Also Tasmania and New
South Wales.

7. MELO MILTONIS.

Melo miltonis, Gray, Grif. An. King. (1833).
Fowler's Bay, to the westward of Port Lincoln.

8. MITRA PICA.

Mitra pica, Reeve, P. Z. S. 1845; Conch. Icon. pl. 31. fig. 247.
Port Elliot; Kangaroo Island (*Bednall*).

9. MITRA LINCOLNENSIS.

Mitra lincolnensis, Angas, P. Z. S. 1878, p. 313, pl. 18. figs.
10, 11.
Port Lincoln, Semaphore Beach; and Salt Creek.

10. MITRA SCHOMBURGKI.

Mitra schomburgki, Angas, P. Z. S. 1878, p. 313, pl. 18. figs.
12, 13.
St. Vincent's Gulf.

11. MITRA TATEI.

Mitra tatei, Angas, P. Z. S. 1878, pl. 54. fig. 8.
Found alive in two fathoms of water, Surveyor's Point; among
shell-sand, Holdfast and Aldinga Bays, and Salt Creek (*Tate*).
For *Columella dernestoides*, Kien. (No. 65 in my first list), read
C. lineolata, Pease. Port Lincoln and Port Elliot.
For *Columella interrupta*, Angas (specific name preoccupied),
read *C. angasi*, Brazier. York's Peninsula.

12. MARGINELLA VOLUTIFORMIS.

Marginella volutiformis, Sow. Thes. Conch.
Macdonnell Bay (*Tate*).

13. MARGINELLA TURBINATA.

Marginella turbinata, Sow. Thes. Conch.
Macdonnell Bay; also New S. Wales.

14. CRYPTOSPIRA CYMBALUM.

Cryptospira cymbalum, Tate, Proc. Adelaide Phil. Soc. 1878.
Aldinga. Like *C. ovulum*, with eight plaits on the pillar.

15. HYALINA ALBIDA.

Hyalina albida, Tate, Proc. Adelaide Phil. Soc. 1878.
Marino. Very narrow and white.

16. ERATO BIMACULATA.

Erato bimaculata, Tate, Proc. Adelaide Phil. Soc. 1878.
Minute, yellowish white, with a red spot at each end of aperture.

17. NATICA MAROCHIENSIS.

Natica marochiensis, Lam., Reeve, Conch. Icon. pl. 13. fig. 52.
Very small specimens, living in St. Vincent's Gulf. Subfossil in
the Port-Adelaide-Creek limestone (*Tate*).

18. SCALA FRIABILIS.

Scalaria friabilis, Sow., Reeve, Conch. Icon. pl. 7. fig. 52.
Port Lincoln; also Swan River.

19. SCALA (OPALIA) AUSTRALIS.

Scalaria australis, Lam., Sow. Thesaurus, pl. 35. fig. 135.
Aldinga Bay (*Bednall*); also New S. Wales.

20. TEREBRA BRAZIERI.

Terebra brazieri, Angas, P. Z. S. 1871, pl. 1. fig. 15.
Port Elliot (*Bednall*); Brisbane Water, New S. Wales.

21. TEREBRA USTULATA.

Terebra ustulata, Desh. P. Z. S. 1859, p. 294.
Fowler's Bay; Port Elliot (*Stansbury*). Also Tasmania.

22. OBELISCUS BRUNNEA.

Obeliscus brunnea, A. Ad., Sow. Thesaurus, pl. 171. fig. 35.
Syrnola brunnea, A. Ad. P. Z. S. 1862, p. 233.
Port Lincoln.

23. SYRNOLA TINCTA.

Syrnola tincta, Angas, P. Z. S. 1871, pl. 1. fig. 11.
St. Vincent's Gulf; also Port Jackson.

24. ODOSTOMIA EBURNEA.

Odostomia eburnea, Metcalfe, M.S. in Brit. Mus.
Holdfast Bay (*Tate*).
A very small, ovate, ivory-white species.

25. *PARTHENIA GRACILIS*.
Parthenia gracilis, Angas, P. Z. S. 1878, pl. 54. fig. 9.
 Shell-sand, Holdfast Bay (*Tate*).
26. *TURBONILLA ACICULARIS*.
Turbonilla acicularis, A. Adams.
 St. Vincent's Gulf (*Tate*).
27. *TURBONILLA FUSCA*.
Turbonilla fusca, A. Adams.
 Holdfast and Aldinga Bays; Port Lincoln (*Tate*).
28. *TURBONILLA HOFMANI*.
Turbonilla hofmani, Angas, P. Z. S. 1877, p. 183.
T. nitida, Angas, P. Z. S. 1867, p. 112 (name preoccupied by A. Adams: *T. nitida*, from Japan, Ann. Nat. Hist., vi. p. 419 (1860)).
T. angasi, Tenison-Woods, Proc. Roy. Soc. Tasmania, Mar. 13, 1877.
 Holdfast and Aldinga Bays (*Tate*); also Port Jackson.
29. *TRIVIA AUSTRALIS*.
Cypræa australis, Lam.; Sow. Conch. Illus. fig. 29.
 Fowler's Bay; Cape Northumberland (*Tate and Bednall*). Also New-South-Wales coast.
30. *DIALA IMBRICATA*.
Diala imbricata, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1862.
 Shell-sand, Glenelg and Aldinga Bay (*Tate*).
31. *DIALA VARIA*.
Diala varia, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1861.
 Between tide-marks, under stones, Aldinga Bay (*Tate*).
32. *DIALA PICTA*.
Diala picta, A. Adams, Ann. & Mag. Nat. Hist. Oct. 1861.
 St. Vincent's Gulf; and Wallaroo, Spencer's Gulf (*Tate*).
33. *RISSOINA NIVEA*.
Rissoina nivea, A. Adams, P. Z. S. 1851, p. 265.
 Port Lincoln.
34. *TROCHITA CALYPTRÆFORMIS*.
Trochus calyptræformis, Lam. Anim. sans Vert. vii. p. 627.
Crepidula tomentosa, Quoy et Gaim.
 On *Pinnæ*, Holdfast and Aldinga Bays (*Bednall*). Also New S. Wales.
35. *TRIPHORIS SCITULUS*.
T. scitulus, A. Adams.
 St. Vincent's Gulf (*Bednall*).

36. AMATHINA TRICARINATA.

Amathina tricarinata, Gray, Woodward's Manual, pl. 11. fig. 19.
Found dead on the beach at Port Lincoln.

37. CYCLOSTREMA TATEI.

Cyclostrema tatei, Angas, P. Z. S. 1878, pl. 54. fig. 10.
Shell-sand, Holdfast Bay; alive in the estuary of the Sturt (*Tate*).

38. SCHISMOPE ATKINSONI.

Scissurella atkinsoni, Tenison-Woods, Proc. Roy. Soc. Tasmania, 1876.

Holdfast and Aldinga Bays (*Tate*).

39. FISSURELLIDÆA SCUTELLA.

Fissurella scutella, Gray, Brit.-Mus. Cat. (*Fissurella*), No. 42; Sow. Thes. Conch. pl. 9. fig. 207 (*Trapezina*).

Guichen and Holdfast Bays (*Bednall*). Also Tasmania, New South Wales, and Cape of Good Hope.

40. MACROSCHISMA TASMANIÆ.

M. tasmaniæ, Gray.

South-east coast (*Bednall*); Tasmania (*T. Woods*).

Emarginula tasmaniæ, Sow., and *E. tenuicostata*, Sow., are regarded, and, I believe, rightly, by Rev. Tenison-Woods as varieties of *E. rugosa* of Quoy and Gaimard.

41. EMARGINULA DILECTA.

E. dilecta, A. Adams, P. Z. S. 1851.

St. Vincent and Spencer's Gulfs.

42. NACELLA PARVA.

Nacella parva, Angas, P. Z. S. 1878, pl. 54. fig. 12.

Holdfast and Aldinga Bays, parasitic on seaweed (*Tate*).

43. DENTALIUM OCTAGONUM?

D. octagonum, Lam.

Henley Beach.

44. CADULUS ACUMINATUS?

C. acuminatus, Desh., M.S. in coll. Cuming.

Holdfast and Aldinga Bays (*Tate*); also Port Jackson.

45. LEPIDOPLEURUS ANTIQUUS.

L. antiquus, Reeve, Conch. Icon. pl. 25. fig. 169.

Aldinga Bay, and Marina (*Bednall*); also Port Jackson.

46. CHITON SICULOIDES.

Chiton siculoïdes, Carpenter.

Port Lincoln (*Bednall*).

47. BUCCINULUS INTERMEDIUS.

B. intermedius, Angas, P. Z. S. 1878, p. 869, pl. 54. fig. 11.
Aldinga Bay (*Tate*).

48. TORNATINA FUSIFORMIS.

T. fusiformis, A. Ad., Sow. Thes. Conch. pl. 121. fig. 37.
Glenelg Beach (*Bednall*); also Port Jackson and Port Stephen,
New S. Wales.

49. VOLVULA ROSTRATA.

V. rostrata, A. Adams, Sow. Thes. Conch. pl. 125. fig. 154.
Holdfast Bay (*Tate*).

50. CYLICHNA PYGMÆA.

C. pygmæa, A. Adams, Sow. Thes. Conch. pl. 125. fig. 150.
Holdfast Bay (*Tate*).

51. ATYS EXIGUA.

Alys exigua, A. Adams, Sow. Thes. Conch. pl. 125. fig. 129.
Holdfast Bay (*Tate*).

52. ALEXIA MERIDIONALIS.

A. meridionalis, Brazier, M.S.
Port-Adelaide Creek (*Bednall*).

53. MARINULA XANTHOSTOMA.

M. xanthostoma, H. & A. Adams, P. Z. S. 1854, p. 35.
York's Peninsula, Aldinga, &c. (*Bednall*).

54. SIPHONARIA ALBIDA.

Siphonaria albida, Angas, P. Z. S. 1878, p. ³¹⁴869, pl. 18. figs. 14, 15.
Port Lincoln.

CONCHIFERA.

55. HUMPHREYIA STRANGEL.

Aspergillum strangei, A. Adams, P. Z. S. 1852, p. 91, pl. 15. fig. 5.
St. Vincent's Gulf (*Bednall*). Also Port Jackson, New S. Wales
(*Angas*); Tasmania (*T. Woods*).

56. GASTROCHÆNA TASMANICA.

G. tasmanica, Tenison-Woods.
Burrowing in limestone forming the bed of Port-Adelaide Creek ;
also on *Chamæ*; and in the incrustated growth of *Pinnæ*, St. Vincent's
Gulf (*Tate*).

57. CORBULA NASUTA.

Corbula nasuta, Sow. P. Z. S. 1833, p. 35.
Holdfast and Aldinga Bays (*Tate*); also New S. Wales.

58. DONAX SORDIDUS.

D. sordida, Reeve, Conch. Icon. pl. 4. fig. 32.

Port Lincoln.

59. MYSELLA ANOMALA.

Mysella anomala, Angas, P. Z. S. 1877, p. 176, pl. 26. fig. 22.

Holdfast and Aldinga Bays (*Tate*); also Port Jackson, New S. Wales.

60. MYSELLA DONACIFORMIS.

Mysella donaciformis, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 13.

St. Vincent's Gulf (*Tate*).

61. TAPES FLABAGELLA.

Tapes flabagella, Desh., Reeve, Conch. Icon. pl. 13. fig. 66.

Aldinga and Holdfast Bays (*Tate*); also New South Wales.

62. CHIONE (MARCIA) LÆVIGATA.

Venus lævigata, Sow. Thes. Conch. pl. 159. figs. 156-8.

Port-Adelaide Creek (*Bednall*). New S. Wales, Victoria, and Tasmania.

63. TIVELA UNDULOSA.

Venus undulosa, Lam. Anim. sans Vert. vi. p. 370.

Venus variabilis, Sow. Thes. Conch. *Venus*, pl. 158. figs. 142-6.

Semaphore Beach, Guichen Bay, and Port Lincoln (*Bednall*).

64. CARDIUM PULCHELLUM.

C. pulchellum, Reeve, Conch. Icon. pl. 8. fig. 42.

Dredged in St. Vincent's Gulf (*Tate*); also Port Jackson and Tasmania. (Very small specimens.)

65. LUCINA TATEI.

Lucina (Codakia) tatei, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 15.

East side of St. Vincent's Gulf, and Cape Northumberland (*Tate*).

66. LORIPES OVUM.

Lucina ovum, Reeve, Conch. Icon. pl. 5. fig. 21.

Holdfast Bay and Salt Creek (*Tate*); also Botany Bay, New S. Wales.

67. LASEA AUSTRALIS.

Poronia australis, Souv. Journ. de Conch. 1863, pl. 12. fig. 8.

Under stones, Aldinga and Holdfast Bays, Cape Northumberland, and Wallaroo. Common in Tasmania, and also in New S. Wales.

68. LEPTON AUSTRALIS.

Lepton australis, Angas, P. Z. S. 1878, p. 863, pl. 54. fig. 14.

Glenelg and Port Creek (*Tate*).

69. CRENELLA BARBATA.

Modiolaria barbata, Angas, P. Z. S. 1867, p. 911, pl. 44. fig. 12.
St. Vincent's Gulf &c.; also Botany Bay, New S. Wales.

70. TRIGONIA MARGARITACEA.

Trigonia margaritacea, Lam., Reeve, Conch. Icon. pl. 1. fig. 3.
Port Lincoln; dead valves washed upon Semaphore Beach (*Bednall*).
Also Tasmania.

71. PECTUNCULUS LATICOSTATUS.

P. laticostatus, Quoy et Gaim. Voy. de l'Astrol.; Reeve, Conch. Icon. pl. 2. fig. 8 a, b.
Cape Jervis; and Hallet's Cove, St. Vincent's Gulf (*Tate*); Badger Island, Bass's Straits (*Tate*). New Zealand.

72. LIMOPSIS MACGILLIVRAYI.

Limopsis macgillivrayi, A. Ad. in Coll. Cuming.
Guichen Bay (*Bednall*). Semifossil at McDonnell Bay (*Tate*).

73. NUCULA MICANS.

Nucula micans, Angas, P. Z. S. 1878, p. 864, pl. 54. fig. 16.
Shell-sand, St. Vincent's Gulf (*Tate*).

74. PLACUNANOMIA (MONIA) IONE.

Placunanomia ione, Gray, P. Z. S. 1849, p. 123.
Henley Beach; Marino (*Bednall*). Common in New South Wales.

75. KRAUSSIA LAMARCKIANA.

Kraussia lamarckiana, Davidson, P. Z. S. 1852, p. 80, pl. 14.
figs. 22, 23.
St. Vincent's Gulf (*Tate*). Common in N. S. Wales and Tasmania,
also New Zealand.

11. Notes on *Myxopoda aurita*, Miln.-Edw.

By G. E. DOBSON, M.A., M.B., &c.

[Received October 21, 1878.]

Among the many valuable specimens lately added to the collection of the Muséum d'Histoire Naturelle at Paris, perhaps the most remarkable is that of a very peculiar species of Bat from Madagascar, described by M. Alphonse Milne-Edwards¹ under the appropriate name of *Myxopoda*² *aurita*.

During a short visit to Paris last month I was enabled, through the kindness of M. Milne-Edwards, to examine the type of this most interesting species, of which the following is a description.

¹ In Bull. Soc. Philom. de Paris, June 22, 1878.

² *μύξα*, mucus; *πὸς*, pes.

Crown of the head but slightly raised above the face-line; muzzle obliquely truncated, in general form closely resembling that of the species of the genus *Chilonycteris*; for the nostrils open widely apart by similar circular sharply defined margins, and the lower lip is also papillate and reflected outwards, though not so broadly, and it has not a thin free margin; the obtuse extremity of the rather long muzzle projects in front considerably beyond the lower lip. Ears very large, much longer than the head, in general outline like those of *Vespertilio murinus*; but the inner margin commences in a small lobe projecting downwards; in the usual position of the tragus, or slightly in front of it, there is an irregularly square lobe continuous above with the keel of the ear-conch; opposite this, on the outer side of the concave surface of the conch, is a mushroom-shaped process consisting of a short stalk supporting a broad flat reniform expansion; the outer margin of the conch terminates near the angle of the mouth.

Thumb with an ill-developed claw; but the whole of the inferior surface of its metacarpal and phalangeal bones supports a large flat horseshoe-shaped pad, more than 0^o.2 inch in diameter, of which the circular margin is directed forwards and slightly notched in front; this pad, though considerably larger than that occupying the same position in *Thyroptera tricolor*, does not form nearly so perfect a clinging-organ as in that species; for it is quite sessile, without a trace of a peduncle, and its surface is flat, like the thumb-pad of *Vesperugo pachypus*, with which it is evidently homologous. The feet have also adhesive pads; but, while resembling closely those of the thumbs in structure and external form, they differ in being much smaller, and so agree rather with those of *Thyroptera tricolor* than with *Vesperugo pachypus*.

The metacarpal bone of the index finger is well developed, being nearly as long as that of the third finger, but there are no distinct phalanges; the third finger has three phalanges, of which the first and second are nearly equal in length.

The tail projects beyond the posterior margin of the interfemoral membrane as in *Thyroptera tricolor*, but to a much greater extent, the free portion being nearly equal to the tibia in length; the calcanea are almost as long as the tibiæ; the very narrow post-calcaneal lobe is notched or toothed near the foot.

As in *Thyroptera tricolor*, the toes are united as far as the base of the claws, and have each two phalanges, and the wing-membrane extends almost to the base of the claws.

Dentition.—Inc. $\frac{2-2}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$.

Upper incisors short, in pairs, placed close to the canines; the outer incisor, on each side, small, conical, and acutely pointed, but much larger than the inner one, which lies close to it and is hardly visible without the aid of a lens; lower incisors short and blunt, in the direction of the jaws; first and second upper premolars very short, the third exceeding the molars in vertical extent; second lower premolar minute, in the tooth-row, the first premolar slightly

smaller than the third; molars acutely tubercular, with W-shaped cusps.

Length (of the type specimen, an adult male), head and body 2''·3; tail 1''·9, tail free from membrane 0''·6; head 0''·85; ear 1''·3, tragus 0''·25; forearm 1''·85; thumb 0''·3; third finger—metacarp. 1''·5, 1st ph. 0''·7, 2nd ph. 0''·75, 3rd ph. 0''·55; fifth finger—metacarp. 1''·5, 1st ph. 0''·5, 2nd ph. 0''·5; tibia 0''·7; calcaneum 0''·6; foot 0''·3.

Certain peculiarities in the structure of this very remarkable species recall similar peculiarities in *Thyroptera tricolor*, and have evidently resulted from adaptation to the same purpose. Thus in these two species alone are the toes united to the base of the claws, and in them alone, among all known species of Bats (except the *Phyllorhininæ*), have the toes an equal number of phalanges; they also, in the possession of a third phalanx in the middle finger, differ from all the species of Vespertilionidæ, and from those of the allied families. This species, however, differs remarkably from *Thyroptera tricolor* in the structure of the adhesive disks, in the presence of a well developed metacarpal bone of the second finger, in the form of the head and ears, and in dentition, and must undoubtedly be considered the type of a distinct genus of Vespertilionidæ.

As remarked above, the adhesive pads are evidently less perfect as clinging-organs than the corresponding parts in *Thyroptera tricolor*, and occupy, in this respect, an intermediate position between those of that species and of *Vesperugo pachypus*.

It is probable that this species (in common with the few other species of Bats provided with such accessory clinging-organs) uses the adhesive pads in sustaining its hold on the smooth hard stems and leaves of palms and of other hard-wooded trees¹.

12. Notes on recent Additions to the Collection of Chiroptera in the Muséum d'Histoire Naturelle at Paris, with Descriptions of New and Rare Species. By G. E. DOBSON, M.A., M.B., &c.

[Received October 28, 1878.]

Through the kindness of M. Alphonse Milne-Edwards I have lately been permitted to examine and describe the valuable additions to the collection of Chiroptera in the Muséum d'Histoire Naturelle, made by various collectors since my last visit to Paris in 1876.

The collections, from which the specimens which form the subject matter of this paper were derived, were made chiefly in the islands of New Guinea and New Caledonia, in Siam, in Africa and Madagascar, and in Central America. The species may therefore

¹ See my 'Catalogue of the Chiroptera in the Collection of the British Museum,' p. 444; also 'Nature,' vol. xviii. p. 585.

be conveniently arranged for description and remarks under the heads of the four zoological regions thus represented.

1. *Australian Region.*

PTEROPUS GERMAINI, n. sp.

Ears shorter than the muzzle, concealed by the long fur of the head, triangular, obtusely pointed, thinly clothed throughout with soft hairs. Fur long and woolly, like that of *Pt. aneiteanus*; on the back long like that of the head, directed backwards. Humerus and forearm rather thinly covered with straight fur, like that of the back. The legs are clothed with long fur which extends to the backs of the feet; the margin of the wing membrane above, almost as far outwards as the extremity of the fifth finger, is clothed with straight appressed hairs; the posterior margin of the narrow interfemoral membrane is quite concealed.

Face in front of and immediately above the eyes light greyish brown; head and the whole inferior surface of the body dark blackish brown, interspersed with several shining greyish hairs, the shoulders and back darker, the rump and legs greyer; upper surface of the neck and shoulders pale yellow, with reddish extremities.

Teeth simple, like those of *Pt. medius*; the first upper premolar small, scarcely raised above the level of the gum, and occupying the centre of the small space between the canine and second premolar; last upper molar slightly larger than the first lower premolar, and about the size of the last lower molar.

Length (of a not quite adult ♀), head and body about 6"; head 2".3; ear 0".8; forearm 4".7; thumb 2".3; third finger—metacarp. 3", 1st ph. 2".5, 2nd ph. 3".5; fifth finger—metacarp. 3", 1st ph. 1".5, 2nd ph. 1".35; tibia 2".2; foot 1".7.

Hab. New Caledonia.

This species resembles externally, to some extent, *Pt. aneiteanus*; but the very different form of the teeth at once distinguishes it. From *Pt. vetulus*, inhabiting the same islands, it is distinguished by the completely different colour of the fur, as well as by the absence of transverse basal ridges in the molars and premolars.

The food of this species appears to consist, in part at least, of figs, as I found portions of these fruits in the mouth of the typical specimen.

At the request of M. Milne-Edwards, who pointed out to me this new species, I have much pleasure in connecting with it the name of its discoverer, M. Germain.

PTEROPUS VETULUS, Jouan.

Besides the type, the Museum possesses several specimens of this species, both male and female, from New Caledonia. These all more or less resemble the type specimen in the colour and distribution of the fur; and the few differences observable are unimportant.

Hab. New Caledonia; Loyalty Isles.

PTEROPUS KERAUDRENI, Quoy & Gaimard.

The specimens in the collection from New Caledonia have the face, back, and inferior surface of the body of a much darker colour than is usually observed in specimens of this species from other localities, and they agree in this respect closely with the types of *Pteropus vanicorensis*, Q. & G., which, as I have indicated in my 'Catalogue of the Chiroptera,' is evidently a variety only of *Pt. keraudreni*.

Hab. New Caledonia, and most other islands of the Polynesian subregion. (See my 'Catalogue of Chiroptera,' p. 64.)

PTEROPUS HYPOMELANUS, Temminck.

Several specimens of this species were obtained by M. Laglaize at Amberbaki, New Guinea.

CYNOPTERUS SCHERZERI (Fitzinger).

Several specimens of this species, labelled "N. Guinée, M. Laglaize." With the exception of that very aberrant form *Cynopterus latidens*, described by me from a specimen from Morty Island, this is the first instance of any species of this genus extending beyond the Oriental region. It is strange that this species should extend from the Nicobar Islands to New Guinea; and it is just possible that some mistake may have been made by the collector when labelling the specimens.

HARPYIA CEPHALOTES, Pallas.

An adult specimen from New Guinea, collected by M. Raffray. This is the first example of this species obtained in the above-named locality.

CEPHALOTES MINOR, n. sp.

Not half the size of adult specimens of *C. peroni*, but closely resembling that species in general structure. The wing-membrane is similarly attached only to the central line of the back along the spine, and is also naked from the shoulders backwards; the head and muzzle are of the same shape as in the larger species; but the ears are less pointed.

The feet are much smaller than in very young specimens of *C. peroni*; and the wing-membrane is attached to the outer toe, not to the space between the toes as in that species; it also extends further outwards, terminating opposite the second joint of the next toe.

The teeth are also slightly different: the upper incisors are wider apart; the second upper premolar has not the prominent antero-internal basal cusp observed in *C. peroni*; and the first lower premolar scarcely rises above the gum.

The following Table exhibits the comparative measurements of this species and of *C. peroni*:—

	<i>C. minor.</i>	<i>C. peronii.</i>
Length, head and body	4·5	6·0
„ tail	0·6	1·3
„ head	1·6	2·0
„ ear	0·7	1·0
„ forearm	3·2	5·3
„ first finger	1·3	1·5
„ third finger, metacarp.	2·0	3·1
„ „ „ 1st ph.	1·5	2·35
„ „ „ 2nd ph.	1·9	3·4
„ fifth finger, metacarp.	2·0	2·8
„ „ „ 1st ph.	1·1	1·7
„ „ „ 2nd ph.	1·1	1·8
„ tibia	1·1	2·3
„ calcaneum	0·25	0·5
„ foot	0·8	1·2

Hab. Amberbaki, New Guinea.

PHYLLORHINA TRICUSPIDATA, Temminck.

Several specimens obtained by M. Raffray in New Guinea. This is the first recorded instance of this species having been found in that country, which, however, it might be expected to inhabit, as it has been noted from Batchian, Amboyna, Morty, and Duke-of-York Island.

PHYLLORHINA CERVINA, Gould.

Examples of this species from New Guinea, collected by M. La-glaize.

NYCTOPHILUS TIMORIENSIS.

Nyctophilus timoriensis (Geoffroy), Dobson, Catal. Chiropt. p. 172 (1878).

Specimens from New South Wales collected by M. de Castelnau.

SCOTOPHILUS TEMMINCKII.

Vespertilio temminckii, Horsfield, Zool. Researches in Java (1824).

Scotophilus temminckii, Gray; Peters; Dobson, Monograph Asiat. Chiropt. p. 258 (1876).

Specimens of this very abundant and widely distributed species from Celebes, collected by M. de la Savinière.

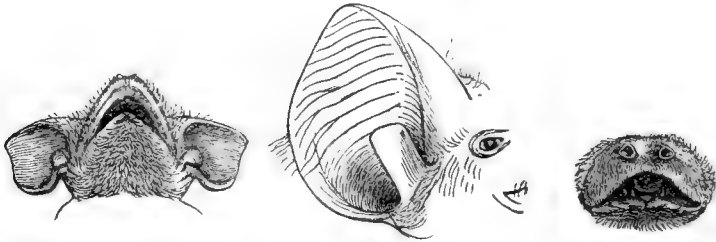
VESPERTILIO ADVERSUS, Horsfield.

Specimens of this species, which extends from Siam to South Australia, have been sent from New Guinea by M. Laglaize.

EMBALLONURA RAFFRAYANA, n. sp.

Slightly larger than *E. nigrescens* from the same region, and

agreeing with that species in the comparatively widely separated nostrils, but resembling the species of the other section of the genus in the projecting extremity of the muzzle, which extends considerably beyond the lower lip; the ears also are much broader, and the upper third of the outer margin of the conch is convex, not concave; the tragus is comparatively shorter and much broader, attaining its



Emballonura raffrayana.

greatest breadth above, where it is so broadly rounded off so as to appear abruptly truncated; the outer and inner margins are straight or faintly concave.

Wings from the ankles or from the tarsi; feet much larger than in *E. nigrescens*; calcanea about two thirds the length of the tibiae.

Fur above dark-brown, paler at the base; beneath paler throughout. Wings nearly naked; upper surface of the interfemoral membrane thinly clothed as far as the extremity of the tail.

Teeth as in *E. nigrescens*, except that the first upper premolar is smaller, and scarcely raised above the level of the gum.

Length (of an adult ♂), head and body 1''·65; tail 0''·5; head 0''·65; ear 0''·58, tragus 0''·2; forearm 1''·55; thumb 0''·25; third finger—metacarp. 1''·3, 1st ph. 0''·4, 2nd ph. 0''·65; fourth finger—metacarp. 1''·1, 1st ph. 0''·3, 2nd ph. 0''·2; fifth finger—metacarp. 1'', 1st ph. 0''·38, 2nd ph. 0''·15; tibia 0''·6; calcaneum 0''·45; foot 0''·3.

Hab. Gilolo Island.

At the request of M. Milne-Edwards, I have much pleasure in connecting with this species the name of its discoverer, M. Raffray.

2. Oriental Region.

CYNOXYCTERIS AMPLEXICAUDATA, Geoffr.

Cambodja (*M. Harmand*).

CYNOPTERUS MARGINATUS, Geoffr.

Singapore (*M. de Castelnau*).

EONYCTERIS SPELÆA, Dobson.

Java (*M. de la Savinière*).

RHINOLOPHUS ACUMINATUS, Peters.Siam, Laos (*M. Harmand*).

This species has been previously recorded from Java only.

RHINOLOPHUS AFFINIS, Horsfield.Cochin China (*M. Harmand*).**PHYLLORHINA DIADEMA**, Geoffr.Cochin China (*M. Harmand*); Sanghir Island (*M. Laglaize*).

The specimens from the latter locality differ from all others examined by me in the great development of the central projecting ridge of the sella, which, in one instance, projects almost as far forwards as the corresponding process of the same part of the nose-leaf in *Ph. cyclops* (see my 'Catalogue of Chiroptera,' pl. ix. fig. 1 *b*); the blunt projection in the centre of the margin of the upper transverse nose-leaf is also much more defined than in other specimens of this species, and in one of the specimens from Sanghir Island corresponds to a large cell in the back of the leaf.

PHYLLORHINA ARMIGERA, Hodgson.Cochin China (*M. Harmand*).

One of the specimens, an adult male, has the glandular elevations between the nose-leaf and the frontal sac as much developed as in the type of this species in the Calcutta Museum, described and figured by me in the 'Proceedings' for 1873 (p. 241).

PHYLLORHINA BICOLOR, Temminck.Cochin China (*M. Pierre*).**PHYLLORHINA FULVA**, Gray.Cochin China (*M. Harmand*).**PHYLLORHINA LARVATA**, Horsfield.Cochin China (*M. Harmand*).

These specimens have the same brilliant golden-yellow fur as those collected by Dr. Anderson at Prome, Upper Burma, and described by me in my 'Monograph of the Asiatic Chiroptera.'

CÆLOPS FRITHII, Blyth.

Laos, in the roof of the Great Pagoda at Lakhon, collected by *M. Harmand*.

The well-preserved specimens of this most remarkable Bat form a valuable addition to the collection of the Muséum d'Histoire Naturelle. Hitherto this species was known only from the type in the Indian Museum, Calcutta (a dilapidated skin from the Bengal Sunderbuns), and a single specimen, in alcohol, from Java, in the collection of the Leyden Museum. Examination of these specimens permits me to add a few additional notes on the structure of the species.

The calcaneum is weak, but distinct, nearly one fifth of an inch in length, and projects at its extremity slightly beyond the membrane;

there is no trace of a tail externally; the wing-membrane extends to the proximal extremity of the metatarsus; the female has pubic teat-like processes, as in other species of *Rhinolophidæ*; the terminal phalax of the fourth finger ends in a large T-shaped process. The measurements agree closely with those of the specimen in the Leyden Museum.

MEGADERMA SPASMA, L.

Laos (*M. Harmand*).

SCOTOPHILUS TEMMINCKI, Horsf.

Cochin China, and Laos (*M. Harmand*).

VESPERUGO ABRAMUS, Temminck.

Cochin China and Laos (*M. Harmand*).

VESPERUGO PACHYPUS, Temminck.

Laos (*M. Harmand*).

VESPERTILIO MURICOLA, Hodgson.

Laos (*M. Harmand*); Sanghir Island (*M. Laglaize*)

TAPHOZOUS MELANOPOGON, Temminck.

Cochin China (*M. Harmand*).

NYCTINOMUS PLICATUS, Buch.-Ham.

Laos (*M. Harmand*).

3. *Ethiopian Region.*

EPOMOPHORUS COMPTUS, Allen.

Ogoné (*M. Marche*).

EPOMOPHORUS MONSTROSUS, Allen,

Ogoné (*M. Marche*).

PHYLLORHINA COMMERSONI, Geoffr.

Bugamojo, Zanzibar (*Mission du St.-Esprit*).

VESPERUGO NANUS, Peters.

Ogoné (*M. Marche*).

MYXOPODA AURITA, A. Milne-Edwards.

Madagascar (*vide antea*, p. 871).

COLEURA SEYCHELLENSIS, Peters.

Seychelle Islands (*M. Lantz*).

4. *Neotropical Region.*

MOLOSSUS RUFUS, Geoffr.

Cayenne (*M. Mélinon*).

MOLOSSUS ABRASUS, Temm.

Cayenne (*M. Mélinon*).

RHYNCHONYCTERIS NASO, Wied.

Cayenne (*M. Mélinon*).

NOCTILIO LEPORINUS.

Cayenne (*M. Mélinon*).

SCHIZOSTOMA BRACHYOTE, n. sp.

Muzzle as long, or slightly longer than the distance between the eyes; side of the face deeply grooved beneath the eye. Ear much shorter than the head, but broad at the base, owing to the strong convexity of the inner margin of the conch in its lower two thirds; at the upper third the inner margin becomes abruptly concave, and the ear terminates in a short, obtusely pointed tip: tragus simple. Nose-leaf small, the lancet very acute, but much narrower than the horse-shoe, which is slightly notched on either side, and confluent with the muzzle in front. Centre of the upper lip slightly grooved; lower lip with a shallow narrow groove between two naked prominences, each of which is divided in its upper third by a small oblique groove.

Wings from the ankles or from the extremities of the tibiæ; interfemoral membrane and tail as in other species of the genus; calcaneum slightly longer than the foot. Fur brown, above and beneath.

Dentition.—Inc. $\frac{4}{4}$; c. $\frac{1-1}{1-1}$; pm. $\frac{2-2}{3-3}$; m. $\frac{3-3}{3-3}$

Upper incisors as in *Sch. megalotis*; lower equal, grooved, not crowded; first upper premolar with a very oblique cusp, touching the canine, second straight; first lower premolar much exceeding the second in antero-posterior diameter; second premolar well developed, in the tooth-row; third premolar nearly equal to the first in vertical extent, but less than it in cross section at the base.

Length (of an adult ♂), head and body 2''·2; interfemoral membrane 0''·9; head 0''·9; ear 0''·65 × 0''·5, tragus 0''·28; nose-leaf 0''·3 × 0''·2; forearm 1''·6; thumb 0''·35; third finger—metacarp. 1''·4, 1st ph. 0''·55, 2nd ph. 0''·7, 3rd ph. 0''·35; fifth finger—metacarp. 1''·35, 1st ph. 0''·42, 2nd ph. 0''·45; tibia 0''·65; calcaneum 0''·45; foot 0''·4.

Hab. Cayenne (*M. Mélinon*).

This is a very aberrant form, differing from all the other species in the development of the chin-warts, and in the shallowness of the central groove between them, as well as in the shortness and peculiar shape of the ears. In the second phalanx of the middle finger being conspicuously longer than the first, it agrees with *Sch. behni*; but, unlike that species, it has the calcaneum longer than the foot.

CAROLLIA BREVICAUDA, Wied.

Darren (*Dr. Viguier*); Cayenne (*M. Mélinon*).

ARTIBEUS QUADRIVITTATUS, Peters.

Cayenne (*M. Mélinon*).

November 19, 1878.

Arthur Grote, Esq., V.P., in the Chair.

Mr. Sclater read the following extract from an article in 'Science-Gossip' of October 1, 1878, by Mr. R. Davenport, of Bury, Lancashire:—

"It is a pleasing duty to me to record the taking of a very beautiful specimen of what I consider an exceedingly rare bird in our neighbourhood (*Saxicola stapazina*). The specimen was shot by a friend of mine, about the middle of May this year, on the margin of the Bury and Radcliffe Reservoir; and though much mangled with number-6 shot, it has been very well mounted indeed by my friend Johnson, of Prestwich. Considering the condition it was in from being killed with such large shot, I really doubted at one time whether it could be mounted; however, it has been; and a valuable addition to our list of birds it is."

Mr. Sclater exhibited the specimen in question, which had been kindly sent up for exhibition by Mr. Davenport. It appeared to be an adult in full plumage of *Saxicola stapazina* (called by Mr. Dresser "*S. rufa*" B. of Eur. pt. xxv.). The species had not been previously recorded as occurring in the British Isles, and was an interesting addition to the list of "Accidental visitors."

The following letters from Dr. A. B. Meyer, C.M.Z.S., and Mr. Bartlett were read, in reference to the communication at the last meeting from Mr. Everett respecting the supposed existence of the Anoa (*Anoa depressicornis*) in the Philippines.

"R. Zool. Mus., Dresden,
November 16, 1878.

"DEAR DR. SCLATER,—

"Having seen in the report of the Society's meeting of the 5th November that Mr. Everett had stated, in a letter to the Marquis of Tweeddale, that the *Anoa* of Celebes (*Anoa depressicornis*) or an allied species is found in the island of Mindoro, I beg leave to send you a few notes from my diary on this subject.

"Mr. Wood of Manilla, an American gentleman, now dead, known to many travellers as a amateur naturalist, and to many European Museums as a collector, told me that Mr. Cuming (in whose company he had formerly collected) had sent home an 'Antelope' from Mindoro, similar to *Anoa depressicornis* from Celebes, which was called '*Tamarao*' by the natives. Mr. Wood had not only seen the animal in the Philippines, but also subsequently in the British Museum, where it had received a specific name of its own.

"Wishing to know something more of the '*Tamarao*' in Manilla, I succeeded in finding a stuffed animal in the Museum of the Dominicans, which they told me was the animal in question. This was apparently, as far as I could make out (it was in a bad state, and

could not be closely inspected), a Buffalo, small in size, with rather straight horns bent backwards, with not much hair on the skin, which was of a light greyish colour. There was no similarity to the *Anoa* from Celebes, which I had seen the year before at Menado, as regards colour, skin, size, or horns.

“The ‘Tamarao’ is said to live only on Mindoro. The wild Buffalo of Luzon does not differ much from the tame one. The name for Buffalo in the Tagaloe language of Luzon is *Anoong*, the same as for *Anoa depressicornis* in South Celebes. (In the Pampanga language of Luzon, ‘Damulag’ means buffalo. For a wild Buffalo they say on Luzon ‘Karabao cimarron,’ ‘cimarron’ being a Spanish expression for wild.)

“When back in Europe in the same year, I looked together with the late Dr. Gray through the galleries of the British Museum for this ‘Tamarao,’ but in vain; we could not find it.

“In the gallery of the Jardin des Plantes of Paris, I saw this autumn a skeleton of a small Buffalo from Timor, brought home by the ‘Astrolabe,’ and labelled *Bubalus seligniceros*, which reminded me of the ‘Tamarao’ of Mindoro, as I mentioned to Prof. Gervais, who kindly accompanied me, telling him also of its supposed affinity to the *Anoa*.

“Of course I cannot depend on the alleged identity of the stuffed Buffalo in the Museum of the Dominicans in Manilla with the ‘Tamarao’ of Mindoro; and, also, my inspection of this specimen was scientifically not sufficient; but I hope to be able to throw some light on this question very soon, as a skull of the real ‘Tamarao’ from Mindoro will be in my hands in a few days, as I bought some time ago for the Dresden Museum Professor Semper’s Mammalian collection from the Philippines, which contains such a skull. I therefore shall soon recur to the subject.

“I take this occasion to remark that there exists on the island of Balabac, Philippines, a species of *Tragulus*, specimens of which I have seen living at the Government House in Cebú; but, having no books with me, I could not make out whether it differs from *Tragulus kanchil* or not.

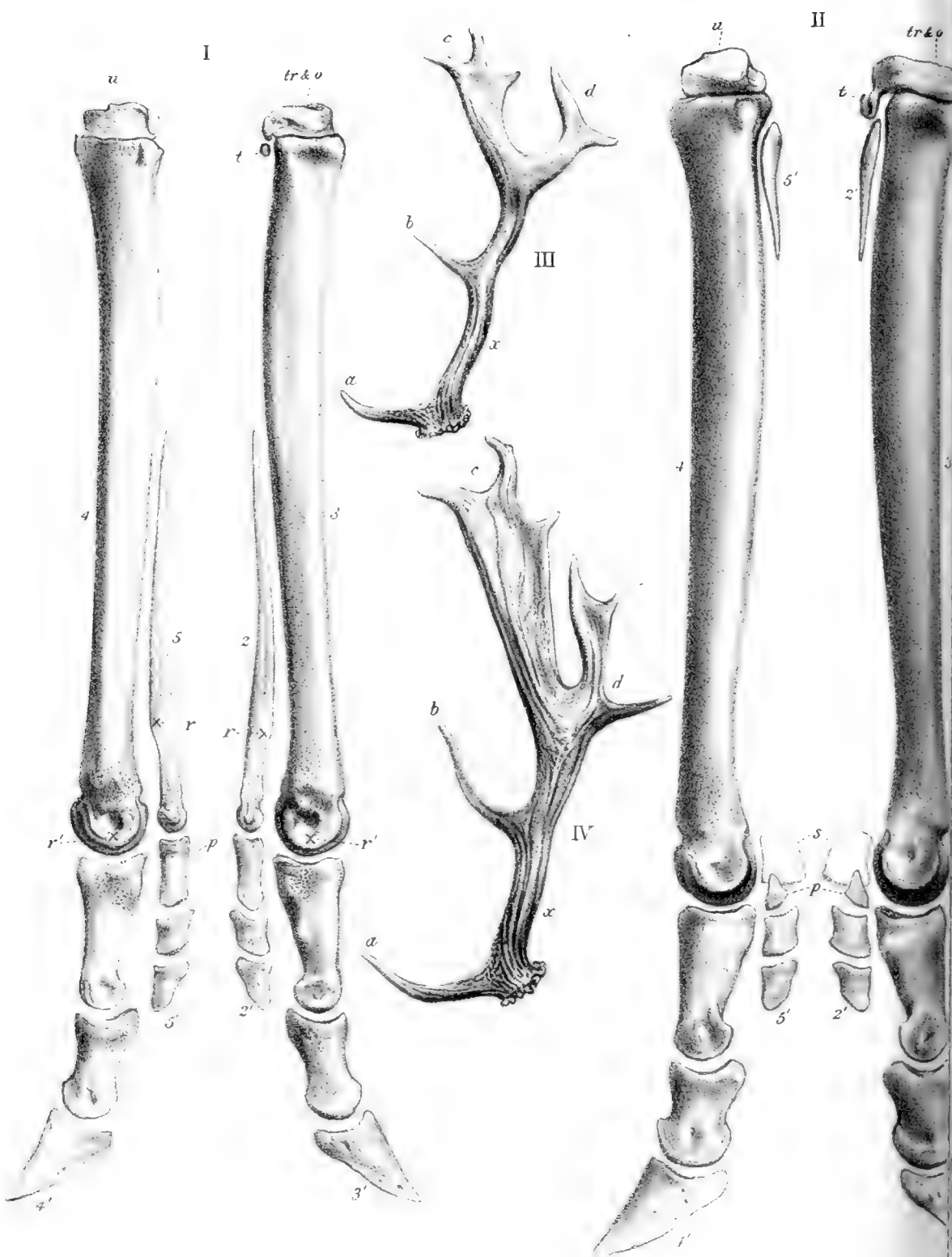
“Yours very sincerely,

“A. B. MEYER.”

“Zoological Society’s Gardens,
Regent’s Park, London, N.W.
November 18, 1878.

“DEAR SIR,—About thirty years since, a collector of natural-history specimens, named Napper, wrote to me from the Philippines to say that there existed on the island of Mindanao or Mindoro, a small kind of Buffalo extremely wild and difficult to obtain. I engaged him to obtain specimens; and after much trouble and expense he sent me an adult bull, a cow, and calf that he had shot and skinned. They were offered by me to Dr. Gray for the British Museum, who declined them, as he was of opinion they were only small varieties of the common Manilla or Water-*Buffalo*; and this was my own opinion, and that also of every one who saw them. I





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CLASSIFICATION OF THE CERVIDÆ.

kept them a long time; and not finding any one that would have them, I at last sent them to Stevens's sale-rooms where they were sold for a few shillings. I can assure you that these animals were not like the *Anoa*, but much larger, and had all the appearance of a common Indian Buffalo of small size.

Yours faithfully,

"A. D. BARTLETT."

The following papers were read:—

1. On the Classification of the *Cervidæ*, with a Synopsis of the existing Species. By Sir VICTOR BROOKE, Bart., F.Z.S.

(Plate LV.)

- I. Introduction, p. 883.
- II. On the division of the *Cervidæ* into sections larger than genera, p. 885.
- III. On the subdivision of the sections into minor groups, p. 889.
- IV. Geographical distribution, and remarks thereon, p. 893.
- V. Synopsis of the existing *Cervidæ*, p. 897.
- VI. Explanation of Plate LV., p. 928.

I. Introduction.

Some years ago I brought before the notice of the Society certain pedal characters in the *Cervidæ* (vide P. Z. S. 1874, p. 33) which appeared to me to be of some importance; but at that time, not having had the opportunity of extending my observations to all the forms of existing *Cervidæ*, a generalization, which I believe to be of considerable taxonomic value, deducible from these characters, escaped my notice. A reconsideration of the characters themselves, and an attempt to work out the deductions which may be drawn from these and other established facts relating to the *Cervidæ*, is the object of the present paper.

Before entering into the subject immediately before us, it may be well to consider briefly the peculiarities common to all Deer, the possession of which distinguishes them from all other mammals, and which may therefore be called their family characters.

The *Cervidæ*, together with *Moschus*, the *Giraffidæ*, and the *Bovidæ*, constitute the *Pecora*, one of the four distinct sections into which the *Artiodactyla*, or even-toed *Ungulates*, is divisible. In having (1) the odontoid process crescentic, (2) the left axillary rising from the innominate artery, (3) the placenta cotyledonous, (4) the psalterium added to the stomach, and (5) the outer bones of the metapodium rudimentary, the inner confluent, all the members of the *Pecora*, as Professor Flower in his exhaustive paper on *Moschus* (P. Z. S. 1875, p. 159) has taught us, agree together, and differ from the three remaining sections of the *Artiodactyla*, viz. the *Tragulina*, *Suina*, and *Tylopoda*.

So far there is little difficulty in defining the zoological position of the *Cervidæ*. That they form part of the *Pecora* there can be no doubt; but when the subdivision of the *Pecora* is attempted difficulties arise which bid fair to set at defiance all systems of classification. An estimate of the nature and relative value of the characters which distinguish the *Cervidæ* from the *Bovidæ* will be most clearly shown by placing them in tabular form. With *Moschus* and the *Giraffidæ* we

need not at present occupy ourselves; in Professor Flower's paper, above referred to, the characters in which they differ from the typical Cervidæ, of which Professor Flower regards them as early offshoots, are distinctly defined.

Cervidæ.

(1) Osseous deciduous outgrowths from cylindrical processes of the frontals in the males of all excepting *Hydropotes*, in which genus they are wanting in both sexes. These appendages, the antlers, are absent in the females excepting *Rangifer*.

(2) Two orifices to the lacrymal duct, situated on or inside the rim of the orbit.

(3) A depression in the facial plate of the lacrymal, called the lacrymal pit or fossa.

(4) An anteorbital vacuity of such dimensions as to exclude the lacrymal from articulation with the nasals.

(5) In all species the first molar in both jaws is brachyodont, or short-crowned, so that when the tooth is in place the neck, which is much constricted, is on a level with or a little above the alveolar border, and in the dry skull the upper ends of the roots are visible.

(6) Upper canines present in both sexes. Exceptions:—*Capreolus*, *Axis*, *Dama*, *Cariacus*, *Blastocerus*, *Pudu*, *Alces*, and some of the smaller Rusine Deer.

(7) Distal ends of the lateral metacarpals present in some.

(8) The first and second

Bovidæ.

(1) Epidermal persistent (exc. *Antilocapra*) sheaths envelop processes of the frontals in both sexes, with the exception of the females of the following genera, in which these appendages, the horns, are wanting:—*Portax*, *Tragelaphus*, *Procapra*, *Antilope*, *Æpyceros*, *Saiga*, *Kobus*, *Cervicapra*, *Pelea*, *Nanotragus*, *Neotragus*, *Tetraceros*.

(2) One orifice to the lacrymal duct, situated inside the rim of the orbit. Exceptions:—*Tragelaphus sylvaticus*, *Tragelaphus decula*, *Tragelaphus angasi*, *Tragelaphus spekii*; in these species there are two orifices, situated as in the Cervidæ.

(3) Absence of this depression. Exceptions:—*Gazella*, *Antilope*, *Nanotragus*, *Neotragus*, *Cephalophus*, *Tetraceros*, *Alcelaphus*.

(4) Lacrymal articulates with the nasals, except in *Gazella* and *Oryx*.

(5) The first molar in both jaws is hypsodont, or long-crowned, so that a large part of the crown is buried in the socket when the tooth is first in place, and there is no constriction between the long crown and the very short roots. Exception, *Tragelaphus*.

(6) Canines absent in both sexes. Exception, *Nanotragus pygmaeus* has sometimes the upper milk-canine.

(7) Distal ends of the lateral metacarpals wanting in all genera.

(8) The first and second pha-

Cervidæ (continued).

phalanges of the lateral digits present. Exception, *Cervulus*.

(9) Parieto-squamosal suture nearer the upper than the lower border of the temporal fossa¹.

(10) Navicular, cuboid, and ectocuneiform united in some.

(11) Placenta with few cotyledons (*Oligocotyledontophora*, Garrod²).

(12) Gall-bladder absent.

Bovidæ (continued).

phalanges of the lateral digits wanting in all.

(9) This suture is nearer the lower than the upper border of the temporal fossa. Exception, *Antilocapra*.

(10) These bones never all united.

(11) Placenta with many cotyledons (*Polycotyledontophora*, Garrod).

(12) Gall-bladder present. Exception, *Cephalophus*.

From this table it becomes apparent that, with the exception of the eleventh, none of these characters can be considered exclusively characteristic of the Cervidæ; and even with regard to it, more extensive observation is required before it can be laid down as a fixed and exclusive Cervine character. But although, with this exception, none of the above characters can be taken *singly* as distinctive of a Cervine from a Bovine animal, the coexistence of the second, third, fourth, and fifth in all the Cervidæ and their absence in combination in the Bovidæ will, I think, be found universal.

Deer may therefore for the present be characterized as *Pecora* having two orifices to the lacrymal duct, situated on or inside the orbit, lacrymal fossæ, an anteorbital vacuity, cutting off the lacrymal from articulation with the nasals, the first molar brachyodont, the parieto-squamosal suture nearer the upper than the lower border of the temporal fossa, and the placenta with few cotyledons.

II. On the Division of the Cervidæ into Sections larger than Genera.

I will now pass on to the consideration of the pedal characters above alluded to.

The fore limbs of all existing species of Cervidæ exhibit one of the two following conditions.

(1) Two slender, short, detached, splint-like bones, the rudiments of the second and fifth metacarpals (Plate LV. figs. 2, 2' and 5'), situated posterior to and one on each side of the *proximal* extremity of the metacarpal cannon (or confluent third and fourth metacarpals); the phalanges of the second and fifth digits separated from their rudimentary metacarpals by a very wide interval; the proximal phalanx of these digits (Plate LV. fig. 2 *p*) inferior in size to the central and unguis phalanges. In *Cervulus* the phalanges of the second and fifth digits are undeveloped.

¹ Vide Prof. Garrod, P. Z. S. 1877, p. 15.

² Garrod, *loc. cit.* p. 12.

(2) Two slender pointed bones, the rudiments of the second and fifth metacarpals (Plate LV. figs. 1, 2' and 5'), situated posterior to and one on each side of the *distal* extremity of the metacarpal cannon. These bones articulate with their respective phalanges, but are separated from the carpus by a wide interval. The proximal phalanx of these digits (Plate LV. fig. 1, *p*) is superior in size to the central and ungual phalanges.

For these forms Professor Flower has kindly assisted me in finding convenient names. For the former, that in which the proximal (or near) extremities of the lateral metacarpals remain, I would propose the term *Plesiometacarpal* (πλησιον, near, and μετακάρπιον, *metacarpus*); and the latter, that in which the distal (or more remote) extremity of these bones remains, I would designate *Telemetacarpal* (τηλε, far, μετακάρπιον, *metacarpus*).

With the view of ascertaining whether the myology of the fore limbs of the Cervidæ confirms or confutes the importance which I would assign to their osteological characters, I have been lately engaged in the examination of the muscles of the fore limbs of the Artiodactyles in general. My materials have been, however, as yet far too meagre to justify me in attaching any great weight to the characters afforded by myology; but I am encouraged in expecting that my observations may not be altogether unimportant, in which case I shall hope to lay them before the Society upon some future occasion.

I will only here mention that in the telemetacarpal limb of the Common Roe, the phalanges of each lateral digit are supplied with two tendons from the extensor muscles of the forearm—a condition precisely similar to that which obtains in the tetradactyle *Tragulus*. On the other hand, in the plesiometacarpal limb of the Red Deer and Fallow Deer, the lateral phalanges are entirely without muscular attachment. In neither the Roe, Red Deer, or Fallow Deer are the lateral phalanges supplied with tendons from the flexors. A similar condition is seen in *Tragulus*, in which form the lateral phalanges are but slightly functional; but in the telemetacarpal limb of *Moschus* the lateral phalanges are (as in *Sus*) supplied with strong tendons from the flexor profundus digitorum. In *Moschus*, the lateral phalanges are highly functional. The special office performed by the lateral phalanges is the prevention of the animal slipping when rushing at speed down slopes or sinking in swampy ground; and this function is effected without danger of the displacement of these delicate structures, by means of strong ligamentous bands developed in the aponeurosis surrounding them, which bind them firmly in their normal position. In the telemetacarpal limbs which I have examined, in addition to these bands, distinct round ligaments pass from the sides of the distal articular surface of the metapodium to the centre of the metacarpal splint on each side (Plate LV. fig. 1, *r-r'*), and aid in preventing its displacement upwards, upon undue pressure being applied from without.

In the annexed list of all the known species of existing Deer, arranged according to their geographical distribution, the names of

those with telemetacarpal limbs are printed in italics, and those with plesiometacarpal limbs in ordinary type. From this a remarkable parallelism becomes at once apparent between the distribution of the Cervidæ in the two main divisions of the earth's surface, and the condition of the rudimentary external digits of their fore limbs. Of the 39 species confined to the Old World, 36 are *Plesiometacarpi*, the exceptions being *Hydropotes inermis* and the two species of *Capreolus*. Of the 22 species confined to the New World, 21 are *Telemetacarpi*, *Cervus canadensis* being the sole exception. Both species of circumpolar range are *Telemetacarpi*.

<i>Old World.</i>	<i>Northern regions of both Hemispheres.</i>	<i>New World.</i>
1. <i>Cervulus muntjac.</i>	1. <i>Alces machlis.</i>	1. <i>Cariacus (Cariacus) virginianus.</i>
2. — lacrymans.	2. <i>Rangifer tarandus.</i>	2. — (—) <i>leucurus?</i>
3. — reevesii.		3. — (—) <i>mexicanus.</i>
4. <i>Elaphodus cephalophus.</i>		4. — (—) <i>similis?</i>
5. — michianus?		5. — (—) <i>savannarum.</i>
6. <i>Cervus (Rusa) aristotelis.</i>		6. — (—) <i>peruvianus.</i>
7. — (—) <i>equinus.</i>		7. — (—) <i>gymnotis.</i>
8. — (—) <i>swinhoii.</i>		8. — (—) <i>toltecus.</i>
9. — (—) <i>philippinus.</i>		9. — (—) <i>macrotis.</i>
10. — (—) <i>mariannus?</i>		10. — (—) <i>columbianus.</i>
11. — (—) <i>nigricans.</i>		11. — (<i>Blastocerus</i>) <i>paludosus.</i>
12. — (—) <i>alfredi.</i>		12. — (—) <i>campestris.</i>
13. — (—) <i>kuhli.</i>		13. — (<i>Furcifer</i>) <i>chilensis.</i>
14. — (—) <i>porcinus.</i>		14. — (—) <i>antisiensis.</i>
15. — (—) <i>lepidus?</i>		15. — (<i>Coassus</i>) <i>rufus.</i>
16. — (—) <i>hippelaphus.</i>		16. — (—) <i>simplicicornis.</i>
17. — (<i>Rucervus</i>) <i>duvauceli.</i>		17. — (—) <i>rufinus.</i>
18. — (—) <i>schomburgki.</i>		18. — (—) <i>nemorivagus.</i>
19. — (—) <i>eldi.</i>		19. — (—) <i>superciliaris.</i>
20. — (<i>Elaphurus</i>) <i> davidianus.</i>		20. — (—) <i>whitelyi.</i>
21. — (<i>Axis</i>) <i>axis.</i>		21. <i>Pudua humilis.</i>
22. — (<i>Pseudaxis</i>) <i>sika.</i>		22. <i>Cervus canadensis.</i>
23. — (—) <i>euopsis?</i>		
24. — (—) <i>mantchuricus.</i>		
25. — (—) <i>dybowskii?</i>		
26. — (—) <i>kopschi?</i>		
27. — (—) <i>taëvanus.</i>		
28. — (—?) <i>caspicus.</i>		
29. — (<i>Cervus</i>) <i>elaphus.</i>		
30. — (—) <i>xanthopygus?</i>		
31. — (—) <i>eustephanus.</i>		
32. — (—) <i>maral.</i>		
33. — <i>cashmeerianus.</i>		
34. — <i>affinis.</i>		
35. — (<i>Dama</i>) <i>dama.</i>		
36. — (—) <i>mesopotamicus.</i>		
37. <i>Hydropotes inermis.</i>		
38. <i>Capreolus caprea.</i>		
39. — <i>pygargus.</i>		

The fact of the plesiometacarpal and telemetacarpal limb-characters so closely corresponding with the distribution of the Cervidæ in the Old and New Worlds, would in itself have convinced me of their fundamental importance; but a certain osteological cranial cha-

acter lately discovered by Professor Garrod (see P. Z. S. 1877, p. 13, fig. 24) has confirmed me in this opinion.

Professor Garrod has observed that in all the American Deer, with the exception of *Cervus canadensis*, the vertical plate developed from the lower surface of the vomer is prolonged sufficiently downwards and backwards to become ankylosed to the horizontal plate of the palatals, and to form a complete septum dividing the nasal cavity into two distinct chambers. The posterior edge of the vertical plate of the vomer is plainly visible upon looking into the posterior nares in the dry skull. In none of the Deer confined to the Old World is the vertical plate of the vomer sufficiently developed to reach the horizontal plate of the palatals; and therefore in none is there a septum dividing the nasal cavity into two chambers separated from the anterior to the posterior nares.

This cranial character agrees with the pedal characters in placing the Reindeer, one of the species of circumpolar distribution, with the Deer of the New World. *Alces*, along with *Hydropotes* and *Capreolus*, all of which are Telemetacarpî, Prof. Garrod's cranial character places with the *Plesiometacarpî* of the Old World.

So long ago as 1836, Dr. Gray¹ pointed out characters afforded by the tufts of hair observable on the tarsus and metatarsus of most Deer, and expressed his opinion that they constitute "a means of subdividing them in natural sections." In his Catalogue of the Ruminant Mammalia in the British Museum (1872), Dr. Gray divides the Cervidæ into two primary groups:—(1) that in which tuft of hair on the outside of the metatarsus is above the middle of that bone, and (2) that in which this tuft is below the middle of the metatarsus.

Now I cannot but think it is a highly significant fact, and one that should make us very cautious in condemning any character as trivial, to find that a classification based on these apparently superficial characters coincides exactly, as far as it goes, with that founded on Prof. Garrod's cranial characters, and, with the exceptions referred to, with that based on the osseous structure of the limb.

There are some species both in the Old and the New World which are devoid of either metatarsal or tarsal tufts. When present, the metatarsal tuft is always above the middle of the metatarsus; and there is never any tuft on the inner surface of the tarsal joint in the Deer confined to the Old World. In the Deer confined to the New World, the metatarsal tuft when present is always below the middle of the metatarsus, and there is frequently a distinct tarsal tuft. *Cervus canadensis* constitutes the solitary exception.

There is yet another character which lends some weight to the teaching of those already mentioned; and for the observation of it we are again indebted to Prof. Garrod². Prof. Garrod has observed that the ascending rami of the præmaxillæ articulate with the nasals in all the Old-World Deer, with one or two exceptions, whilst in the Deer of the New World, again with one or two exceptions, the rami of the præmaxillæ do not reach the nasals.

I shall not now attempt to decide the relative value of these charac-

¹ Vide P. Z. S. 1836, p. 66.

² P. Z. S. 1877, p. 13.

ters, a task which can only become possible when our knowledge of the extinct forms of Deer shall be very much more complete than it is at present. Accepting the facts as we find them, the existing Cervidæ may be divided into three primary sections.

A. Proximal ends of the lateral metacarpals remaining.

(PLESIOMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone. Tuft of hair on the inside of the tarsus always absent.

Ascending rami of the præmaxillæ articulating generally with the nasals.

Genera :—*Cervulus*, *Elaphodus*, *Cervus* (subgen. *Rusa*, *Rucervus*, *Elaphurus*, *Axis*, *Pseudaxis*, *Dama*).

B. Distal ends of the metacarpals remaining. (TELEMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone.

Genera :—*Alces*, *Hydropotes*, *Capreolus*.

C. Distal ends of the metacarpals remaining. (TELEMETACARPI.)

Posterior portion of the nasal cavity divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus when present, below the centre of that bone. Tuft on the inside of the tarsus frequently present.

Ascending rami of the præmaxillæ generally not reaching the nasals.

Genera :—*Cariacus* (subgen. *Cariacus*, *Blastocerus*, *Furcifer*, *Coassus*), *Pudua*, *Rangifer*.

Of the inequivalency and heterogeneous nature of section *B* I am most fully aware. It can only be considered a temporary receptacle for species whose natural relationship to sections *A* and *C* cannot as yet be finally decided.

III. *On the Subdivision of the Sections into minor Groups.*

The definition of the minor groups into which the three primary sections are ultimately divisible in such a manner as to render their boundaries readily appreciable, is, I believe, almost impossible. And yet that a solid bond of affinity unites the members of each natural minor group, that they possess in common certain peculiarities which distinguish them from species contained in other minor groups, no one who has studied the Cervidæ can for a moment doubt. This being so, I think that the distinct recognition of the various clusters of species, into which the Cervidæ naturally group themselves, is a matter of the first importance in an attempt to understand their entire life-history.

The question as to whether these minor groups should be regarded as genera or subgenera, or merely marked as nameless sections, appears to me to be of wholly secondary importance.

Actuated by this belief, I have retained the names originally given to these subgroups whenever the grouping has appeared to me to be natural, and have spoken of them as subgenera. The characters upon which the subgenera are based are derived principally from the form of the antlers, the skull, the rhinarium¹, external coloration, position and degree of development of the cutaneous glands, and general external form.

As is the case with the family characters, it is seldom that any one subgeneric peculiarity can be taken singly as exclusively characteristic of a certain subgenus; but the existence in different fixed combinations of these characters in the several subgenera is an empirical certainty. For example, the form of rhinarium peculiar to *Rusa* (*vide infra*) is shared by other groups, but never in combination with the form of antler and immense lacrymal pit typical of that subgenus; and no species of *Rusa* is without this combination. Again, the form of the rhinarium in the subgenus *Cervus* differs from that of *Rusa*, but resembles that of *Dama* &c.; but in *Cervus* this rhinarium is always associated with the antlers typical of that subgenus, and an anal disk of paler colour than the adjacent parts surrounding the tail; whilst in *Dama* it is combined with the palmated form of antler and tuft of long hair surrounding the prepuce. It is needless here to give further examples of this law: it will be found fully illustrated in the diagnoses of the subgenera (imperfect as these doubtless are) given in the synopsis.

The objection that antlers are absent in the females of all existing species with the exception of *Rangifer*, whilst in *Hydropotes* they are wanting in both sexes, has been frequently urged against the value of characters based on these appendages. The stability of this objection strikes me as very questionable. There can be no doubt that it would be highly convenient if such prominent and easily observed features as those afforded by the antlers were universally attainable; and the lack of their invariable occurrence is doubtless a source of some slight confusion to the systematist.

But surely the value of a character as a test of genetic affinity cannot be judged upon utilitarian principles; and if, as I think, I can show reason for believing the form of the antlers is one of the clearest proofs of the blood-relationship of the species contained in the various subgenera, characters derived therefrom must be regarded as the most trustworthy for taxonomic purposes.

In order to account for the phenomena presented by the antlers in the males of the existing Deer, four factors are necessary:— (1) The gradual evolution of the antlers from very simple to complex forms; (2) Their constant tendency to vary; (3) Variation extending far enough to induce the partial atrophy of one part of the antler

¹ I follow Illiger and Sundevall in the adoption of this term for the naked moist skin between the nostrils. It is decidedly preferable to muffle, which is French, or muzzle, which signifies something quite different in every-day speech.

to compensate for the extra development of some other part ; (4) The transmission and fixation of such variations by heredity.

(1) The gradual evolution of the antlers from very simple to more complex forms.

The earliest Cervine animal of which we have any knowledge is *Dremotherium* from the early Miocene of Europe. This species was, so far as is at present known, without antlers. In the middle Miocene of France and Germany, and in a somewhat similar horizon in North America, the earliest antlered Deer as yet discovered have been found. These species, belonging to the very closely allied genera *Dicrocercus* and *Cosoryx*, possessed very short antlers with a single tine projecting forwards ; in fact they closely resembled the antlers of the existing species of *Furcifer* (fig. 17, p. 923).

From this period to recent times a gradual increase in the luxuriance of growth and diversity in the form of the antlers is evidenced even by the miserably imperfect materials as yet at the command of naturalists. Of this the following forms bear witness :—

CERVUS MATHERONI, Gerv.

Cervus matheroni, Gaudr. An. foss. Mont Léb. p. 66, pl. 13.

Horizon. Upper Miocene.

CERVUS CUSANUS, Croiz. & Job.

Cervus cusanus, Boyd Dawk. Quart. Journ. Geol. Soc. 1878, p. 405, fig. 2.

Horizon. Pliocene (Lower ?)

CERVUS PERRIERI, Croiz. & Job.

Cervus perrieri, Boyd Dawk. Quart. Journ. Geol. Soc. 1878, p. 488, figs. 3-5.

Horizon. Pliocene.

CERVUS CYLINDRICORNIS, Boyd Dawk. Vide *loc. cit.* p. 415, figs. 11, 12.

Horizon. Upper Pliocene.

CERVUS TETRACERUS, Boyd Dawk. loc. cit. p. 417, figs. 13-17.

Horizon. Upper Pliocene.

MEGACEROS HIBERNICUS.

Horizon. Post-tertiary Deposits.

CERVUS ELAPHUS.

Horizon. Post-tertiary deposits, and existing epoch.

I need hardly say that these species have no direct affinity to each other ; they are simply chosen as illustrating the general fact that the antlers of the Cervidæ have gradually increased in complexity from the Upper Miocene period to recent times.

It might at first sight appear as though the occurrence of existing species with very simple antlers militated against the more compre-

hensive fact of the gradual augmentation of complexity in these organs through geological time; but as the converse, namely the existence of highly complicated antlers in the Miocene and Pliocene periods, finds no support in the Geological record, the simple antlers of some existing species may be, I think, safely regarded as the result of arrestation, dependent on a less severe struggle for existence, or possibly upon some hitherto undiscovered influence.

(2) A constant tendency to vary.

Of this, any one can satisfy himself by the inspection of large collections of antlers. No two antlers are ever exactly alike; and the variations to which the antlers are subject in some species (*e. g. Cervus elaphus*, vide *infr.* p. 910) is so great, that in the absence of a large series they would be held as indicative of several distinct species.

(3) Variation extending far enough to induce the partial atrophy of one part of the antler to compensate for the extra development of some other part.

To illustrate this subject exhaustively would occupy more space than can be well devoted to it in the present paper. An attentive examination of any large collection will yield abundant evidence that such is invariably the case. It will, perhaps, be sufficient for my present purpose to bring forward one special example. The normal form of the upper half of the antlers of the common Fallow Deer (fig. 9, p. 914) may be described as broadly palmated, with several rudimentary tines produced from the posterior margin of the palm, the tine situated lowest on the palm exceeding the others slightly in length (fig. 9, *d*). In my cousin Mr. J. Bloomfield's place, Castle Caldwell, on the shores of Lough Erne, there is a herd of Fallow Deer which have lived at large in the woods, and under perfectly natural conditions, for upwards of 50 years. The antlers of these Deer are so remarkable in form, and present the peculiarities in which they are remarkable so constantly, that they could be recognized amongst a large collection of Fallow-Deers' antlers without the slightest difficulty. The tine growing from the inferior and posterior border of the palm (Plate LV. fig. 3, *d*) is in the Castle-Caldwell Deer immensely developed, and the palm itself is much contracted and seldom bears more than 3 or 4 tines. Variation is still actively at work on the antlers of these Deer, and reversion towards the normal form occasionally asserts itself; but, notwithstanding, a fixed type of antler has stamped itself indelibly upon the males in this herd in the short space of 50 years, and the peculiarities characteristic of that type are unquestionably the result of the extra development of one of the posterior tines and the consequent partial atrophy of the palm.

(4) The transmission and fixation of such variations by heredity.

That this is the case has been in a large measure proved by what has been already said; but the following fact places the matter beyond all possibility of doubt. The Castle-Caldwell Deer are the descendants of about one or two males and twice as many females. A single antler of one of the fathers of the herd has been fortunately preserved in the Museum at Castle Caldwell. This antler (Plate

LV. fig. 4) I have the pleasure of exhibiting this evening. It will be seen that it presents the same peculiarities that are characteristic of the distant descendants of its original owner, and that we have here a direct proof of heredity transmitting, and to a very great extent fixing, a definite and prominent variation¹.

Did space permit I could give many more illustrations corroborating the evidence of the above-mentioned facts. Innumerable instances of the power of heredity to transmit and fix variations in the antlers until some stronger influence interferes, are enacted annually before my eyes, amongst about 600 Deer of several different species preserved in my parks. Enough has, however, I think, been adduced to leave the *onus probandi* upon those who deny to characters derived from the antlers the right to be considered one of the surest land-marks of affinity in the Cervidæ.

IV. *Geographical Distribution of the Cervidæ, and Remarks thereon.*

Genera and Subgenera.	Number of species.	W. Palaearctic Reg. W. of long. 70° E.	E. Palaearctic Reg. E. of long. 70° E.	Indian Region.	Neartic Region.	Neotropical Region.
		No. of sp.	No. of sp.	No. of sp.	No. of sp.	No. of sp.
Cervulus ...	3	...	...	3		
Elaphodus ...	2	...	...	2		
Rusa	11	...	...	11		
Rucervus ...	3	...	...	3		
Elaphurus ...	1	...	1			
Axis	1	...	...	1		
Pseudaxis ...	7?	1?	4	2		
Cervus	7	2	4	...	1	
Dama	2	2				
Hydropotes .	1	...	1			
Capreolus ...	2	1	1			
Cariacus.....	10?	...	...	...	7	3
Blastocerus..	2	...	...	...	...	2
Furcifer	2	...	...	...	...	2
Coassus	6	...	...	...	...	6
Pudu	1	...	...	...	...	1
Total	61	6	11	22	8	14

¹ The production of so marked a variation from the form of antler typical of *Dama vulgaris* in the short space of fifty years as that exhibited by the Castle-Caldwell Fallow Deer might be considered as tending to prove the instability of the original specific characters. It may, however, be observed that the general form of antler typical of the species has not been obliterated by the evolution of the characters now peculiar to the variety, but that, on the contrary, heredity has preserved a record of the earlier, or specific, alongside of the later, or varietal, modification. Essentially analogous phenomena are presented by the antlers typical of the species and subgenera of the Cervidæ, the distinctive specific characters being, in every instance, an evident modification of the form of antler characteristic of the subgenus.

In this Table, showing the geographical distribution of the Cervidæ exclusive of the Elk and Reindeer, which have a circumpolar range, the following are the most important facts observable. Out of a total of 61 species 39 are confined to the Old and 22 to the New World. Of the 39 Old-world species 33 are found in the Eastern Palæartic and Indian regions, the latter containing 22 species, a much larger number than that contained in any one of the remaining four regions.

Of the 22 species confined to the New World, 8 are found to the north and 14 to the south of the Isthmus of Tehuantepec, the division adopted by Mr. Sclater between the Nearctic and Neotropical regions. These figures cannot, however, be taken as affording a just estimate of the relative degree of specialization of the Cervidæ in the Nearctic and Neotropical regions respectively. On the one hand, the three species of *Cariacus* in the latter are undoubtedly immigrants from the former region; and on the other hand, the species contained in the subgenera *Coassus* and *Furcifer* are, as far as the antlers are concerned, amongst the least-specialized of existing species.

Out of the eleven genera into which the Old-world Deer are divisible, there is only one (*Dama*) which has not a representative in either the Palæartic or Indian region.

Owing to the exceeding paucity of Palæontological material, any attempt to account for the present differentiation and distribution of the Cervidæ must be considered as purely tentative; and I venture to put forward the following hypothesis, more to provoke investigation and criticism, which may possibly bring new and more correct ideas to light, than from any great confidence that I feel in its approximation to completeness.

In order to avoid unnecessary recapitulation, and to indicate as clearly as possible the interdependence of the facts and hypothesis, I shall place the facts and theory in two columns, numbering the former, and merely introducing the number attached to each fact before the deduction or deductions which are drawn from it.

Facts.

(1) So many characters are common to the Cervidæ and Bovidæ that it is very difficult to lay down definitions distinctive of the families.

(2) *Dremotherium*, the earliest known Cervine form, was without antlers and tetradactyle.

Hypothesis.

(1) A very high degree of specialization had been attained by the common ancestor of the Cervidæ and Bovidæ, especially in the structure of the skull, dentition, and limbs; hence the possibility of divergence of character in its descendants was much restricted. (2) For a long period the early ancestors of the Cervidæ, which were tetradactyle,

Facts (continued).

(3) The antlers of the European *Procervulus* and of some species of the North-American *Cosoryx* appear to have been persistent.

(4) The antlers of *Dicroceros* and *Cosoryx* possessed one, or at most two tines.

(5) The increase in the complexity of the antlers of extinct species accompanies their chronological sequence in geological time.

(6) In a conversation which I have lately had with Prof. Marsh, he informed me that some of the specimens of *Cosoryx* collected by him in North America were tetradactyle. The lateral metacarpals in these specimens are excessively attenuated in the centre third of their length. In other specimens Prof. Marsh tells me a natural separation had taken place between the proximal and distal ends of the bones.

(7) The condition of the lateral metacarpals separates existing Deer into two great groups, the *Plesiometacarpî* and *Telemetacarpî*.

Hypothesis (continued).

remained unantlered; and spread from the centre of their geographical area (13), which was probably in the Eastern Palæarctic and Indian regions, they passed westward into Europe, and eastward into North America. (3) Processes then became developed from the frontals, which gradually elongated and in some instances branched. At first these outgrowths from the frontals remained persistently attached; but eventually the great advantage enjoyed by individuals who through necrosis lost, and through an inherited tendency to produce frontal processes renewed their antlers, over individuals who retained antlers broken and rendered useless by frequent combats, caused the natural selection of the former in the struggle for existence. (4, 5) These first deciduous antlers were exceedingly simple; but as time rolled on the advantage of large and complex antlers as a means of offence and defence established an ever-increasing tendency towards complexity in their form. (6) A diminution in the size of the lateral digits of the early forms of Deer accompanied the increase in the size of their antlers. The centre part of these bones, after attaining an extreme degree of atrophy, at last ceased to ossify. (7, 8) In some species the default in ossification took place nearer the distal than the proximal extremity of the bone. In others the converse obtained. The reduction of the rudiments steadily continued, resulting eventually in the disappearance of the shorter rudiment in both forms. Hence the origin of the plesiome-

Facts (continued).

(8) In some of the *Telemetacarpī* the distal extremities of the lateral metacarpals is two thirds the length of the metacarpal cannon. In some of the Bovidæ (e. g. *Gazella*), of which family all the species are plesiometacarpal, the proximal extremity of these bones is two thirds the length of the metacarpal cannon.

(9) With three exceptions all the Old-world Deer are plesiometacarpal; and with one exception all the New-world Deer are telemetacarpal.

(10) In none of the Old-world Deer is the vomer sufficiently prolonged backwards to divide the nasal cavity into two chambers. In all the New-world Deer the nasal cavity is so divided.

(11) The vomer of *Megaceros hibernicus* exhibits an intermediate condition. The limb in this form is plesiometacarpal, and as highly specialized as in the existing *Plesiometacarpī*.

(12) The *Telemetacarpī* of the Old World resemble the *Plesiometacarpī* in the form of their vomer and in the position of the metatarsal tufts.

(13) Thirty-three out of the thirty-nine species of Old-world Deer are inhabitants of the Indian or East Palæarctic regions; and of the eleven subgenera into which they are divisible there is only one (*Dama*) that has no representative in these regions.

Hypothesis (continued).

metacarpal and telemetacarpal condition of limbs in existing Cervidæ. (9) It is probable that the separation between the upper and lower extremities of the metacarpals took place long after the first *Dremotherium*-like Cervidæ had found their way into North America. In these the default in ossification began in the upper third of the lateral metacarpals; (12) whilst in the Cervidæ remaining in the Old World both modes of reduction obtained a footing, the Plesiometacarpī gaining ultimately the preeminence. (10) The vomer in the early forms of Deer was, as in the existing less-specialized Artiodactyles (e. g. *Hippopotamus*, *Sus*, *Tragulus*), prolonged backwards, dividing the nasal cavity into two distinct chambers. (11) As the competition between rapidly multiplying and allied forms became severe in the Old World, specialization extended to this part of the cranium, and a reduction in the backward extension of the vertical plate of the vomer, and consequent modification of the surrounding parts, set in. It is not improbable that the limbs of the *Plesiometacarpī* had nearly reached their present stage of specialization before the form of their vomer departed from the primitive type. The Deer of the New World, being less numerous both in individuals and species, and not being subjected to such severe competitions as the Old-world Deer, retained the primitive form of vomer. The greater development of the antlers in the larger majority of Old-world Deer, as compared with those of the New-world Deer, may be

Facts (continued).

(14) There are only twenty-two species in America; and the South-American species have remarkably simple antlers.

(15) The antlers of the Cervidæ are subject to great variation; and such variations are transmissible by heredity.

(16) Two species have a circumpolar range, and *Cervus canadensis*, a species allied to the common Red Deer of Europe, is found in North America.

Hypothesis (continued).

attributed to the same cause.

(14) The Deer of South America, which, according to the theory under consideration, have been freer from contact with allied forms than species inhabiting districts nearer to, and more in direct continuity with, the centre of the family area of distribution, are remarkable for the great simplicity of their antlers.

(15, 16) For long periods there was no possibility of communication between the Deer of the Old and New World; and during this time the perpetuations by heredity of the more favourable varieties which arose from time to time resulted in the divergence of the Cervidæ into the clusters of species which we now term genera. (16) At length the means of dispersal was for a second time opened between Asia and North America; an interchange of species took place; the ancestors of *Cervus canadensis* passed over into North America from the Old World, and the Elk and Reindeer extended their range till it was circumpolar.

In the following synopsis I have admitted every species of whose invalidity I am not absolutely certain; and frequently, even where I have felt grave doubts as to the soundness of the claims of a species to specific recognition, I have left it distinct, if by so doing I have thought it probable that future investigation of its claims may throw light on the important problems of geographical variation and distribution. Where colour is not mentioned in the diagnoses it affords no generic or subgeneric character. Supplementary columns are absent in the molars, and the central incisors are much expanded, where the contrary is not stated. Where the metatarsal and tarsal tufts are not specially mentioned, they are present.

V. *Synopsis of the existing Cervidæ.*

A. Proximal ends of lateral metacarpals remaining.

(PLESIOMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, above the centre of that bone. Tuft of hair on the inside of the tarsus always absent.

Ascending rami of the præmaxillæ articulating with the nasals. (Exception, species 3, in genus 1.)

1. CERVULUS.

1816. *Cervulus*, Blainv. Bull. Soc. Phil. p. 74.

1827. *Stylocerus* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 319.

1836. *Prox*, Ogilby, P. Z. S. 1836, p. 135.

Antlers half the length of the head, and placed on pedestals which nearly equal (and sometimes surpass) them in length. Brow-antler (fig. 1, *a*¹) very short, inclined inwards and directly upwards. Terminal extremity of the beam (fig. 1, *x*), which is unbranched, curved downwards and inwards. Lacrymal pit of great depth and extent, the facial plate of the malar taking part in its floor. Anteorbital vacuity of moderate extent. Ascending rami of the præmaxillæ equalling or exceeding the nasals in length. A strong ridge passes from the root of each pedestal over the orbit, lacrymal pit, and anteorbital vacuity, serving to protect frontal cutaneous glands which lie on its inner surface. Auditory bullæ very

Fig. 1



Cervulus muntjac.

slightly inflated, the tympanohyal abutting against the paroccipital process.

Canines strongly developed in the males, and curved downwards, backwards, and outwards; in the females they are small; and in neither are the pulps persistent.

Rhinarium extensive, completely surrounding the nostrils, the upper border of its internarial portion slightly convex. Prænarial portion of the rhinarium broad, its lateral borders passing sub-vertically downwards to the upper lip. No metatarsal tufts. Tarsus with the navicular, cuboid, and ectocuneiform united. Phalanges of lateral digits absent in both fore and hind extremities. Young spotted (exc. species 1?). Stature small.

Distribution. Indian and South-eastern Palæartic regions.

¹ Prof. Garrod, in his valuable paper to which I have so frequently alluded (P. Z. S. 1877, p. 16), has drawn attention to a law of which the various modifications of the antlers in the Cervidæ are, in his opinion, the result. I have ventured to extend, and in some slight degree to modify, Prof. Garrod's suggestion. The lettering in the woodcuts indicates the parts of the antlers which appear to me to be homologous.

1. *CERVULUS MUNTJAC.*

1780. *Cervus muntjac*, Zimm. Geogr. Gesch. Band ii. p. 131.

1785. — *muntjak et vaginalis*, Bodd. Elench. Anim. vol. i. p. 136.

1867. *Cervulus aureus*, Jerd. Mamm. p. 264.

1873. — *amostylis et tamulicus*, Gray, Hand-list Rum. Mamm. p. 165.

1874. — *muntjac*, Brooke, P. Z. S. 1874, p. 38, fig. 3.

Range. British India, Burmah, Malay peninsula, Sumatra, Java, Hainan, Banka, Borneo.

This species appears to attain a larger size in Java, Sumatra, and Borneo than it does on the mainland; and I think it not improbable that persistent race-characters may eventually be found, distinguishing the Muntjac of these islands from that of British India.

2. *CERVULUS LACRYMANS.*

1871. *Cervulus lacrymans*, Alph. M.-Edw. Nouv. Arch. du Mus. t. vii., Bull. p. 93; and Rech. s. l. Mamm. p. 348, pls. 63, 64.

1872. — *sclateri*, Swinh. P. Z. S. 1872, p. 814.

1874. — —, Brooke, P. Z. S. 1874, p. 40, pl. 8 & fig. 4.

Hab. Moupin (*David*); hills near Hangchow, China (*Swinhoe*).
Type, Mus. d'Hist. Nat. Paris.

3. *CERVULUS REEVESII.*

1838. *Cervus reevesii*, Ogilby, P. Z. S. 1838, p. 105.

1862. *Cervulus reevesi*, Swinh. P. Z. S. 1862, p. 361.

1874. — —, Brooke, P. Z. S. 1874, p. 41, fig. 5.

Range. Southern China from latitude of Canton as far north as Ningpo; Formosa (*Swinhoe*).

2. *ELAPHODUS.*

1871. *Elaphodus*, Alph. M.-Edw. Nouv. Arch. du Mus. p. 93, pl. 7; and Rech. Mamm. p. 353, pls. 65-67.

1874. *Lophotragus*, Swinh. P. Z. S. 1874, p. 452.

Antlers very small, unbranched, supported on slender, long, converging pedestals. Ascending rami of the præmaxillæ very strong, and articulating broadly with the nasals, to which they are inferior in length. No supraorbital ridges or frontal cutaneous glands. Canines in the male massive and long, curved downwards, and not everted. A well-developed frontal tuft. In other respects resembles *Cervulus*, with which genus *Elaphodus* may be united to form the subfamily *Cervulinae*, as proposed by Professor Garrod (P. Z. S. 1876, p. 765).

Distribution. South-Eastern Palæarctic region.

1. *ELAPHODUS CEPHALOPHUS.*

1871. *Elaphodus cephalophus*, Alph. M.-Edw. (*loc. cit. supra*).

Hab. Moupin (*David*). Type, Mus. d'Hist. Nat. Paris.

2. ELAPHODUS MICHIANUS.

1874. *Lophotragus michianus*, Swinh. P. Z. S. 1874, p. 452, pl. 59.

1876. — — —, Garr. P. Z. S. 1876, p. 757, pl. 76.

Hab. Neighbourhood of Ningpo (*Swinhoe*). Type, Mus. Berlin.

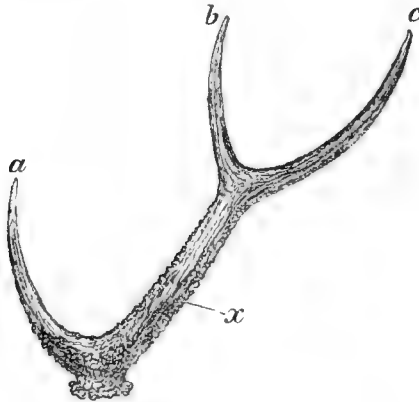
Although I feel sure that Professor Garrod is correct in uniting the genera *Elaphodus* and *Lophotragus*, I have been unable to satisfy myself that the types of the two genera are referable to the same species, as he supposes. I have therefore refrained from amalgamating the Moupin and Ningpo specimens in a single species, and have left the question for the present open.

3. CERVUS.

(*RUSA*, subgen.)

1827. *Rusa* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 309.

Fig. 2.



Cervus (Rusa) aristotelis.

Antlers twice or thrice the length of the head, supported on pedestals of moderate length. Brow-antler (fig. 2, *a*) strong, curved boldly upwards, its axis forming an acute angle with that of the beam. The beam (fig. 2, *x*) bifurcates, giving rise to two strong tines (fig. 2, *b* & *c*). Lacrymal pit of very great depth and extent, its antero-posterior diameter exceeding that of the three upper molars. Anteorbital vacuity very large. Auditory bullæ but slightly inflated and rugose externally (exc. species 8 and 9). Rudimentary canines present in both sexes (exc. species 6, 7, 8, 9). Molars with small supplementary columns.

Rhinarium resembling that of *Cervulus*, but less extensive, its upper internarial margin being slightly concave, and its infranarial portion narrower. Tail of moderate length. Neck maned (exc. species 7 and 9). Colour uniform brown (exc. 7 and 9). Stature diverse, the largest species being amongst the largest, and the smaller almost amongst the smallest of the Cervidæ. Young unspotted (exc. species 7 and 9).

Distribution. Indian region.

(α) *The upper tines (b & c, fig. 2) of nearly equal length in adult animals; in young males the outer and anterior tine (b, fig. 2) the longer.*

1. CERVUS ARISTOTELIS.

1835-7. *Cervus aristotelis*, Cuv. Oss. foss. (ed. 4) tom. vi. p. 84.

Range. British India, Ceylon, Burmah, Siam, Hainan (*Swinh.*).

(β) *The outer tine (b, fig. 2) always surpassing the inner tine (c) in length.*

2. CERVUS EQUINUS.

1825. *Cervus equinus*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 454; ib. (ed. 4) pl. 201. fig. 10.

1839-44. *Cervus equinus*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool. p. 213, pls. 42-45. figs. 7-11.

Range. Borneo, Sumatra (*Müll.*); Singapore (*Brooke*).

I have seen several living specimens of this species, all of which in their much darker colour, more bushy tail, short slightly curved antlers, presented a *tout ensemble* very unlike the common Sambur. On the other hand, I have received skulls and antlers from Siam which are strikingly intermediate between typical specimens of *Cervus aristotelis* and *C. equinus*. It appears to me therefore probable that the existence of these intermediate forms may ultimately render it impossible to maintain the distinction of the species.

3. CERVUS SWINHOII.

1862. *Rusa swinhoii*, Sclat. P. Z. S. 1862, p. 152, pl. 17.

1862. ———, Swinh. loc. cit. p. 364.

1871. ———, Sclat. Trans. Z. S. 1871, p. 333, pl. 39.

Hab. Formosa. Type, Brit. Mus.

This species closely resembles *Rusa equinus*.

4. CERVUS PHILIPPINUS.

1827. *Cervus philippinus*, Ham. Sm., Griff. An. Kingd. vol. iv. p. 147, and vol. v. p. 319.

1877. ———, Brooke, P. Z. S. 1877, p. 51, pl. 8.

Hab. Luzon (Philippines). Type, Mus. d'Hist. Nat. Paris (No. 409 in Cat.).

5. CERVUS MARIANNUS.

1820. *Cervus mariannus*, Desm. Mamm. sp. 669, p. 436.

1877. ———, Brooke, P. Z. S. 1877, p. 53.

Hab. Island of Guam (Marianne Islands). Type, Mus. d'Hist. Nat. Paris (414 a in Cat.).

As I have stated in my paper above referred to, I feel pretty certain that this and the preceding species are identical. I am, how-

ever, now, as then, unable to substantiate this opinion satisfactorily, owing to insufficiency of material.

6. CERVUS NIGRICANS.

1877. *Cervus nigricans*, Brooke, P. Z. S. 1877, p. 57, pls. 9, 10.
Hab. Philippines (exact locality?). Type, in my own collection.

7. CERVUS ALFREDI.

1870. *Cervus alfredi*, Sclat. P. Z. S. 1870, p. 381, pl. 28.
 1877. ———, Brooke, P. Z. S. 1877, p. 59.
Hab. Philippines (Luzon?). Type, Brit. Mus.

8. CERVUS KUHLI.

1839–44. *Cervus kuhlii*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool. p. 223, pls. 44, 45. figs. 12–14.

Hab. Bavian Islands. Type, Mus. Leyden.

This species was originally described by Müller from specimens collected by Diard in the Bavian Islands, to which locality the species, as far as is at present known, is confined. The auditory bullæ in *Cervus kuhli* are largely inflated. By this character the skull may be distinguished from that of any of the Rusine deer with the exception of *C. porcinus*. The skull of *C. kuhli* differs from that of *C. porcinus* in having the facial portion anterior to the orbits much more compressed, and the orbits much more prominent. *C. kuhli* has proportionally much longer limbs than *C. porcinus*; and all the hairs of the back and sides are annulated in the former and not in the latter species. The young of *C. kuhli* are unspotted, which is not the case with those of *C. porcinus*¹. Both species are devoid of upper canines.

9. CERVUS PORCINUS.

1777. *Cervus porcinus*, Zimm. Spec. Zool. Geogr. Quadr. p. 552, sp. 6.

Range. British India, Ceylon, Burmah.

10. CERVUS LEPIDUS.

1844. *Cervus lepidus*, Sund., Pec., Vetensk. Akad. Handl. p. 180, sp. 14.

Hab. Java? Type, Mus. Frankfort?

This is a very doubtful species. Some years ago I saw the type in the museum at Frankfort; and it appeared to me to closely resemble *Cervus sika*. Upon the occasion of my last visit to Frankfort I sought in vain for the specimen, and much fear that it has been destroyed.

¹ *Vide* Sclater, P. Z. S. 1863, p. 224.

(γ) *The inner tine (fig. 3, c) always surpassing the outer tine (fig. 3, b) in length.*

11. CERVUS HIPPELAPHUS.

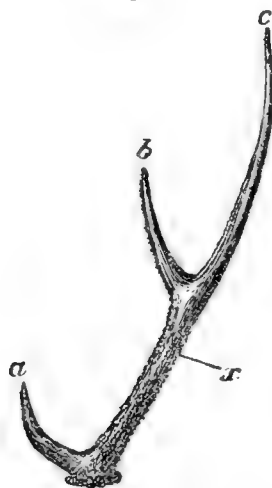
1825. *Cervus hippelaphus*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 40 ;
ib. (ed. 4) tom. vi. p. 77, pl. 166. figs. 31-34.

1839-44. *Cervus rusa*, Müll. Verh. Nat. Gesch. Ned. Bez. Zool.
p. 217, pl. 43, pl. 44. figs. 1-6.

Hab. Java, Borneo (introduced).

Deer resembling *Cervus hippelaphus* in every particular excepting size are found in many of the islands in the Indo-Malayan and Austro-Malayan regions. How far these are the result of natural distribution, or how far their occurrence is attributable to artificial transportation is now most difficult to decide. The best authorities on the fauna of the East Indies, Wallace, Schlegel, and Müller,

Fig. 3.



Cervus (Rusa) hippelaphus.

are inclined to lean towards the latter alternative ; and it is I think certain that the introduction of many of the larger mammals (*e. g.* Monkeys, Pigs, and Deer) into the islands of the Austro-Malayan region has been effected by the Malays, who, according to Wallace, are much given to taming animals and conveying them from island to island. At the same time, the existence of a species of *Felis* peculiar to Timor, and of the singular *Anoa depressicornis* on Celebes, seems to me to necessitate caution in accepting this solution as of universal application.

I shall therefore, for the present, keep the references to *Cervus timoriensis* of Timor and *C. moluccensis* distinct.

12. (a) CERVUS TIMORIENSIS.

1822. *Cervus timoriensis*, Blainv. Journ. de Phys. vol. xciv. p. 267.

1825. — *peronii*, Cuv. Oss. foss. (ed. 3) tom. iv. p. 46.

1833. *Cerf de Timor*, F. Cuv. Mamm. pl. 361.

1852. *Cervus peronii*, Puch. Cerf, Arch. du Mus. vol. vi. p. 409.

1839-44. *Cervus rusa*, var. *timoriensis*, Schl. et Müll. Verh. Ned. Bez. Zool. pp. 212, 220.

Hab. Timor (*Peron, Dussumier*), Samao, and Cambing near Timor (*Schlegel and Müller*).

Specimens examined :—

Type of F. Cuvier's and Pucheran's descriptions, Mus. d'Hist. Nat. Paris.

Müller's types, Mus. Leyden.

Specimen from Leyden, British Museum.

Living specimens in Zool. Gardens of Paris and Rotterdam.

The Timor Deer is a short-legged, thickset animal. The facial profile is remarkably concave, a character which I have frequently noticed in Red Deer and Fallow Deer living under unfavourable circumstances. *C. timoriensis* is not more than half the size of *C. hippelaphus*.

(β) *CERVUS MOLUCCENSIS*.

1830. *Cervus moluccensis*, Quoy et Gaim. Zool. de l'Astrolabe, tom. i. p. 133, pl. 24.

1839-44. *Cervus rusa*, var. *moluccensis*, Schl. et Müll. Verh. Ned. Bez. Zool. pp. 212, 220.

1836. *Cervus moluccensis*, Eyd. et Gerv. Mag. de Zool. tom. vi. p. 26.

1839. ———, Eyd. et Gerv. Zool. de la Favorite, tom. v. Mamm. p. 26.

Hab. Bouru (*Quoy and Gaimard*), Amboina (*Schlegel and Müller*), Celebes (*Beccari*).

Specimens examined :—

Schlegel and Müller's types, Mus. Leyden.

Specimens collected by Beccari, Museo Civico, Genoa.

Cervus moluccensis is a much more delicately built, graceful animal than *C. timoriensis*.

The following are the dimensions of one of Beccari's specimens (♂) :—

	Eng. inches.	Metre.
Total length of skull in a straight line ..	11	0·280
From ant. rim of orbit to free extremity of præmaxillæ	5·7	0·145
Length of upper molar series	1·8	0·045
Length of upper premolar series	1·4	0·035
Greatest length of nasals	3·5	0·088
Length of præmaxillæ	2·9	0·073
Across the lower rims of orbits at the widest place	4·5	0·114
Length of humerus	7·9	0·200
Length of radius	7·2	0·183

	Eng. inches.	Metre.
Length of metacarpal cannon	6·1	0·155
Length of femur	9·7	0·245
Length of tibia	10·5	0·265
Length of metatarsal cannon.	7	0·178

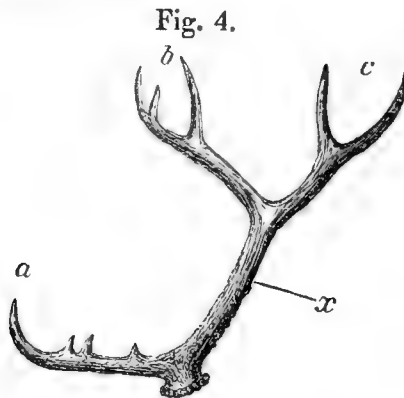
(RUCERVUS, subgen.)

1838. *Rucervus* (subgen.), Hodgs. Ann. Nat. Hist. vol. i. p. 154 ;
J. As. Soc. Beng. vol. x. pt. ii. p. 914 (1841).

Antlers on short stout pedestals. Brow-antlers (fig. 4, *a*) very powerful, projecting forwards at a right angle from the beam, sometimes forked, and frequently developing rudimentary tines from their upper surface. Beam curving boldly forwards along the upper half of its length, and bifurcating into two upper tines, which in their relative dimensions present specific differential characters.

Skull narrower in proportion to its length, in other respects resembling that of *Rusa*: the bullæ are moderately inflated, and the upper and under molars have small supplementary columns. Tail short. Neck maned. Stature large. Young spotted.

Distribution. Indian region.



Cervus (Rucervus) duvauceli.

13. CERVUS DUVAUCELI.

1835-37. *Cervus duvauceli*, Cuv. Oss. foss. (ed. 4) tom. vi.
p. 89, pl. 201. figs. 6-8.

1871. — — —, Scat. Trans. Zool. Soc. vol. vii. p. 346, pl. 36.

Hab. Nepal; Assam; Denwa valley, Mahadeo hills, Central India (*Forsyth*).

14. CERVUS SCHOMBURGKI.

1863. *Rucervus schomburgki*, Blyth, P. Z. S. 1863, p. 155, fig.

1867. — — —, Blyth, P. Z. S. 1867, p. 835, figs. 6-12.

1876. *Cervus schomburgki*, Brooke, P. Z. S. 1876, p. 304,
figs. 1, 2: Sc. P. Z. S. 1877, p. 682.

Hab. Siam. Types, Brit. Mus.

15. CERVUS ELDI.

1842. *Cervus eldi*, auct. anon. Calc. Journ. vol. ii. p. 417.

1867. ———, Beavan, P. Z. S. 1867, p. 759.

1871. ———, Sclat. Trans. Z. S. vol. vii. p. 348, pls. 37, 38.

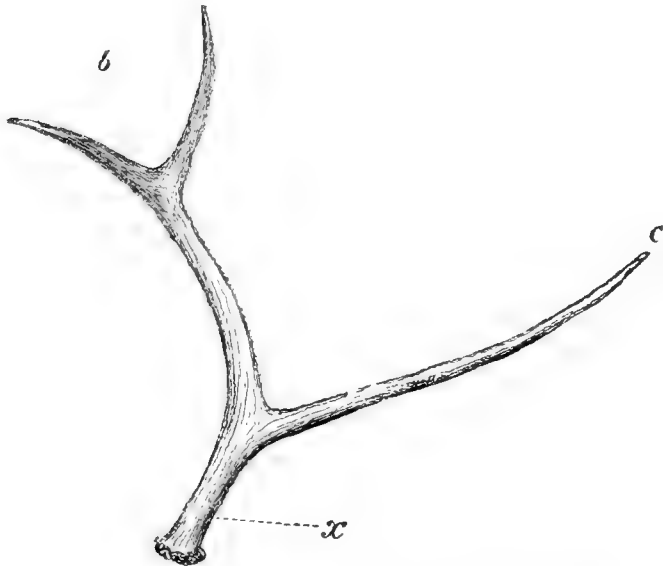
Hab. Burmah; Siam; Hainan (*Swinh.*).

(ELAPHURUS, subgen.)

1866. *Elaphurus*, Alph. M.-Edw. Compt. Rend., and Ann. Sc. Nat. ser. 5, tom. v. p. 380, and Nouv. Arch. du Mus. 1866, vol. ii. p. 27.

Antlers dichotomous, about twice the length of the head, pedestals short. The anterior branch of the antlers (fig. 5, *b*) more strongly developed than the posterior branch (fig. 5, *c*), and in adult specimens bifurcating and carrying many strong tines. Facial portion of the skull much elongated. Ascending rami of the præmaxillæ of great length, articulating broadly with the nasals. Nasals long, and ex-

Fig. 5.

*Cervus (Elaphurus) davidianus.*

panded posteriorly between the large anteorbital vacuities, of which they form the larger part of the superior border. Lacrymal pit deep and large. Upper molars with supplementary columns. Ears small and narrow. Eye small. Tail long. Neck maned. Stature large. Young unspotted?

Distribution. North-eastern Palæarctic region?

16. CERVUS DAVIDIANUS.

1866. *Elaphurus davidianus*, Alph. M.-Edw. Nouv. Arch. du Mus. 1866, vol. ii. p. 27, pls. 4, 5, 6.

1871. ———, Sclat. Trans. Z. S. vol. vii., p. 333, pl. 28.

Hab. Mantchuria. The specimens which have reached Europe

were brought from the imperial park, south of Peking. Types, Mus. d'Hist. Nat. Paris.

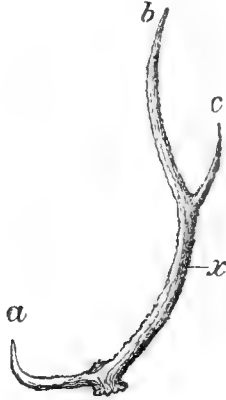
(*Axis*, subgen.)

1827. *Axis* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 312.

Antlers about three times the length of the head, supported on slightly elongated pedestals. Brow-antler (fig. 6, *a*) rising at something less than a right angle from the beam (fig. 6, *x*), which bifurcates at a little above the half of its entire length. Of the tines thus formed, the external and anterior tine (fig. 6, *b*) is much the longer. Skull and rhinarium as in *Rusa*. Upper canines wanting. Molars with small supplementary columns. Both sexes at all ages and seasons distinctly spotted with white. Stature medium.

Distribution. Western portion of the Indian region.

Fig. 6.



Cervus (Axis) axis.

17. *CERVUS AXIS.*

1877. *Cervus axis*, Erxl. Syst. Reg. An. p. 312.

1843. *Axis maculata*, Gray, Spec. Mamm. Brit. Mus. p. 178.

Range. British India; Ceylon.

(*PSEUDAXIS*, subgen.)

1872. *Pseudaxis*, Gray, Cat. Rumin. Mamm. Brit. Mus. p. 70.

Antlers about twice the length of the head, supported on short stout pedestals. Brow-antler (fig. 7, *a*, p. 908) rather short, directed upwards at a rather acute angle with the beam (fig. 7, *x*). A strong tine (fig. 7, *b*) is developed from the anterior surface of the antler at about half its entire length, and a short tine (fig. 7, *d*) from the posterior surface of its upper third.

Lacrymal pit of moderate depth and extent, its antero-posterior diameter being less than that of the three upper molars. Anteorbital vacuity moderate. Auditory bullæ moderately inflated, compressed, and smooth externally. Rudimentary upper canines present in both sexes. Rhinarium as in *Rusa*, with the exception of the internarial portion, which is slightly less prolonged upwards.

Metatarsal tuft whitish. Tail moderate. Neck maned. In summer spotted; in winter uniform brown. Black bands on each side of the pure white anal disk form a cross with the narrow black streak along the dorsum of the tail. Stature medium. Young indistinctly spotted.

Distribution. Eastern Palæartic region.

18. CERVUS SIKA.

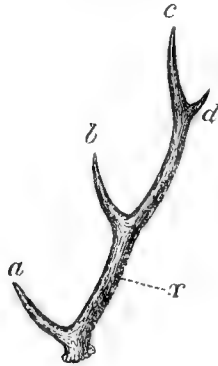
1847. *Cervus sika*, Temm, et Schl. Jap. Mamm. p. 54, pl. 17.

1860. ———, Scat. P. Z. S. 1860, p. 377.

1871. ———, Scat. Trans. Z. S. vol. vii. p. 346, pl. 35.

Hab. Japan. Type Mus. Leyden.

Fig. 7.



Cervus (Pseudaxis) sika.

19. CERVUS EUOPIS?

1874. *Cervus euopis*, Swinh. P. Z. S. 1874, p. 151.

Hab. North China? Type, ♂, Zool. Soc. Menag.

The type, which is still living, differs in no appreciable external characters from ordinary specimens of *Cervus sika*. It was originally received from Tientsin, China. I have not included *C. euopis* among the synonyms of *C. sika*, in the hope of attracting further attention to the subject, as it would be of considerable interest should *C. sika* be found inhabiting the mainland as well as the islands of Japan.

20. CERVUS MANTCHURICUS.

1861. *Cervus pseudaxis*, Gray, P. Z. S. 1861, p. 236, pl. 27 (nec Eydoux et Souleyet?)¹.

1864. ——— *hortulorum* et *mantchuricus*, Swinh. P. Z. S. 1864, p. 169.

1865. ——— *mantchuricus*, Swinh. *in lit.* P. Z. S. 1865, p. 1.

1871. ———, Scat. Trans. Z. S. vol. vii. p. 344, pls. 31, 32.

————— *mandarinus*, Alph. M.-Edw. Rech. Mamm. p. 184, pls. 22, 22 A.

Hab. Neighbourhood of Newchwang. Type, Mus. d'Hist. Nat. Paris.

¹ Cf. *infra*, p. 909.

The Society has within the last few years received living specimens of a *Pseudaxis* from Japan, which are intermediate in size &c. between *P. sika* and *P. mantchuricus*. These have, in my opinion, with excellent judgment, been labelled by the Secretary as *Cervus mantchuricus minor*. I think it probable that, when a larger series, of Pseudaxine Deer are brought together, it will be found impossible to separate them into definite species, but that it will be found necessary to regard them as one species of wide geographical range, endowed with a constitution sufficiently elastic to enable it to support very varied conditions.

24. CERVUS DYBOWSKII ?

1876. *Cervus dybowskii*, Tacz. P. Z. S. 1876, p. 123, fig.

— *axis*? Radde, Reise im Süd. von Ost-Sib. Band i. p. 286.

Hab. Upper Ussuri (Mantchuria).

It is highly probable that, when we know more of this form, it will be found inseparable from *C. mantchuricus*.

22. CERVUS KOPSCHI ?

1873. *Cervus kopschi*, Swinh. P. Z. S. 1873, p. 574.

Hab. Department of Kienchang, Kiangse, China (Swinh.). Types, Brit. Mus.

Also a very doubtful modification. I had an opportunity of examining the types upon their arrival, and could perceive no particulars in which they differ from *C. mantchuricus*.

23. CERVUS TAËVANUS.

1862. *Cervus taëvanus*, Sclat. P. Z. S. 1862, p. 152, pl. 16.

— —, Swinh. loc cit. p. 362.

1871. — —, Sclat. Trans. Z. S. vol. vii. p. 345, pls. 33, 34.

Hab. Mountains of Formosa.

24. CERVUS CASPICUS.

1874. *Cervus caspicus*, Brooke, P. Z. S. 1874, p. 42.

Hab. Mountains S.W. of the Caspian.

Since my original notice of this supposed species, I have received no further information respecting it. The antlers are in my private collection; and I am still unable to refer them to any known species. Although I have placed the species provisionally amongst the Pseudaxine Deer, I am very far from satisfied that this is its proper location. I am chiefly influenced in doing so by an antler I have lately received from Mr. Robertson (H.B.M. Vice-Consul, Busra) from the Karun, which is of decided Pseudaxine character, and may possibly belong to the same species. It is to be hoped that, through the indefatigable exertions of Mr. Robertson, we may ere long have the advantage of seeing this species living in the Society's Menagerie.

I have hesitated in referring the *Cervus pseudaxis* of Eydoux and Souleyet ('Voy. de la Bonite,' vol. i. p. 64, pl. 12) to any species of this subgenus. The specimen is still preserved in the Muséum d'His-

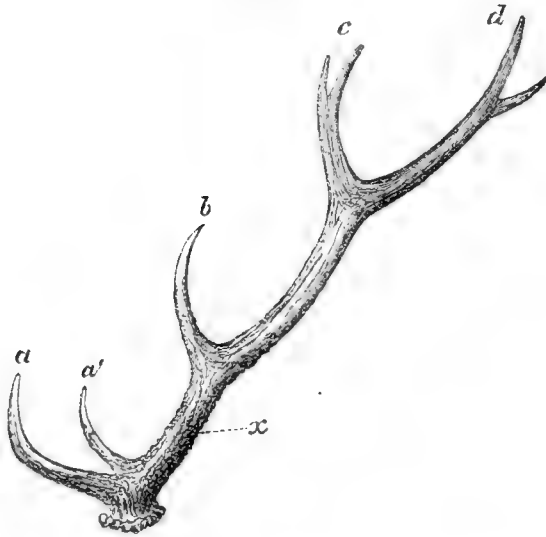
toire Naturelle at Paris; but though I have often carefully examined it, the absence of the skull and the great uncertainty of the locality where it was procured render it impossible to form a decided opinion.

(CERVUS, subgen.)

1766. *Cervus*, Linn. Syst. Nat. (ed. 12) p. 92.

Antlers differ from those of *Pseudaxis* in having a second brow-antler (fig. 8, *a'*) developed above the brow-antler (fig. 8, *a*), in the brow-antler being curved forwards at a right angle with the beam (fig. 8, *x*), and in the posterior coronal tine (fig. 8, *d*) being more strongly developed than the anterior coronal tine (fig. 8, *c*). Skull as in *Pseudaxis*. Molars sometimes with small supplementary columus.

Fig. 8.



Cervus (Cervus) elaphus.

Upper border of the internarial portion of the rhinarium forming an acute angle, with apex directed forwards. Infranarial portion of rhinarium not developed; the prænarial portion much constricted, but spreading out before joining the upper lip. Tail short. Neck maned. A patch of lighter colour than that of the body surrounds the tail. Stature large. Young spotted.

Distribution. Palæarctic and Nearctic regions.

25. CERVUS ELAPHUS.

1766. *Cervus elaphus*, Linn. Syst. Nat. (ed. 12) p. 93.

1837. — *barbarus*, Benn. List An. Gard. Zool. Soc. 13th pub. p. 31 (sine descr.).

Range. Co. Kerry (Ireland); Cumberland; Devonshire; highlands of Scotland, and following islands—Harris, Skye, Rum, Mull, Jura, and Arran; island of Hitteren (Norway); Southern Sweden;

France; Spain; Germany; Austria; Turkey; Greece; Corsica; Sardinia; Province of Constantine (Algeria); Asia Minor; Caucasus.

A comparison of the gigantic antlers of the Red Deer of the 15th, 16th, and 17th centuries preserved in the old hunting Schloss at Moritzburg (built 1540), near Dresden, with the antlers of Red Deer from the islands of Harris or Sardinia, shows in a most striking manner the great variations to which this species is subject. Some of the antlers at Moritzburg measure 50 inches along the outside curve, are 10 inches in circumference round the smallest part of the beam, and the two antlers carry from 24 to 50 points. The spread between the coronal tines of one specimen is 74 inches. Antlers from Harris and Sardinia rarely exceed 30 inches in length, their circumference being about 4 inches; they very rarely carry a larger number than 12 points; and their span seldom exceeds 28 inches.

I have considered the African Deer, *Cervus barbarus*, specifically identical with *Cervus elaphus*. Specimens from Corsica and Sardinia completely bridge over the characters which have been advanced as distinctive of the African and European races. The second brow-antler is rarely developed in the African form; but I have known instances of its occurrence.

26. CERVUS XANTHOPYGUS.

1831. *Cervus elaphus*, Pall. Zoogr. Rosso-Asiat. vol. i. p. 217.

1853. ———, Midd. Sib. Reis. Wirb., Band ii. Th. 2, p. 120.

1859. ———, Schrenck, Reis. u. Forsch. Amurlande, Band i. p. 170.

1862. ———, Radde, Reis. im Süd. v. Ost-Sib. Band i. p. 284.

1867. ——— *xanthopygus*, Alph. M.-Edw. Ann. Sc. Nat. sér. 5, vol. viii. p. 376; Rech. s. l. Mamm. p. 181, pl. 21.

1876. ——— *elaphus*, Prejevalsky, Mongolia (Engl. trans.), vol. i. p. 164.

Range. From the Caucasus to the Altai, and thence round Baikal through Dauria, as far as the Lena and Witim (*Pallas*); thence to the mountains surrounding the sources of the Silimdscha and Bureja (*Middendorff*); along the Amoor, as far eastwards as the Gorin and the Chelasso, and thence southwards to the sea-coast, a few days' journey south of the Bay of Kastries (*Schrenck*); Chinghan Mountains (*Radde*); Munniula Mountains (China, lat. of Pekin) (*Prejevalsky*).

Type, Mus. d'Hist. Nat. Paris.

This species was founded provisionally by Professor Alphonse Milne-Edwards upon the examination of a single specimen, certain cranial peculiarities and the large size of the anal disk deciding him that it was expedient for the time being to keep the form separate from *Cervus elaphus*. It is by no means certain that *Cervus xanthopygus* (should the species ultimately prove distinct from *Cervus elaphus*, which I greatly doubt) is the form found in all the localities above mentioned. The exact limits of the distribution eastwards of *Cervus elaphus*, *Cervus eustephanus* (Blanf.), and *Cervus maral*

(Ogilby) remain as yet unknown; and it is fully possible that the Deer met with by some of the celebrated travellers above quoted may have appertained to one or more of these species.

27. *CERVUS EUSTEPHANUS.*

1875. *Cervus eustephanus*, Blanf. P. Z. S. 1875, p. 638, fig.

Hab. Thian-Shan mountains.

This species is only known from its antlers, which are of immense size. Specimens which I have seen, in their great size and flattened crowns so closely resemble antlers of *Cervus canadensis* that it would be impossible to decide to which species they had belonged.

28. *CERVUS MARAL.*

1840. *Cervus maral*, Ogilby, Rep. Counc. Zool. Soc. 1840, p. 22.

1871. ———, Sclat. Trans. Z. S. vol. vii. p. 336, pl. 29.

Hab. Circassia, Persia.

Cervus maral differs in a marked manner from the allied species *C. elaphus* and *C. cashmeerianus* in the much greater length of its face, as shown by the table given below. The Red Deer of which the measurements are there given was a remarkably large old male. A pair of *Cervus maral*, which lived at large in one of my parks for some years, kept entirely apart from the Red Deer inhabiting the same park. They bred together; and during the rutting-season the species never showed the faintest desire to cross. This was the more remarkable as the old stag Maral, though considerably larger in size, lived in great fear of the Red Deer stags, which during that season roamed incessantly through the park in search of hinds, but at all times treated the female Maral with sovereign disdain, although at any moment they could have taken possession of her had they so desired.

The limits of the eastern range of *Cervus maral* are as yet undefined.

	<i>Cervus maral.</i>		<i>Cervus elaphus.</i>		<i>C. cashmeerianus.</i>	
	Eng. in.	metre	Eng. in.	metre	Eng. in.	metre
Total length of skull ...	18	0·457	16	0·405	16	0·405
From occ. prominence to ant. rim of orbit ...	7·6	0·193	7·5	0·190	7	0·178
From ant. rim of orbit to free extremity of the præmaxillæ.....	11	0·280	9	0·229	8·8	0·223
Length of upper molar and premolar series ...	5	0·127	4·5	0·114	4·5	0·114

29. *CERVUS CASHMEERIANUS.*

1839. *Cervus cashmeerianus*, Falconer, MS. (non vidi).

1871. ———, Sclat. Trans. Z. S. vol. vii. p. 339, pl. 30.

Hab. Cashmere.

The voice of the Cashmere Stag in the rutting-season differs greatly

from that of the Red Deer in the same season. In the former it is a loud squeal ending in a more guttural tone; in the latter it is a distinct roar resembling that of a Panther. The voice of the Wapiti resembles that of the *Cervus cashmeerianus*. The second brow-antler (fig. 8, a') in *Cervus cashmeerianus*, with very rare exceptions, exceeds the brow-antler (fig. 8, a) in length, a peculiarity by which the antlers of this species may be distinguished from those of its allies.

30. CERVUS AFFINIS.

1835. *Cervus affinis*, Hodgs. Journ. As. Soc. Beng. vol. iv. p. 648, pl. 53. fig. 5.

1871. ———, Sclat. Trans. Z. S. vol. vii. p. 343.

Cervus wallichii, Cuv. Oss. foss. (ed. 4) tom. vi. p. 88; and F. Cuv. Hist. Nat. Mamm. pl. 356.

Hab. Choombi valley (Eastern Himalayas).

Should *Cervus wallichii*, Cuv., prove to be specifically identical with *Cervus affinis*, Hodgs., the former name, having priority, must stand. The antlers of the type of Cuvier's original description are, I believe, still preserved in the Museum of the Asiatic Society of Calcutta; F. Cuvier's plate shows them to be of decidedly abnormal growth.

31. CERVUS CANADENSIS.

1777. *Cervus canadensis*, Erxl. Syst. Règn. An. p. 305.

1857. *Cervus canadensis*, Baird, N. Am. Mamm. p. 638.

Range. Alleghany regions of Pennsylvania and Virginia, Northern Wisconsin?, Minnesota, Dakota, Nebraska, Washington, Oregon, and California; 57° N. is its northern limit (*Baird*).

(DAMA, subgen.)

1827. *Dama* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 306.

Antlers about twice the length of the head, palmated, the tines on the upper half of the antler rising from their posterior surface (figs. 9 and 10). Skull resembling that of *Cervus*, but more depressed, broader proportionally, and the orbits more prominent. Auditory bullæ subglobular; no upper canines; rhinarium as in *Cervus*. Tail moderate. Prepuce furnished with a tuft of long hair. Both sexes spotted in summer, unspotted in winter. Black markings on the rump and tail as in *Pseudaxis*. Stature medium. Young spotted.

Distribution. South-western Palæarctic region.

32. CERVUS DAMA.

1766. *Cervus dama*, Linn. Syst. Nat. (ed. 12) i. p. 93.

1843. *Dama vulgaris*, Gray, Spec. Mamm. Brit. Mus. p. 181.

1874. *Cervus dama*, Jeitt. Zool. Gart. 1874, p. 288, (translated by Sclater) Nature, vol. ii. p. 71; vide also Boyd Dawkins, *tom. cit.* pp. 112, 210, 226, and Brooke, *tom. cit.* p. 210, figures.

Range. Greece, Spain, Anatolia, island of Rhodes, Sardinia, N. Palestine; frontier of Tunis in Algeria? (fide *Loche*).

The semidomesticated life which the Fallow Deer has lead for so many generations in the parks of Europe has given rise to many permanent variations of colour. The natural colour of the species in a wild condition in summer is a brilliant fawn with white spots irregularly distributed over the upper parts of the sides and haunches, this spotted region being bounded inferiorly on the sides and posteriorly on the haunches by indefinite white lines. In winter the spots entirely disappear.

Fig. 9.

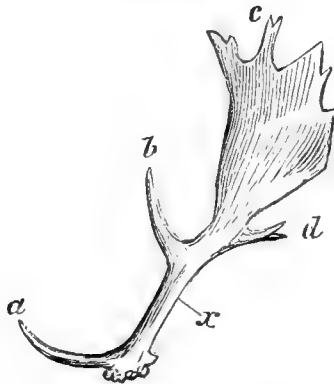
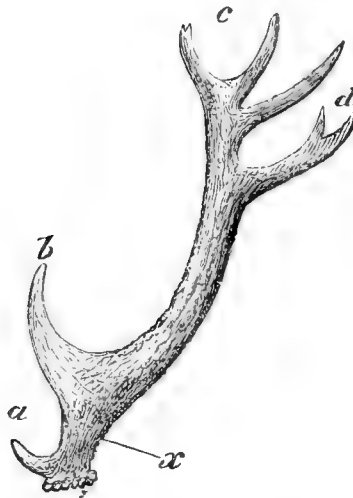
*Cervus (Dama) dama.*

Fig. 10.

*Cervus (Dama) mesopotamicus.*

33. CERVUS MESOPOTAMICUS.

1875. *Cervus (Dama) mesopotamicus*, Brooke, P. Z. S. 1875, p. 265, pl. 38. figs. 1, 2.

1876. ———, Brooke, P. Z. S. 1876, p. 298, figs. 1-4.

Hab. Luristan hills (Persia).

Since my description of the species, the Society has received two living specimens (♂ and ♀) from Mr. Robertson, to whom I was indebted for my original knowledge of its existence. *Cervus mesopotamicus* is a very much larger animal than *C. dama*.

B. Distal ends of metacarpi remaining. (TELEMETACARPI.)

Posterior portion of the nasal cavity not divided by the vomer into two distinct chambers.

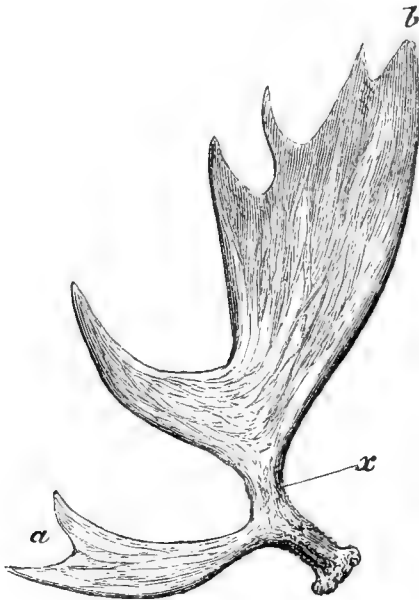
Tuft of hair on the external surface of the metatarsus when present above the centre of that bone. Tuft on inside of the tarsus absent.

4. ALCES.

1827. *Alces* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 303.

Antlers dichotomous, both main branches palmated, the posterior branch (fig. 11, *b*) much surpassing the anterior branch (fig. 11, *a*) in dimensions. Anterior nares of great extent, owing to the shortness of the nasals. Lacrymal pit and anteorbital vacuity moderate.

Fig. 11.



Alces machlis.

Ascending rami of the præmaxillæ long, not articulating with the nasals. Incisors decreasing gradually in size from the central to the external pair.

A very small triangular rhinarium. Head very long, neck and body short, legs very long, stature great. Young unspotted.

Distribution. North Palæartic and Nearctic regions.

ALCES MACHLIS.

1836. *Alces machlis*, Ogilby, P. Z. S. 1836, p. 135.

1834-7. ——— *americanus*, Jard. Nat. Libr. xi. p. 125.

Range. Sweden, Lithuania? Northern Russia, Altai Mountains? mountains to the west of Lake Baikal. Apple Mountains (west of Chita), Khinghan Mountains; forests of the Lower Amoor as far south as the mouth of the Ussuri, in lat. 48° (*Radde*, &c.). "West coasts of America from the shores of the Arctic Ocean nearly to the Columbia River. Further east the northern limit is about 65° and thence through Canada to Maine, New Hampshire, Vermont, and the north parts of New York" (*Baird*).

5. HYDROPOTES.

1870. *Hydropotes*, Swinh. P. Z. S. 1870, p. 90.

Without antlers in either sex. Lacrymal pit deep, small, its antero-posterior diameter about equalling that of m. 3. Anteorbital vacuity moderate. Ascending rami of the præmaxillæ strong. Orbits small and but slightly prominent, their greatest diameter less than the extent of the three upper molars. Auditory bullæ considerably inflated, a portion intervening between the tympanohyal and the paroccipital process. Angle of lower jaw much produced backwards, forming a compressed semicircular prominence. Rami of lower jaw between the dental foramen and the incisors compressed and raised into sharp ridges, the edges of which are everted. Canines of immense size, in the male curved downwards, and gently convergent, pulp non-persistent. Rhinarium ample. No metatarsal tufts. Interdigital glands in hind feet deep, in fore feet slightly developed and shallow. Spigelian lobe of liver Rusiform (*vide* Garrod). Young spotted distinctly, from 3 to 6 at a birth. Stature small.

Distribution. Eastern Palæarctic region.

HYDROPOTES INERMIS.

1870. *Hydropotes inermis*, Swinh. P. Z. S. 1870, p. 89, pls. 6, 7.

1871. ———, Ham. P. Z. S. 1871, p. 258.

1877. ———, Garr. P. Z. S. 1877, p. 789.

Hab. Islands of the Yang-tse-Kiang.

6. CAPREOLUS.

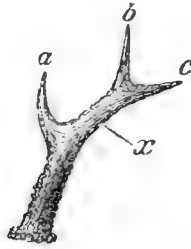
1827. *Capreolus* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 313.

Antlers less than twice the length of the head. Normal number of tines 6. Brow-antler (fig. 12, *a*) developed from the anterior surface of the upper half of the antler, directed upwards. Lacrymal pit very shallow and of small extent. Anteorbital vacuity small. Ascending rami of the præmaxillæ articulating generally but not invariably with the nasals. Auditory bullæ very slightly inflated, their external surface rugose. Angle of lower jaw as in *Hydropotes*. Crowns of central incisors moderately expanded.

Upper margin of the internarial rhinarium running straight across from the upper angle of the nostrils. No infranarial rhinarium. Tail very short. In the female the clitoris is surrounded by a long tuft of hair. Interdigital glands in the fore feet rudimentary, in the hind feet deep, opening by a narrow orifice into a capacious round pouch. Stature small. Young spotted.

Distribution. Central and Western Palæarctic region.

Fig. 12.



Capreolus caprea.

1. CAPREOLUS CAPRÆA.

1843. *Capreolus capræa*, Gray, Cat. Spec. Mamm. Brit. Mus. p. 176.

1844. *Capreolus europæus*, Sund. Pec., Vetensk. Akad. Handl. 1844, p. 184.

Range. Scotland, Southern Sweden, France, Germany, Austria, Hungary, Spain, Tuscany, Greece, Turkey, Northern Palestine, Elburz Mountains (South of Caspian).

I have received a specimen from the last-mentioned locality which differs in no respect from the European specimens.

2. CAPREOLUS PYGARGUS.

1771. *Cervus pygargus*, Pall. Reise Russ. Reichs, vol. i. p. 97, Append. p. 453.

1831. *Cervus capreolus*, Pall. Zoogr. Rosso-As. vol. i. p. 219.

1853. ———, Midd. Sib. Reis. Wirb. Band ii. Th. 2, p. 118.

1859. ———, Schrenck, Reis. u. Forsch. Amurlande, Band i. p. 163.

1862. ———, Radde, Reise Süd. v. Ost-Sib. Band i. p. 277.

Range. Suitable localities in the mountains forming the watershed between the Russian and Chinese empires, in Central Asia; Chingan Mountains (Mantchuria).

Most authors have considered *C. pygargus* to be a large variety of the common Roe. There are, however, in the British Museum two specimens purchased from Brandt and said to be from Siberia, which, in their very much larger size, larger anal disk, and much more hairy ears, differ widely from all specimens of the common species. Specimens of Roe from Mantchuria in the British and Paris Museums are very much smaller than the above-mentioned

specimens; they also differ from the larger specimens and the common Roe in some details of coloration. It is not improbable that the Manchurian Roe may prove to be a third modification of the form.

C. Distal ends of the lateral metacarpals remaining. (TELEMETACARPI.)

Posterior portion of the nasal chamber divided by the vomer into two distinct chambers.

Tuft of hair on the external surface of the metatarsus, when present, below the centre of that bone. Tuft on the inside of the tarsus frequently present.

Ascending rami of the præmaxillæ not reaching the nasals. (Exception, subgen. *Furcifer*.)

7. CARIACUS.

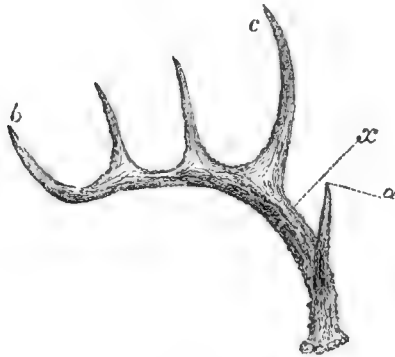
(CARIACUS, subgen.)

1827. *Mazama* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 314 (nec Rafinesque)¹.

1850. *Cariacus*, Gray, P. Z. S. 1850, p. 237.

Antlers not greatly exceeding the head in length, on short pedestals. A short upright brow-antler (fig. 13, *a*) rises from the inner surface of the lower third of the antler some little distance above the burr. The antlers are curved boldly forwards, downwards, and inwards, one or more tines being developed from their

Fig. 13.



Cariacus (Cariacus) virginianus.

convex or posterior surface. Skull elongated and narrow. Lacrymal pit of moderate extent, owing to the very large anteorbital vacuity, which encroaches on the region usually occupied by the facial plate of the lacrymal. Nasals forming the larger part of the superior border of the anteorbital vacuity. Auditory bullæ slightly inflated. No upper canines; molars sometimes with small supplementary columns; central incisors but slightly spatulate. A tuft of long

¹ *Mazama*, of Rafinesque (1817), is too ill-defined to be used for either the Rocky-Mountain Sheep or the Pronghorn; but its publication invalidates its subsequent use in any other sense. Cf. Baird, N.-Am. Mamm. p. 665.

hair on the inner surface of the limb at the tarsal joint. Rhinarium as in *Cervus*. Tail long. Stature medium. Young spotted.

Distribution. Nearctic and northern portions of the Neotropical region.

(a) *Antlers non-dichotomous. Lacrymal of moderate depth.*

1. *CARIACUS VIRGINIANUS.*

1774. *Cervus virginianus*, Bodd. Elench. An. vol. i. p. 136 (non vidi).

1788. ———, Gm. L. Syst. Nat. p. 179.

1857. ———, Baird, N.-Amer. Mamm. p. 643, figs. 12, 13.

Range. From Maine all over the United States east of the Missouri (*Baird*).

2. *CARIACUS LEUCURUS.*

1829. *Cervus leucurus*, Dougl. Zool. Journ. vol. iv. p. 330.

1857. ———, Baird, N.-Amer. Mamm. p. 649, figs. 14-18.

1873. ———, Walsingham, P. Z. S. 1873, p. 561.

Range. N. California, Oregon principally east of the Cascade Mountains (*Walsingham*), Washington, Dakota west of the Missouri, Nebraska (*Baird*).

3. *CARIACUS MEXICANUS.*

1827-1834. *Cervus mexicanus*, Licht. Darst. d. Thiere, Taf. 18.

1827. *Cervus nemoralis*, Ham. Sm., Griff. An. Kingd. vol. iv. p. 137, plate.

1857. ———, Baird, N.-Amer. Mamm. 653.

Range. Texas, Mexico, Sonora (*Baird*); Guatemala, Honduras, Nicaragua (*Salvin*); Costa Rica (*Saussure*); Panama (*Salvin*).

Lichtenstein's types, ♂ et ♀ Mus. Berlin.

The name *Cervus mexicanus* was originally given by Gmelin (Syst. Nat. p. 179) to the Mexican deer of Pennant, described in his 'Quadrupeds,' p. 110. The description and dimensions given by Pennant are reconcilable with the *Cervus mexicanus* of Lichtenstein; but the antlers figured by him (plate xi. figure 3) are certainly not referable to the same form. They appear rather to represent abnormal antlers of *Cariacus macrotis*. The specimens described by Lichtenstein were obtained by Graf von Sack in Mexico, and are in all particulars thoroughly typical of the Deer inhabiting the localities I have given in the range of this species.

I give the dimensions of a female specimen collected by Mr. Salvin in Guatemala, and of the antlers of a male collected by the same gentleman in the same locality. The latter resemble in every particular antlers collected by Mr. Salvin in Nicaragua and Panama. There are not more than six points, inclusive of the brow-antler, on both antlers in any of the specimens collected between Guatemala and Panama; but I have seen specimens from Mexico and Texas with eight and ten tines; and one splendid specimen collected by Mr. Dresser near Friedrichsburg in Texas has as many as fifteen.

The Texan deer are decidedly larger than those inhabiting Guatemala, Nicaragua, and Panama.

Dimensions of *Cariacus mexicanus*.

	Engl. inches.	Metre.
♀ Height at shoulder	27·5	0·700
Length of ears	4·3	0·110
Length of tail exclusive of hair	5·5	0·140
Total length of skull in a straight line	9·0	0·230
Length from ant. rim of orbit to free extremity of præmaxillæ	4·5	0·114
Length of molar and premolar series (upper)	2·7	0·067
♂ Length of antlers	7·5	0·190
Greatest span	8·2	0·210

4. *CARIACUS SIMILIS* ?

1852. *Cervus similis*, Puch. Nouv. Arch. du Mus. 1852, p. 357, pl. 26.

Hab. Unknown. Type, ♂ Mus. d'Hist. Nat. Paris.

5. *CARIACUS SAVANNARUM*.

1848. *Cervus savannarum*, Cab. & Schomb. Reis. Brit. Guian. vol. iii. p. 785.

1852. *Cervus gymnotis*, Puch. Nouv. Arch. du Mus. 1852, p. 348, pl. 25, pl. 23. figs. 2-10.

Hab. Guiana, Venezuela? Type, ♂ Mus. Berlin.

6. *CARIACUS PERUVIANUS*.

1874. *Coassus peruvianus*, Gray, Ann. & Mag. Nat. Hist. (ser. 4) vol. xiii. p. 332.

Hab. Peru. Types, ♀ Brit. Mus., ♀ in my own collection.

The number of specimens from well-authenticated localities at present existing in European collections is far too small to enable me to form any decided opinion respecting the degree of persistency of modification in the above-mentioned forms. Notwithstanding, I think it highly probable that when we possess a sufficiently large series we shall find that *C. peruvianus* and the four preceding species are nothing more than climatic varieties of *C. virginianus*, connected inseparably by every shade of intermediate forms. Mr. Allen, in his valuable paper on the geographical variation of North-American Mammals, especially in respect to size (Bull. U.S. Survey, 1876, p. 304), has conclusively proved that a decrease in size and characteristic development takes place in all mammals the centre of whose area of distribution is in North America, as they spread southwards; and, so far as the materials at my command enable me to judge, I think it probable that the characters upon which *C. leucurus*, *C. mexicanus*, *C. similis*, *C. savannarum*, and *C. peruvianus* have been established as species may be in large measure the result of this law.

7. *CARIACUS GYMNOTIS.*

1833. *Cervus gymnotis*, Wieg. Isis von Oken, p. 965.

Hab. New Granada. Type, ♂ Mus. Berlin.

This is, I think, a distinct species. The large drooping ears (naked externally), the very narrow head, and the remarkably slender, delicate form of the animal render it easily distinguishable from specimens of the allied species.

8. *CARIACUS TOLTECUS.*

1860. *Cervus toltecus*, Sauss. Rev. et Mag. Zool. (ser. 2) tom. xii. p. 247.

Hab. Vera Cruz.

M. Saussure gives 6·9 inches as the total length of the skull of his type specimen, which was a male of at least two years of age, as evidenced by his antlers, which are not those of the first year. If this measurement is correct, *Cariacus toltecus* is a very small species, one third smaller than *C. mexicanus* from the same locality.

(β) *Antlers dichotomous. Lacrymal pit deep.*

9. *CARIACUS MACROTIS.*

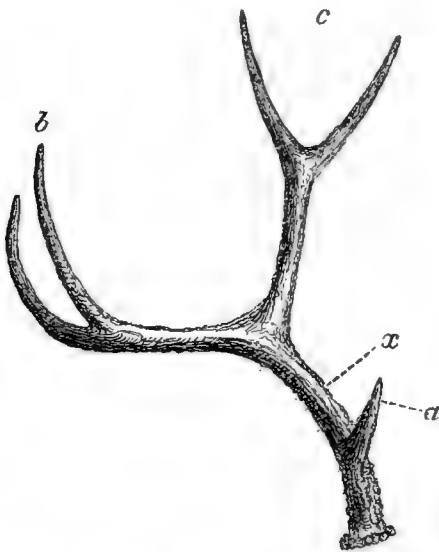
1823. *Cervus macrotis*, Say, Narr. Long's Exp. vol. ii. p. 88.

1857. ———, Baird, N.-Amer. Mamm. p. 656.

1873. ———, Walsingham, P. Z. S. 1873, p. 561.

Range. Oregon, Nebraska, Dakota west of the Missouri, Colorado, Kansas.

Fig. 14.



Cariacus (Cariacus) macrotis.

10. *CARIACUS COLUMBIANUS.*

1829. *Cervus macrotis*, var. β. *columbianus*, Rich. Faun. Bor.-Am. p. 257.

1848. *Cervus lewisii*, Peale, Mamm. Birds U.S. Expl. Exp. p. 39 (fide Baird).

1850. *Cariacus punctulatus*, Gray, P. Z. S. 1850, p. 239, pl. 28.

1857. *Cervus columbianus*, Baird, N.-Amer. Mamm. p. 659.

Range. California, Oregon, and Washington west of the Cascade Mountains.

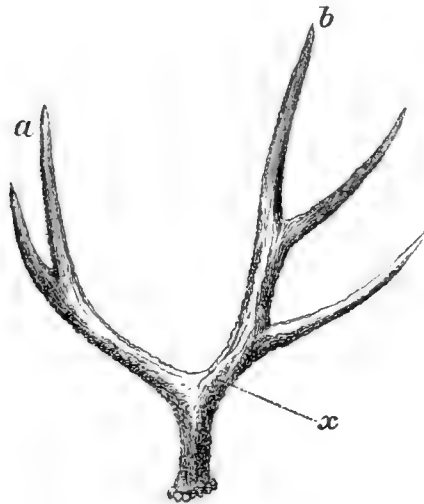
This species is about one third smaller than *C. macrotis*, which it otherwise closely resembles. The two species are found on the same ground in Washington.

(BLASTOCERUS, subgen.)

1850. *Blastocerus*, Gray, P. Z. S. 1850, p. 237.

Antlers slightly exceeding the head in length, on short pedestals. They are dichotomous, the anterior branch (figs. 15 and 16, *a*) inferior to the posterior branch (*b*) in development. In adult specimens the former sometimes, the latter always bifurcates. Lacrymal

Fig. 15.



Cariacus (Blastocerus) paludosus.

pit deep. Skull in all essential particulars resembles that of *Cariacus*. Central incisors very slightly spatulate, and exceeding the pair next to them but slightly in size. Tail short. No metatarsal tuft. Tarsal tuft present.

Distribution. Central and Southern Neotropical region.

11. CARIACUS PALUDOSUS.

1820. *Cervus paludosus*, Desm. Mamm. p. 443.

—— —, Licht. Darst. pl. 17 (1827-1834).

1872. —— —, Hensel, Beitr. Kenntn. Säug. Süd-Bras. p. 95.

Range. South Brazil, Paraguay, Rio Grande do Sul, Uruguay.

12. *CARIACUS CAMPESTRIS*.

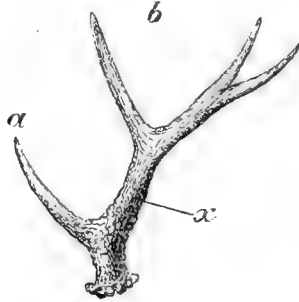
Cervus campestris, F. Cuv. Dict. Sc. Nat. tom. vii. p. 484.

— — —, Licht. Darst. pl. 19 (1827–1834).

— — —, Hensel, Beitr. Kenntn. Säug. Süd-Bras. p. 96 (1872).

Range. Paraguay, Uruguay, Buenos Ayres, N. Patagonia.

Fig. 16.



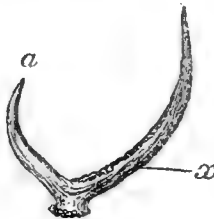
Cariacus (Blastocerus) campestris.

(*FURCIFER*, subgen.)

1850. *Furcifer*, Gray, P. Z. S. 1850, p. 236.

Antlers the length of the head, with a strong brow-antler (fig. 17, *a*) curved forwards and upwards at a right angle to the simple beam (fig. 17, *x*), which is gradually attenuated to a sharp point. The entire beam is curved gently forwards. Lacrymal pit deep, but of moderate antero-posterior extension. Auditory bullæ very slightly

Fig. 17.



Cariacus (Furcifer) antisiensis.

inflated, their external surface rugose. Ascending rami of the præmaxillæ articulating with the nasals. Free extremities of the nasals forming together a single point. Central incisors very slightly exceeding the pair next to them in size, and but slightly spatulate. Upper canines in both sexes. Rhinarium as in *Cariacus*. Stature medium.

Distribution. South-western Neotropical region.

13. *CARIACUS CHILENSIS*.

1846. *Cervus chilensis*, Gay et Gerv. Ann. d. Sc. Nat. 1846, p. 91.

1849. *Capreolus leucotis*, Gray, P. Z. S. 1849, p. 64, Mamm. pl. 12.

1875. *Cervus chilensis*, Sclat. P. Z. S. 1875, p. 45, figure.

Range. Andes "from Magellan to near Santiago, but far more rare in the north than in the southern portion of its range" (Reed, P. Z. S. 1875, p. 44). Type, ♀ Mus. d'Hist. Nat. Paris.

14. *CARIACUS ANTISIENSIS.*

1834. *Cervus antisiensis*, D'Orb. Nouv. Arch. du Mus. iii. p. 91.

1869. *Anomalocera huamel*, Gray, Scient. Opin. 1869, p. 384.

1869. *Xenelaphus huamel*, Gray, P. Z. S. 1869, p. 497.

1872. *Xenelaphus leucotis*, Gray, Cat. of Rum. Mamm. p. 89.

1872. *Xenelaphus anomalocera*, Gray, Ann. Nat. Hist. (ser. 4) vol. x. p. 445.

1873. *Xenelaphus chilensis*, Gray, Ann. Nat. Hist. (ser. 4) vol. xii. p. 161.

1874. *Furcifer chilensis*, Gray, Ann. Nat. Hist. (ser. 4) vol. xiii. p. 332.

1875. *Cervus antisiensis*, Sclat. P. Z. S. 1875, p. 46.

Range. Peruvian Andes. Type, ♂ Mus. d'Hist. Nat. Paris.

Naturalists owe a debt of gratitude to Mr. Sclater for the care and clearness with which he has unravelled the meshes of confusion in which the synonymy of the two very distinct species, *Cariacus chilensis* (Gay) and *C. antisiensis* (D'Orb.), was formerly enveloped. There is not the smallest foundation for a third species of *Furcifer*. The type of *Xenelaphus leucotis*, &c. of Dr. Gray is preserved in the British Museum, and is undoubtedly nothing but a very fine old male *C. antisiensis* with strongly developed abnormal antlers.

(*COASSUS*, subgen.)

1827. *Subulo* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 318¹.

1850. *Coassus*, Gray, P. Z. S. 1850, p. 240.

Antlers simple spikes not exceeding half the length of the head (fig. 18). Skull resembling that of *Cariacus*, the auditory bullæ less inflated and the facial profile more arched. Molars sometimes

Fig. 18.



Cariacus (Coassus) rufus.

with supplementary columns. Canines of uncertain occurrence. Rhinarium ample, resembling that of *Cervulus*. No metatarsal tuft. Tarsal tuft present. Stature small. Form heavy, with the back much arched. Young spotted.

Distribution. Neotropical region.

¹ If this name, which has been totally unused, were to be revived, it would take precedence of *Cariacus* as the title of the whole genus. But it is too close to *Subula* (Mollusca) of Schumacher, 1817.

15. CARIACUS RUFUS.

1817. *Cervus rufus*, F. Cuv. Dict. Sc. Nat. vol. vii. p. 485.

Hab. Surinam. Types, Mus. d'Hist. Nat. Paris, ♀ ad. (No. in Cat. 532), young (No. in Cat. 527).

16. CARIACUS SIMPLICICORNIS.

1827. *Cervus simplicicornis*, Ham. Sm., Griff. An. Kingd. vol. v. p. 318.

Hab. Brazil (*St.-Hilaire, Lalande*), New Granada (*Brooke*). Types:—Mus. d'Hist. Nat. Paris, ♀ (No. 525 in Cat.); skull of same, Mus. d'Anat. Comp. Paris (in Cat. 2208); skull of ♂ collected by *St.-Hilaire*, in Mus. Anat. Comp. (in Cat. 2225).

17. CARIACUS RUFINUS.

1851. *Cervus rufinus*, Puch. Arch. du Mus. p. 491, pl. 30; id. Rev. Mag. Zool. 1851, p. 561.

Hab. Ecuador (*Pucheran*), Guatemala (*Salvin*). Type, ♂ Mus. d'Hist. Nat. Paris.

18. CARIACUS NEMORIVAGUS.

1817. *Cervus nemorivagus*, F. Cuv. Dict. Sc. Nat. vol. vii. p. 485.

Hab. Surinam. Types, stuffed head of ♂ and skull of same (Cat. 2223), Paris, in Mus. d'Hist. Nat. and Mus. d'Anat. Comp.

I append a table of the comparative measurements of the four last-mentioned species. The cranial measurements are taken from adult females.

	<i>C. rufus.</i>		<i>C. simplicicornis.</i>		<i>C. rufinus.</i>		<i>C. nemorivagus.</i>	
	Engl. inches.	metre.	Engl. inches.	metre.	Engl. inches.	metre.	Engl. inches.	metre.
Height at shoulder ...	27	0·685	21	0·535	19	0·485	19	0·485
Total length of skull in a straight line ...	9·2	0·235	7·10	0·200	6·5	0·165	6·2	0·157
From anterior rim of orbit to free extremity of præmaxillæ	4·9	0·124	3·10	0·098	3·3	0·083	3·1	0·078
Length of upper molar and premolar series	2·7	0·068	2·3	0·058	2·1	0·053	2	0·050
Greatest width between the orbits, measuring from the lower rim	3·6	0·090	3·2	0·080	3	0·076	2·7	0·068

From this it will be seen that *Cariacus rufus* is considerably the largest, and *C. nemorivagus* the smallest and most delicately formed species. *C. rufus* is red at all ages, and very heavily built. *C. simplicicornis* is brown when young, never attains so brilliant a colour as

C. rufus, and is much more gracefully shaped. *C. rufinus*, when adult, is of a beautiful shining red, with the face and fore limbs strongly shaded with bluish brown, as shown in exaggeration in Pucheran's figure (*vide supra*); and *C. nemorivagus* is of a dull pepper-and-salt brown, and never becomes red at any age.

19. CARIACUS SUPERCILIARIS.

1850. *Coassus superciliaris*, Gray, P. Z. S. 1850, p. 242, pl. 25.
Hab. Brazil (*fide Gray*).

20. CARIACUS WHITELYI.

1873. *Coassus whitelyi*, Gray, Ann. & Mag. Nat. Hist. (ser. 4) xii. p. 163; id. Hand-list Edent. &c. 1873, p. 162, pl. 32. fig. 2.

Hab. Peru. Founded on a single skull of an immature animal in Brit. Mus. (No. in Cat. 73. 6. 27. 2).

It is now many years since I commenced the study of this difficult group of Cervidæ; but although I have examined the specimens contained in nearly all the continental museums, and made a private collection of some importance, I must confess that I am still far from a satisfactory understanding of the subject. The complete absence of cornual and cranial characters renders it exceedingly difficult to grasp the characteristic peculiarities of the different modifications of the form, six or seven of which are, I think, probably persistent, and worthy of specific recognition by naturalists. In the above list I have enumerated all the species (or supposed species) of which the types are extant, and must leave it to the future to decide whether they are valid or not. There is still much valuable work to be done amongst the Cervidæ by collectors in South America, well-authenticated specimens from Rio Grande do Sul, Paraguay, South Brazil and Bolivia being almost a blank in European museums. The type of *Coassus auritus*, Gray, not having been preserved, I have omitted the name from my list, as without the type it will be impossible to decide with any certainty upon what species Dr. Gray's name was conferred.

8. PUDUA.

1850. *Pudu* (subgen.), Gray, P. Z. S. 1850, p. 242.

Antlers minute simple spikes. Lacrymal pit oval, very deep, its antero-posterior extent slightly exceeding m. 3. Ascending rami of the præmaxillæ reaching the nasals, which are considerably expanded between the moderate anteorbital vacuities. Auditory bullæ as in *Coassus*. Molars without supplementary columns. Canines absent. Central incisors slightly expanded, but exceeding those external to them very much in size. Muzzle as in *Cervulus*, but with the internarial and infranarial portions less extensive. Neither tarsal nor metatarsal tufts. Ectocuneiform, navicular, and cuboid bones in tarsus united. Stature very small.

Distribution. Chilian Andes.

PUDUA HUMILIS.

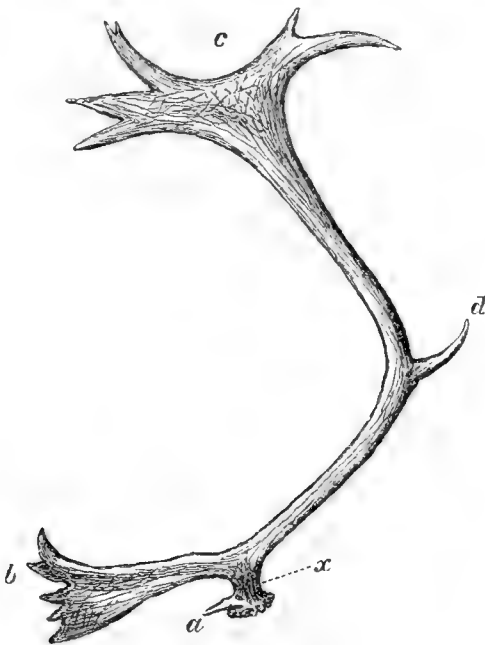
1831. *Cervus humilis*, Benn. P. Z. S. 1831, p. 27,1871. *Cervus pudu*, Sclat. P. Z. S. 1871, p. 238, pl. 17.*Hab.* Chilian Andes.

9. RANGIFER.

1827. *Rangifer* (subgen.), Ham. Sm., Griff. An. Kingd. vol. v. p. 304.

Antlers developed in both sexes; a strong brow-antler (fig. 19, *a*) is developed sometimes on both, but more frequently on only one antler, that on the other being a mere rudiment. The brow-antler, when fully developed, is directed downwards parallel with the face and palmated anteriorly. A short distance above the brow-antler another similar tine (fig. 19, *b*) is developed. Above this the antler forms a bold curve, the concavity forwards, its extremity (fig. 19, *c*) is palmated; and a short tine (*d*) is developed from its posterior surface at half

Fig. 19.

*Rangifer tarandus.*

its length. Portion of the skull anterior to the horns elongated, that posterior to it remarkably short. Lacrymal pit and anteorbital vacuity of moderate dimensions, the former shallow. Nasals much expanded posteriorly. All the teeth remarkably small in proportion to the skull; the incisors decrease very gradually in size from the central to the external pair, they are none of them spatulate. Vomer produced backwards nearly as far as the basilar suture. Frontal

process for the support of the antlers carried back into the parietals, this region of the skull being much restricted. No rhinarium.

Ears and tail short, neck maned, stature large. Young unspotted.
Distribution. Northern Nearctic and Palæarctic regions.

RANGIFER TARANDUS.

1766. *Cervus tarandus*, L. Syst. Nat. (ed. 12) p. 93.

1829. *Cervus tarandus* et var. *artica* et *sylvestris*, Rich. Faun. Bor.-Am. pp. 238-251 (1829).

1857. *Rangifer caribou* et *R. grænlandicus*, Baird, N.-Amer. Mamm. pp. 633, 634; American Reindeer, Hardy, 'Forest Life in Acadie,' pp. 120-163.

Range. Norway, Lapland, Spitzbergen, Nova Zembla, Western Siberia from the Arctic Sea, about as far south as lat. 60° in Eastern Siberia to lat. 55° in the Yablonoi Mountains, to lat. 49° on the Japanese sea-coast, and to lat. 46° on the island of Saghalien; Russian America from the Arctic Sea, somewhat further south than the Arctic circle? British America from Melville Island to Great Slave Lake in the west, and in the east from Labrador to Nova Scotia, Greenland, Newfoundland.

There are many well-marked varieties of Reindeer in this wide and varied range; but the study of a considerable series has only shown me the difficulty, if not impossibility, of defining them; and consequently I have been constrained to include all under one title in this synopsis, although I think the differentiation of the form according to latitude and locality merits further attention.

EXPLANATION OF PLATE LV.

Fig. i. Left fore limb of *Capreolus capræa*, selected as an example of the TELEMETACARPI.

3. Metacarpal cannon, seen from the inside. 4. Ditto, seen from the outside. 3', 4'. Phalanges of the 3rd and 4th metacarpals, which coalesce to form the metacarpal cannon. 2-5. Distal extremities of the 2nd and 5th metacarpals. 2'-5'. Their respective phalanges. *r-r'*. Place of origin and insertion of the round ligament which prevents the upward displacement of the 2nd and 5th metacarpals. *t*. Trapezium. *tr* and *o*. Confluent trapezoid and os magnum. *u*. Unciform.

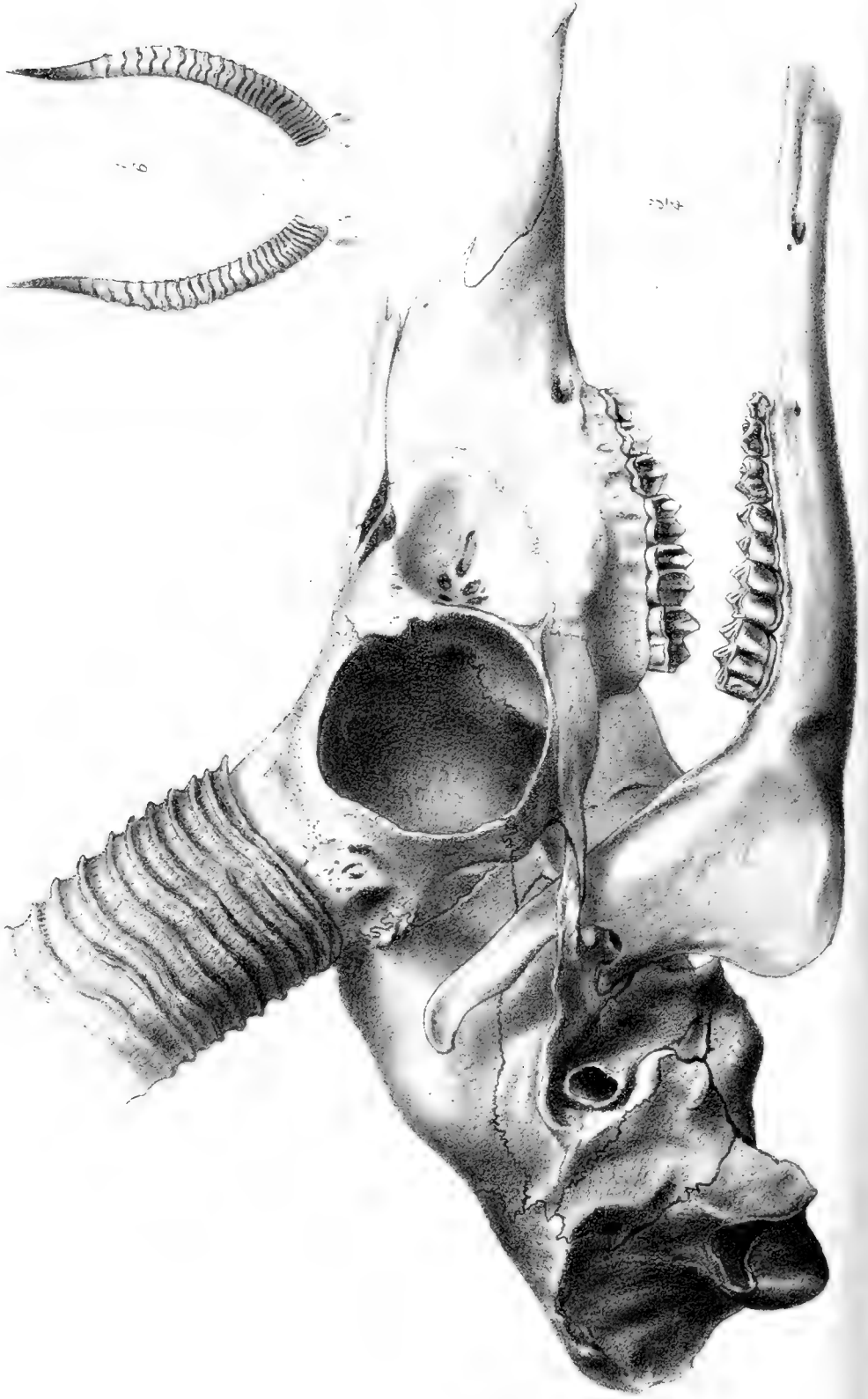
ii. Left fore limb of *Cervus elaphus*, selected as an example of the PLESIO-METACARPI.

2, 5. Proximal extremities of the 2nd and 5th metacarpals. *s*. Metacarpo-phalangeal sesamoids. *p*. Proximal phalanges of 2nd and 5th digits. (The remainder of the lettering as in fig. i.)

iii. Antler of the present Castle-Caldwell Fallow Deer, showing the excessive development of the tine, *d*, and consequent contraction of the palm, *c*.

iv. Antler of one of the males from which the Castle-Caldwell herd of Fallow Deer are descended.





2. On a new Species of Gazelle from Western Africa. By
Sir VICTOR BROOKE, Bart., F.Z.S.

[Received November 19, 1878.]

(Plate LVI.)

I have the pleasure of bringing before the notice of the Society a new and exceedingly interesting form of Gazelle. As is well known, the different species into which the genus *Gazella* is divisible (vide P. Z. S. 1873, p. 535) resemble each other so closely that it is often very difficult to define them. The differences exist in nature, let their taxonomic value be what it may; but in many cases they absolutely baffle verbal description.

In the form at present under consideration there is no such difficulty. Although the materials at my command consist only of the skulls of three males, with a small portion of the skin of the head attached to one of them, characters are apparent which separate the form from all known Gazelles. Indeed my only doubt is as to whether the species should not constitute the type of a new subgenus. The specimens belong to Mr. Gerald Waller, and it is through his courtesy that I have the opportunity of exhibiting them this evening. Mr. Waller tells me that the skulls were procured on the mainland of Africa, north of the island of Zanzibar, about lat. 3° S. and long. 38° E. He is unfortunately unable at present to give any further particulars respecting the species.

The new Gazelle differs from all hitherto described species in the very great backward prolongation of the occiput. This extension is principally gained by the great size of the supraoccipital bone and the prominence of the occipital crest. The skull is much more depressed, the facial axis forms a more obtuse angle with the cranial axis, and the rami of the lower jaw are more slender than in any known Gazelle. The ascending rami of the præmaxillæ are remarkably thick, and do not nearly reach the nasals. In all other Gazelles the molars and premolars are decidedly hypsodont; in the new species they are as decidedly brachyodont, and, in comparison with the skull, remarkably small. The horns do not differ greatly from those of *Gazella dorcas*; they are, however, more massive and more laterally compressed. The skin of the head is of a uniform foxy red, with white marks under the eye. Mr. Waller has expressed a desire that the species should be named after his brother, who lost his life in Africa. I have therefore much pleasure in proposing the name *Gazella walleri* for the new form.

The following table of the comparative dimensions of *Gazella walleri* and *Gazella dorcas*, and the Plate (LVI.), will render further description unnecessary.

	<i>G. walleri</i> ♂.		<i>G. dorcas</i> ♂.	
	English inches.	metre.	English inches	metre.
Total length of skull.....	9.2	0.234	7.5	0.190
From anterior rim of orbit to free extremity of the præmaxillæ	4.3	0.108	3.6	0.090
From anterior rim of orbit to the occipital protuberance	6.0	0.152	4.0	0.101
From centre of the external auditory meatus to occipital protuberance	2.4	0.061	1.0	0.025
From the centre of external auditory meatus to posterior rim of orbit...	1.9	0.046	1.6	0.041
Length of the præmaxillæ	2.1	0.053	2.2	0.055
Length of basicranial axis	3.7	0.093	2.8	0.071
From inferior rim of orbit to alveolus of third upper molar .....	.9	0.022	1.1	0.028
Greatest depth of the rami of the lower jaw in the portion underlying the molars .....	.6	0.015	.8	0.020
Length of diastema of the lower jaw	2.1	0.053	1.4	0.035
Length of upper molar series	1.15	0.029	1.4	0.035
" " pre-molar series ...	.8	0.020	.8	0.020
" " lower molar series	1.3	0.032	1.5	0.038
" " pre-molar series ...	.7	0.018	.8	0.020
Length of horns round the curve ...	12.0	0.305	9.0	0.230
Their circumference.....	4.4	0.111	3.8	0.096

3. Notes on the Anatomy of *Indicator major*. By A. H. GARROD, M.A., F.R.S., Prosector to the Society.

[Received October 25, 1878.]

Through the kindness of Mr. R. B. Sharpe I have had the opportunity of examining a spirit-preserved specimen of *Indicator major*, from Fantee, which enables me to lay before the Society some fresh facts in its anatomy confirmatory of its non-Cuculine affinities.

In his contributions to Orr's edition of Cuvier's 'Animal Kingdom' (1840), the late Mr. E. Blyth referred the Honey-guides to the Woodpeckers as their nearest allies¹; and this idea was expanded by him two years later in the Journal of the Asiatic Society of Bengal². In 'The Ibis' for 1870³, Mr. Sclater brought forward fresh facts in proof of the non-Cuculine affinities of the genus, and proposed to place it next to the Capitonidæ, with which, or with the Coliidæ, Mr. Blanford also in the same year showed it had its nearest relationships⁴.

The following observations tend to prove the correctness of the conclusions arrived at by the two last-mentioned ornithologists, and the error of imagining that *Indicator* is related to the Cuculidæ.

¹ *Loc. cit.* p. 215.

² Vol. xi, p. 167, 1842.

³ p. 176.

⁴ Observations on the Geology and Zoology of Abyssinia, 1870, p. 308.

Pterylosis.—This has been recorded by Nitzsch in his ‘Pterylography;’ and it seems more than strange that the characteristically Picine distribution of its feather-tracts did not lead that able ornithologist to recognize its true relationships. He retained it among the Cuculidæ.

My study of Pterylography has led me to look upon the nature of the dorsal tract as all-important in determining to which great group of Birds, the Homalognatæ or Anomalognatæ¹, any doubtful family belongs. When the dorsal tract develops a fork *between* the shoulder-blades a bird is homalognatous; when the tract runs on unenlarged to near the lower ends of the scapulæ, then it is anomalognatous. Again, among the Anomalognatæ, when the pectoral tract bifurcates into an outer and an inner branch just after commencing on the chest, then the bird is one of the Piciformes, and has a tufted oil-gland; when the pectoral tract does not bifurcate at all, or only at the lower end of its pectoral portion, but is only increased in breadth instead, then the bird is Passeriform², and has a naked oil-gland. Exceptions to these rules scarcely exist.

In that the dorsal tract of *Indicator* does not form a fork, but remains narrow, between the shoulder-blades, it is anomalognatous—the Cuculidæ being homalognatous; in that it possesses a free outer pectoral band to the anterior tract, it is a Piciform bird. The oil-gland is also tufted.

A careful examination of the skin proves that the genus agrees more closely in its feather-tracts with the Picidæ, Capitonidæ, and Ramphastidæ than Nitzsch’s figures would tend to prove. To me it is evident that there is a communication between the thoracic extremity of the inferior neck-tract and the upper extremity of the humeral tract, as in the Picidæ, Capitonidæ, and Ramphastidæ. Again, in the three groups just named there is a great weakness or an entire disappearance for a short distance of the dorsal tract towards the lower extremity of the interscapular region. In *Indicator* this same weakness exists; so that, with the exception of a single feather in the middle line, the appearance of the region in question is much more like the arrangement in *Ramphastos* than in Nitzsch’s figure of the genus. On the ventral surface of the fleshy tail I find a median subcircular space surrounded by feathers, as in the Picidæ and Ramphastidæ, as well as in the Capitonidæ apparently. The caudal termination of the dorsal tract agrees with the account given by Nitzsch. I could find no trace of a duplication of the lumbar tract. In the possession of twelve rectrices *Indicator* differs from the Capitonidæ and Ramphastidæ, which have ten, like the Picidæ.

Skeleton.—The specimen of the skull of *Indicator* examined by Professor Huxley³ at Mr. Selater’s request was too imperfect for exact description. The considerable interval between the maxillo-palatines is recorded by him. I am now able to add that the vomer

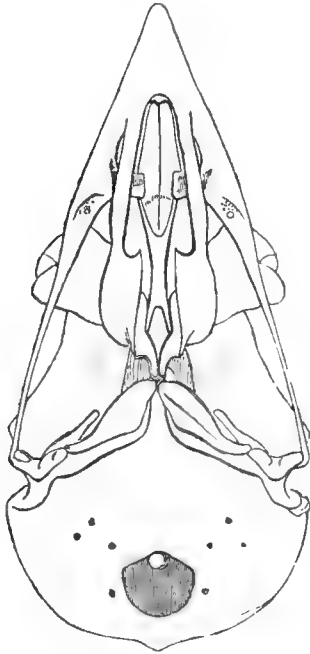
¹ Vide P. Z. S. 1874, p. 116, for definition of these terms.

² Vide P. Z. S. 1874, p. 119.

³ Ibis, 1870, p. 179.

is but little different from that of the *Capitonidæ*. The palate of *Megalæma asiatica* is described and figured by Professor Parker in the 'Transactions of the Linnean Society'¹. It is truncated in front and strongly bifid, the cornua running forward to blend with the maxillo-palatines. These last-named inward-directed processes of the maxillary bones blend with the mid-nasal septum in some

Fig. 1.

Palate of *Indicator*.

specimens of *Megalæma asiatica*, whilst in others they remain free from one another, separated by an inconsiderable interval. In *Pogonorhynchus bidentatus* and *Tetragonops ramphastinus* they completely blend across the middle line, without the nasal median septum persisting in front of the junction. So these two last-named species, and most probably all the species of the genera, are genuinely desmognathous.

The point in which the truncated vomer of the *Capitonidæ* most differs from that of the order *Passeres*, is that in the former the truncation occurs behind the line joining the posterior angles of the maxillo-palatines, whilst in the latter the truncation occurs some way in front of the same transverse line. The limbs of the forked vomer in the *Capitonidæ* run forward to meet the posterior angles of the maxillo-palatines; in the *Passeres* they continue, often in cartilage alone, to the nasal labyrinth.

¹ 2nd series, Zoology, vol. i. p. 122, and pl. 23.

In *Indicator* the vomer is less ossified than in the Capitonidæ above mentioned, and is smaller; the fork is slenderer and has longer limbs, which, however, quite typically join the well separated maxillo-palatines (which advance but slightly beyond the inner margins of the palatine bones) at their posterior angles.

As the Ramphastidæ have to be mentioned so frequently in connexion with the genus under consideration, it may be useful to refer to the vomer of this family. By Prof. Huxley it is included among his Coccygomorphæ, in which the vomer, if present, is pointed anteriorly. Prof. Huxley further remarks¹ that in *Ramphastos* "the antero-internal angles of the palatines not only meet, but are united by bone." But close examination demonstrates a *large tabular truncation* of the anterior extremity in the Ramphastine vomer, which I cannot help thinking Prof. Huxley interpreted as a median osseous bridge formed by the (supposed) blending of the antero-internal angles of the palatines. Figure 2 represents the vomer of

Fig. 2.



Palatal aspect of the truncated vomer of *Ramphastos ariel*, with the posterior parts of the palatine bones retained in union with it.

Ramphastos ariel, freed from its surroundings. It does not send forward limbs to join the maxillo-palatines [which are those of the desmognathous Capitonidæ inflated], but helps by its terminal expansion to complete, by contact or ankylosis with the palatine on either side, the posterior wall of a cavity in the dried skull, bounded laterally and superiorly by the inflated and infused maxillo-palatines, anteriorly by the nasal septum together with ossifications in the nasal cartilages associated with it.

In the 'Transactions' of the Linnean Society² Prof. Parker describes the vomer of *Ramphastos toco* as double, it being composed of a smaller posterior and a larger anterior bone, the truncated nature of which I am not able to infer from the account given.

The Capitonidæ, the Ramphastidæ, and *Indicator* are intimately associated, therefore, so far as the vomer is concerned. Nevertheless the proportionally great length of the limbs of the vomerine fork in the last-named form, and the considerable separation of its small

¹ P. Z. S. 1867, p. 444.

² Linn. Trans. 2nd ser. vol. i. p. 127.

maxillo-palatines, are characters which tend to bring it nearer than either of the others to the Picidæ.

The pterygoid bones of *Indicator* are much flattened from above downwards, with thin outer and inner margins, which are curved, a triangular groove on the palatal surface running from end to end. In the Capitonidæ and Ramphastidæ these bones are much more cylindroid, the superior surface alone being thin-edged, whilst in the Picidæ they are thin, as in *Indicator*, but differ in possessing a large anteriorly directed process springing from the superior surface of each.

In *Indicator* there is a small notch in the middle of the superior margin of the osseous orbit, no trace of which exists in any of the other birds above referred to. In its external osseous nares, also, there is no tendency towards the Ramphastine position of those orifices, such as is so well marked in *Tetragonops*; the alinasal ossification that tends to divide each of the nares into an anterior and a posterior moiety is likewise far less considerable than in *Megalæma*.

As is known, and well illustrated in Mr. Selater's figure of the bone (Ibis, 1870, p. 178), the sternum agrees most closely with that of the Capitonidæ and Ramphastidæ; and this is especially the case in the imperfect development of the posterior extremity of the median xiphoid process, which in the Picidæ continues further onward to reach the level of the ends of the lateral xiphoid processes, at the same time that the manubrial rostrum of the last-named family only of the group is bifid. As to the posterior sternal notches, the inner is the deeper; and the same is the case in *Gecinus viridis*, whilst in *Picus*, the Capitonidæ, and Ramphastidæ the outer is the deeper.

In its soft parts *Indicator* agrees with the Capitonidæ, Ramphastidæ, and Picidæ, and differs from the Cuculidæ, in the following particulars:—There is only one carotid artery, the left; the ambiens and the accessory femoro-caudal muscles are absent (the latter of these is wanting in the Tree-Cuckoos); there are no colic cæca. The femoro-caudal, semitendinosus and accessory semitendinosus are present, as is the large gluteus. The tensor patagii brevis muscle of the wing is inserted into the extensor metacarpi radialis longus exactly as in the Capitonidæ, Ramphastidæ, and Picidæ, and as in no other birds¹. As in these three groups also (and in the Galbulidæ, but not in the scansorial Cuculidæ and Psittaci), the deep plantar tendons are distributed peculiarly—the flexor profundus digitorum supplying the third digit only, whilst the flexor longus hallucis sends slips to digits I. II. and IV., as well as a vinculum to its companion muscle². The trachea at its lower end (fig. 3, p. 935) consolidates into a bony box, formed by the fusion of the lowermost rings. To the enlarged uppermost bronchial half-ring (*a a*) the single slender intrinsic muscle of each side fans out to be attached at its middle.

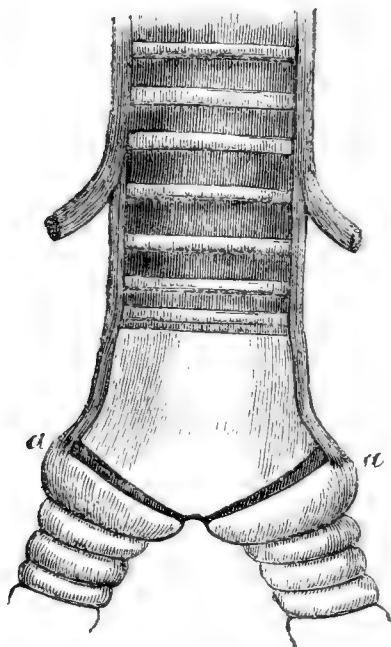
Summing up the results of the above analysis, it may be stated that, among the Piciform birds, pterylosis, osteology, myology, and visceral anatomy place the Picidæ, *Indicator*, the Capitonidæ, and

¹ Vide P. Z. S. 1876, p. 508, pl. xlvi. fig. 1.

² Vide P. Z. S. 1875, p. 346.

the Ramphastidæ in one great group of subordinal importance (if the peculiar hammer skull of the Picidæ be omitted from consideration). In this suborder the Picidæ constitute one main division—a family; whilst I, for one, cannot separate off the Capitonidæ from the Ramphastidæ by any well marked differences, the two sub-families graduating into one another.

Fig. 3.



Syrinx of *Indicator major* (enlarged); anterior aspect.

Indicator must, in my opinion, also be placed in this family, from all members of which it differs in possessing an extra pair of rectrices. No one, however, objects to keeping all the Momotidæ together because of a similar difference in some of its genera; why remove *Indicator* therefore from its allies? Nevertheless *Indicator* is not exactly like a Capitonine bird in certain details, so may be placed as a subfamily by itself, the Indicatorinæ; and the whole series may be thus tabulated.

Order.	Suborder.	Family.	Subfamily.
Piciformes.	Pici.	{ Picidæ. Capitonidæ.	{ Indicatorinæ. Capitoninæ. Ramphastinæ.

4. Contributions to the Ornithology of the Philippines.—
No. XI. On the Collection made by Mr. A. H. Everett
at Zamboanga, in the island of Mindanao. By
ARTHUR, Marquis of TWEEDDALE, F.R.S., President of
the Society.

[Received October 26, 1878.]

(Plates LVII.—LIX.)

The Spanish settlement of Zamboanga, situated at the southern extremity of the long south-western limb of the large Philippine island of Mindanao, is classical ground to the ornithologist. More than a century ago Sonnerat collected birds there; and in the year 1839 D'Urville's second Expedition remained a couple of months at Zamboanga. Yet only 19 species in all were recorded from Mindanao when in 1875 I published my List of Philippine Birds. Since that date Dr. Steere and the naturalists of the 'Challenger' Expedition have collected in the vicinity of Zamboanga, and added 40 species, thereby increasing the total of known species to 59.

Mr. Everett arrived at Zamboanga last March, and remained through April and part of May. During his stay he obtained examples of 98 species of birds. Mr. Everett writes that these were all procured "within a radius of ten miles of Zamboanga, chiefly in the hilly country some five miles distant at the back of the town." Of these 98 species only 33 had been previously known to inhabit this part of Mindanao; so that 65 species have been added by Mr. Everett, of which 11 are new to the Philippines, the following 6 being also new to science—

Pseudoptynx gurneyi,
Ninox spilocephalus,
Scops everetti,

Chætura picina,
Lyncornis mindanensis,
Volvocivora mindanensis,—

the remaining 5 having been previously unknown in the Philippines—

Accipiter stevensoni,
Ninox lugubris,
Coccytes coromandus,

Cacomantis sepulchralis,
Ptilopus melanocephalus.

Examples of 6 species previously said to have a Philippine habitat Mr. Everett found at Zamboanga, thus reducing the number of uncertain Philippine species to 29.

Twenty species authentically recorded from Zamboanga and its vicinity are not contained in Mr. Everett's collection; so that the now known total of Zamboanga species identified from specimens amounts to 118.

Mr. Everett writes:—"I enclose a note of the species observed by me here, which I think were not represented by skins in my col-



1
2

Smit lith.

Hanhart imp

ACCIPITER STEVENSONI





$\frac{1}{2}$

J.Smit lth

Hanhart imp

PSEUDOPTERYX GURNEYI.





J. Smit lith

Mannars omg

CHÆTURA PICINA.



lection. I have only included in these lists those birds the names of which I am absolutely certain I can give with accuracy."

- Cacatua hæmaturopygia*. [New to Zamboanga.]
Haliastur intermedius. [Already recorded.]
Merops bicolor. [Already recorded.]
Entomobia gularis. [Already recorded.]
Sauropatis chloris. [Already recorded.]
Artamus leucorhynchus. [Already recorded.]
Anthus, sp.? [?]
Carpophaga, sp.? [Probably *Ptilocolpa griseipectus*, and new to Zamboanga.]
Turtur dussumieri. [New to Zamboanga.]
Charadrius fulvus. Throat and belly jet-black. [Already recorded.]
Tringoides hypoleucus. [Already recorded.]
Sterna, sp. Bill chrome; crown of head black; wing delicate brownish-grey; underparts snowy white. Rather large. [Probably *Sterna bergii*, and already recorded.]
 Three of the above species (omitting the *Anthus* as undeterminable) not having previously been recorded from Zamboanga, when added to the number of species represented by specimens, raise the total number of birds known from this part of Mindanao to 121.

1. CACATUA HÆMATUROPYGIA (1).

[Zamboanga.]

I include this species on Mr. Everett's authority.

2. PRIONITURUS DISCURUS (2).

[Zamboanga, ♀ ♂, April.]

3. TANYGNATHUS LUZONENSIS (3).

[Zamboanga, ♀, May.]

4. CYCLOPSITTA LUNULATA (4).

[Zamboanga, ♂ ♀, March, April, and May.]

Examples with lunated collars are marked female by Mr. Everett, those with blue collars as being males.

5. LORICULUS HARTLAUBI (7).

[Zamboanga, ♂ ♀, April and May.]

6. HYPOTRIORCHIS SEVERUS (9).

[Zamboanga, ♂, April: iris dark brown; bill black; cere and orbital skin greenish yellow; legs bright yellow; claws black.]

In the plumage described by Mr. Sharpe (Cat. Accipitres, p. 397) as belonging to the young bird.

7. MICROHIERAX ERYTHROGENYS (10).

[Zamboanga, ♂ ♀, April.]

8. ACCIPITER STEVENSONI. (Plate LVII.)

Accipiter stevensoni, Gurney, Ibis, 1863, p. 447, t. xi.

[Zamboanga. *a.* ♀, April: iris golden; bill black; legs greenish ochre. *b.* ♀, April: iris golden; orbital skin greenish-yellow; bill leaden, apex and cere blackish; legs greenish-yellow, but pale brown on the toes; claws dark brown. *c.* ♂, pullus, April: iris yellow; bill black; legs light green; sole of foot yellow; claws black. *d.* (sex?), pullus, April: iris yellow; cere greenish; beak and claws black; legs light greenish; sole of foot yellow.]

Dimensions:—

	Wing. in.	Tail. in.	Tarsus. in.	Middle toe. in.
<i>a.</i> ♀	7·50	5·75	1·87	1·16
<i>b.</i> ♀	6·75	5·75	1·75	1·25
<i>c.</i> ♂ juv. (♀?)	5·75	4·00	1·81	1·25
<i>d.</i> ♂ juv.	5·12	4·00	1·62	1·06

Example *a* is slaty brown above, darkest on the head. Rectrices pale greyish slate-colour, with five dark-brown bands on middle pair. The under surface is white; the pectoral, abdominal, and flank-plumes being traversed with two, three, or more pale-brown bands. The pure white throat has a dark brown and extremely narrow median line formed by the white feathers having a very fine dark edging to the shafts. The quills underneath are regularly banded with white and brown, above brown banded with dark brown. The innermost tertiaries are at most pure white with a pale brown margin. Axillaries pure white with a series of narrow brown cross bars.

Example *b* (which is figured in the accompanying plate) has the breast and abdomen uniform pure bright rufous. When the feathers are discomposed they appear white banded with bright rufous. Vent and under tail-coverts are pure white. Thigh-coverts white, with faint pale rufous cross bands. Middle of throat white, with terminal pale earthy marks. Sides of head dingy pale rufous-brown. Upper plumage brown, mixed with rufous in some of the feathers. Middle pair of rectrices with six transverse brown bands. Quills barred as in example *a*, pale rufous occupying the interspaces between the brown bands to a great extent. Axillaries white, banded with pale rufous.

Examples *c* and *d* are of nestlings in rufous dress. Underneath creamy-fulvous, with broad ruddy brown stripes. A central gular stripe of brown. Middle pair of rectrices with three brown bands. Upper surface of body and head dark brown, with rusty margins and bases to the feathers. Thigh-coverts spotted with light ruddy brown.

Mr. Gurney observes on these specimens as follows:—The hawk “marked *a* on the ticket is a female of *Accipiter stevensoni* in the ordinary adult dress; that marked *b* I believe to be the same; but I have never before seen a *female* with so rufous a breast, though it much resembles the figure of the male type specimen (now somewhat faded) in the ‘Ibis’ (*l. s. c.*). The two nestlings may be either *A. ste-*

vensoni or *A. virgatus*. We have a very similar one from Java ; but as both species are found there, I am not sure to which it belongs, but probably to *A. virgatus*, as I suspect that *A. stvensoni* is only a winter visitor to Java. Judging from the size of the tarsus and foot, I think the larger nestling, marked *c*, is a female though marked male, and that the smaller, marked *d*, is a male."

Having expressed to Mr. Gurney some doubts about the correctness of identifying example *b* with the female of *A. stvensoni*, that gentleman kindly favoured me with the following remarks:—

"Your rufous-breasted hawk from the Philippines, which I marked *b*, is certainly nearer to *A. stvensoni* than to any other species that I am acquainted with ; but since returning it to you I have felt some doubt as to whether it will not prove to belong to a distinct and undescribed species.

"Your bird differs in having the wing shorter than any of our females, and larger than any of our males. Our three males have but four transverse bars on the tail. Of our four females three have five bars, and the fourth (an immature bird from Java) four, like the males, whereas your specimen *b* has six, as mentioned in your letter.

"None of our females have any rufous on the breast ; and in all our males it is hardly more than a tinge of buff. Our type specimen (a male, figured in the 'Ibis' for 1863, pl. 11) is perhaps somewhat faded ; but our Curator is confident that it was never so rufous as is represented in the 'Ibis' plate ; and in this I believe he is right.

"Your bird is more like the male of *A. stvensoni* than it is to the female ; but as your collector has marked it ♀, it probably is so.

"Specimens of *A. stvensoni* are scarce, and we hardly know the limits of variation to which it is liable ; and on this account I should be glad if additional specimens like your skin *b* could be obtained, before venturing to publish it as a species distinct from *A. stvensoni* ; but at the same time, if it should ultimately prove distinct, it would by no means surprise me.

"I ought to add that as *A. stvensoni* has not yet been met with when paired, we have no positive proof that the bird which I suppose to be its female (the type being a male) is so, though I do not myself entertain any doubt of such being the case."

9. SPILORNIS HOLOSPILUS (16).

[Zamboanga, ♂ ♀, April and May.]

10. ELANUS HYPOLEUCUS (18).

[Zamboanga, ♂ juv., May : iris light yellow-brown ; bill black ; cere greenish yellow ; feet pale chrome ; claws black.]

11. NINOX SPILOCEPHALA, sp. n.

[Zamboanga, ♂, March : iris golden ; bill greenish leaden ; feet pale yellow. ♀, April : iris golden ; bill-greenish lead, tinged yellow on culmen and tip ; feet wax-yellow. ♀, April : iris light greenish-yellow.]

Were it not that the large series of examples sent by Mr. Everett (six males and thirteen females) all agree in having spotted heads, I should not have ventured to separate the Zamboanga species from *N. philippinensis* of Luzon. Every variety of markings and colorations is exhibited in this series, from dark brown to tawny-rufous brown above, and stripes and spots of the same colours below; but all the nineteen examples have the frontal and coronal feathers brown, spotted with rufous—in some bright rufous, in others pale tawny rufous. Some have the whole under plumage, from throat to vent, dark-centred; others have the breast almost uniform rich rufous, without pale margins, and with a subterminal brown transverse narrow band.

Every specimen has its sex noted on its label; and the length of the wing in the six birds marked ♂ is greater than in those marked ♀. The wing of the six males ranges in length from 6.50 to 7.0, of the thirteen females from 6.25 to 6.50. Two Luzon males have the wings 6.37 and 5.25. Mr. Sharpe (Cat. ii. p. 168) states 2 inches as the length of the tarsus of an example of *N. philippinensis* in the British Museum; none of these Zamboanga birds has the tarsus longer than 1.12.

12. NINOX LUGUBRIS.

Strix lugubris, Tickell, J. A. S. B. ii. p. 573.

[Zamboanga. *a.* ♀, March: iris golden; bill blackish; cere, culmen, and mandible greenish yellow; feet dark chrome-yellow; claws black. *b.* ♀, April: iris deep brown; bill greenish; feet chrome-yellow.]

Dimensions:—

	Wing.	Tarsus.	Culmen.	Tail.
	in.	in.	in.	in.
<i>a</i>	8.30	1.12	0.62	4.75
<i>b</i>	8.14	1.12	imperfect.	4.82

Six caudal bands. First two primaries without bars. The wings of a ruddy hue. The outer webs of most of the primaries rusty-red.

The remarks Mr. Gurney has been good enough to favour me with about this Zamboanga race of *Ninox lugubris* are as follows:—“I think the outer webs of the primaries unusually rufous. We have only one similar specimen, which is from Formosa and is described in Sharpe’s volume (Catalogue, ii. p. 161); and with this specimen the Zamboanga bird seems to me to agree generally. If *N. japonica* be admitted as distinct from *N. lugubris* (though I doubt whether it ought to be), the Zamboanga specimen, I think, ought to be referred to *N. japonica*.”

Mr. Sharpe has suggested (*t. c.* p. 166) that the large Japanese and North-China form is migratory. These Zamboanga examples favour his hypothesis.

13. PSEUDOPTYNX GURNEYI, sp. n. (Plate LVIII.)

[Zamboanga, ♂, pairing, April: iris warm brown; bill greyish white; feet pale grey; claws white tipped with dark grey.]

Sides of face bright pure unmarked rufous. Lengthened stiff plumes springing from base of maxilla rufous mixed with tawny, and many with dark-brown shafts and tipped with dark brown. Space above front of eyes, uniting on forehead and extending back over the eyes, pale tawny rufous. Crown and occiput dark rufous, many of the feathers with a dark brown broad mesial stripe. Nape and sides of neck pure rufous. Lengthened ear-tufts the same, some with very narrow brown mesial linear markings near their apices. Plumes bordering the facial disk albescent tawny; some almost pure white, tipped with dark brown. Chin and upper throat pale tawny rufous. Middle of throat white. Breast and remainder of lower surface pure rufous, more dilute on lengthened tibial plumes and under tail-coverts. A few pectoral plumes, with dark-brown large terminal drops. Many abdominal plumes, with dark-brown elongated central stripes. Back rufous, minutely freckled with brown, each feather with a bold, irregular, dark-brown central stripe. Scapulars like the back, but some of the shorter and outer albescent tawny on outer webs. The dark brown central marks are so arranged that the back, together with the scapulars, appears to have three parallel dark-brown stripes running down it. Uropygium and upper tail-coverts rufous-brown, with darker shafts. Rectrices brown, minutely freckled with pale rufous, and with eight or nine narrow pale rufous cross bands. Minor and median wing-coverts brown, freckled with rufous, and each with a dark narrow central brown line. Major coverts brown on inner web, freckled with rufous on outer. Quills brown, alternately banded with freckled brown and pale rufous. Tertiaries pure rufous, with traces of dark brown along the shafts. Carpal edge white; wing-lining yellowish white; some of the under carpal coverts rufous. Thigh and tarsal coverts pale rufous and tawny white.

Mr. J. H. Gurney writes to me:— "The *Pseudoptynx* is certainly distinct from *P. philippinensis*, and, so far as I know, is undescribed. Besides its very much smaller size, it is very much more rufous below, and of a much darker rufous above; and the dark central marks of the mantle are altogether of a different character, and very much less coarse than those in *P. philippinensis*. As to the difference of size, we have two specimens of *P. philippinensis* here; and the comparison between their dimensions and those of the Zamboanga bird is as follows:—

	Wing.	Tarsus.	Middle toe.	Culmen without cere.
	in.	in.	in.	in.
" <i>P. philippinensis</i> , No. 1..	15·5	2·4	1·6	1·4
" <i>P. philippinensis</i> , No. 2..	imperfect	2·5	1·5	1·5
" <i>P. gurneyi</i>	9·3	1·8	1·4	1·1."

The dimensions of the type in the British Museum given by Mr. Sharpe (Cat. ii. p. 43) also much exceed those of the Zamboanga bird.

I name this fine Owl after Mr. Gurney, to whom for many years

I have been largely indebted for great assistance in determining the obscurer species of *Rapaces*.

14. *SCOPS EVERETTI*, sp. n.

[Zamboanga, ♀, April: iris warm brown; bill pale greenish leaden, nearly white; feet whitish grey; claws dark grey. ♂, April: iris deep brown; feet whitish.]

Mr. Everett has sent three examples of a species of *Scops*, which may be described as being a large form of *Scops lempiji* as it occurs in Java. Above it has the deep rich brown colouring of the Javan species; the same broad dark-brown mark in the form of a parallelogram on the head and nape; the same pale-coloured forehead, stripe above each eye and round the nape, and the broad dark brown stripe leading from behind the eye, and including most of the ear-tufts. In the Zamboanga species (as represented in Mr. Everett's series) there are no pale uniform tawny or fulvous scapulars. Underneath, the markings differ from those of the Javan bird by being more confused, and by the absence of regular dark-brown cross markings on the abdominal plumes. The general colouring of the under surface is of a ruddier brown.

Dimensions:—

	Wing. in.	Tarsus. in.	Tail. in.	Culmen. in.
♂	6·50	1·20	3·50	0·62
♀	6·75	1·20	3·62	0·68

Mr. Sharpe, to whom I submitted two of the specimens, has obliged me with the following observations:—"Your Owl is of the *S. lempiji* group, having that peculiar light streak on the sides of the crown, running onto the ear-tufts; but underneath it is quite aberrant, and verges more towards the Moluccan *S. leucospilus* section. At the same time I expect it will come very near *Scops umbratilis*, Swinhoe."

Mr. Gurney writes, "The Owl is new to me, and different to any that we have here."

15. *THRIPONAX JAVENSIS* (28).

[Zamboanga. ♂, March: iris yellow.]

The white at the tips of the primaries is unusually developed in the specimens from Zamboanga.

16. *CHRYSOCOLAPTES LUCIDUS* (32).

Chrysocolaptes maculiceps, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 314, t. xlvi. fig. 2.

[Zamboanga, ♀, May: iris crimson.]

An example (marked a female) wears the plumage of *C. maculiceps*, as described and figured by Mr. Sharpe.

17. *YUNGIPICUS VALIDIROSTRIS* (33 *partim*).

Picus nanus, Vigors, Blyth, J. A. S. B. 1845, p. 197.

Picus validirostris, Blyth, Cat. Calc. Mus. p. 64. no. 305; J. A. S. B. 1849, p. 805.

[Zamboanga, ♂ ♀, May: iris crimson?; bill black; mandible lead-grey; feet olive.]

When writing on *Picus maculatus*, Scopoli (Tr. Z. S. ix. p. 148), I stated that the titles I then brought together were treated as synonyms on the assumption that the islands of Luzon, Panay, and Mindanao possessed but one and the same species of *Yungipicus*. I had had no opportunity of examining an example from any one of the Philippine Islands. Since then Mr. Everett has sent me examples of a species of the genus from Luzon; and these I identified (P. Z. S. 1877, p. 689) with *P. maculatus*, rather than create a new title, while their dimensions were too small for *P. validirostris*, Blyth. The birds from Zamboanga differ specifically from the Luzon species. They are larger; the uropygium and upper tail-coverts are unspotted tawny-white; and the rectrices are tawny buff banded with dark brown, and not dark brown, for the most part, as in the Luzon bird, with narrow albescent bands or marks. In both, the lower throat and upper breast are spotted, and not streaked, as in *Y. fuscoalbidus* of the Sunda Islands and Malacca. Until typical examples of *P. maculatus* from Panay are compared, it cannot be affirmed whether the type of *P. maculatus* belongs to the Luzon or the Mindanao species, or whether it may not be a species distinct from either. In the meantime I adopt Blyth's title, the dimensions he gives being exactly those of the Zamboanga species:—bill to forehead 0.75; wing 3.25.

I may mention that *Y. aurantiiventris*, Salvadori, is an excellent species, quite distinct from *Y. fuscoalbidus*.

18. *HARPACTES ARDENS* (34).

[Zamboanga, ♀, March: coloration of soft parts as in male.]

The coloration of the soft parts is not mentioned on the labels of the males sent.

19. *ALCEDO BENGALENSIS* (38).

[Zamboanga, ♀, March.]

20. *PELARGOPSIS GIGANTEA*.

Pelargopsis gigantea, Walden, Ann. & Mag. Nat. Hist. ser. 4, xiii. p. 123.

[Zamboanga, ♂ ♀, March and May.]

21. *CEYX ARGENTATA*.

Ceyx argentata, Tweeddale, *antea*, p. 108. no. 7, t. vi.

[Zamboanga, ♂, May.]

22. *ENTOMOBIA GULARIS* (44).

[Zamboanga.]

23. HALCYON WINCHELLI.

Halcyon winchelli, Sharpe, Tr. L. S. (2) Zool. i. p. 318, t. xlvii.

[Zamboanga, ♀, April: iris dark brown; bill black; the basal half of mandible white; feet light greyish-green.]

I have not been able to compare the Zamboanga birds with the Basilau type; but the female agrees well with Mr. Sharpe's description and plate. A second example (sex unrecorded) differs in having the whole under surface pure white.

24. CALIALCYON COROMANDA (46).

[Zamboanga, ♀, March.]

The discovery of this species by Mr. Everett at Zamboanga removes all doubts of its being an inhabitant of the Philippines.

25. ACTENOIDES HOMBRONI (48).

[Zamboanga, ♂, April: iris brown; bill orange-red; the culmen blackish; feet dirty greenish orange.]

In the perfectly adult male the crescentic pectoral markings disappear.

26. XANTHOLEMA HÆMACEPHALA (50).

[Zamboanga, ♂, March and April.]

27. MACROPTERYX COMATUS (52).

[Zamboanga, ♂, April.]

28. CHÆTURA PICINA, sp. n. (Plate LIX.)

[Zamboanga, ♀, April.]

Black with a blue gloss, greenish in some lights. Chin, throat, and larger under wing-coverts pure white. Wing 6·37; tail 1·25.

29. LYNCORNIS MINDANENSIS, sp. n.

[Zamboanga, ♂, April: iris warm brown; feet purplish brown.]

Typical *L. macrotis* (ex Luzon) has the crown, forehead, ear-tufts, and nape rufous brown, of almost the same shade as in *L. temminckii*. The three examples of the species of *Lyncornis* which inhabits the vicinity of Zamboanga, sent by Mr. Everett, differ from *L. macrotis* by having the crown, nape, forehead, and ear-tufts dark greyish-brown, and not rufous, by all the browns of the plumage being much darker, and by the wing being shorter. Wing 9·90.

30. CAPRIMULGUS MANILLENSIS (55).

[Zamboanga, ♀, April.]

Compared by Mr. Sharpe with the type.

31. BATRACHOSTOMUS SEPTIMUS.

[*Batrachostomus septimus*, Tweeddale, P. Z. S. 1877, p. 542, no. 13.]

[Zamboanga, ♂, April: iris orange-yellow; bill light horn-

brown; feet pale ochreous yellow; nails grey. Interior of gape, ♂ ♀, lemon-yellow.]

Two examples of the adult male and one of an adult female are sent by Mr. Everett. The white nuchal band of the female is not so conspicuous as in the type, nor are the white markings of the throat-band and pectoral plumes. The general hue of the male-plumage agrees with that of the female; but in the males the elongated scapulars have the outer webs pure white, with a black subterminal spot on the inner web. Four examples of this species are now known, two of males and two of females; and all four are in the rufous phase. Mr. Everett, in his remarks about one of the males is very explicit; he writes:—"I have one *Batrachostomus*, a good skin; it is in rufous plumage, and is ♂. I took especial care in the sexing; and luckily the parts had not been touched by shot. Judging from the size of the testes, I think the bird is rather immature."

32. CACOMANTIS SEPULCHRALIS ?

Cuculus sepulchralis, S. Müller, Land- en Volkenk. p. 177.

[Zamboanga, ♂ ♀, April.]

Mr. Everett obtained five examples of a Plaintive Cuckoo, two of which are in adult plumage, and so closely resemble the Javan *C. sepulchralis*, that I do not venture to separate them. The dimensions of the wings and tail are slightly less, while the chin and throat are of the same rufous as the breast, and not grey. S. Müller described (*l. c.*) the chin of the Javan and Sumatran type as being grey; and so it is in my Javan specimens; but it is not certain that in Javan birds this grey does not change into rufous. An example obtained by Mr. Everett at San Mateo, Luzon (*C. merulinus*, a, P. Z. S. 1877, p. 691. n. 19), belongs, without doubt, to *C. sepulchralis*, and has the chin and upper throat grey, the others being examples of true *C. merulinus*. This last species can hardly be kept separate from the grey-breasted species of Continental Asia, *C. threnodes*, &c.

33. SURNICULUS VELUTINUS.

Surniculus velutinus, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 320.

[Zamboanga, ♀, April.]

34. CHALCOCOCCYX MALAYANUS.

Cuculus malayanus, Raffles, Tr. L. S. xiii. p. 286, "Malay Peninsula" (March 1821).

? *Cuculus basalis*, Horsfield, Tr. L. S. xiii. p. 179, "Java" (April 1820).

[Zamboanga. a. ♂, April: iris burnt-sienna colour; orbital ring fine vermilion; bill blackish; feet very dark lead-grey. b. April: iris light yellowish brown; bill black; legs lead-grey; nails black.]

Mr. Everett sends three Golden Cuckoos, which, although somewhat smaller than typical examples, differ in no other respect.

Wing 3·62. I adopt the more recent specific title of *malayanus*, as it has not as yet been absolutely demonstrated that the Malayan-Peninsula bird is the same as the Javan. The only Javan example I have seen is pure white underneath, without any transverse bands. Above, the whole back is very dark green without any coppery gloss, the head and nape coppery greenish-brown. This individual is fairly represented on plate 102. f. 2, of the 'Planches Coloriées,' under the title of *Cuculus chalcites*, Illiger, exact habitat unknown. It may be only a phase of plumage; but Horsfield and Moore (Cat. Mus. E. I.C. ii. pp. 706, 707) keep the Malaccan species distinct from the Javan.

35. *HIEROCOCCYX PECTORALIS* (60).

[Zamboanga, ♂, April: iris pale yellow; orbital skin bright chrome-yellow; bill black; mandible and base of maxilla greenish; feet bright wax-yellow; claws horn-yellow.]

A single example, which agrees in every detail with the description given by Dr. Cabanis. It may also belong, as suggested by me (*l. c.*), to *Cuculus hyperythrus*, Gould; but it differs from the figure of that species in wanting the black chin, in not being so intensely rufous underneath, in the rufous colouring not extending below the breast, and in the upper plumage not being of so dark a shade of grey. It also has four, distinct, transverse, narrow, dark caudal bands, and not merely two as described by Mr. Gould.

36. *COCCYSTES COROMANDUS*.

Cuculus coromandus, Linn. S. N. i. p. 171. no. 20.

[Zamboanga, ♀, March: iris brown; bill jet-black; feet bluish grey; interior of gape salmon-red.]

New to the Philippines, and a most unexpected addition to their fauna.

37. *EUDYNAMIS MINDANENSIS* (61).

[Zamboanga, ♀, March: iris bright crimson; bill and legs greenish plumbeous. ♂, ♂, March.]

These are typical examples of the species, and do not differ from North-Mindanao examples. They are somewhat smaller than birds from Guimaras and Zebu. Maximum length of wing 7·50. In the female the spots and bands appear in this species to be always rufous.

38. *CENTROCOCCYX VIRIDIS* (64).

[Zamboanga, March.]

39. *PYRRHOCENTOR MELANOPS* (65).

[Zamboanga, ♂ ♀, March.]

Sexes alike.

40. *BUCEROS MINDANENSIS*.

Buceros mindanensis, Tweeddale, P. Z. S. 1871, p. 543.

[Zamboanga, ♂ ♀ ♀ juv., March.]

41. *PENELOPIDES AFFINIS*.

Penelopides affinis, Tweeddale, P. Z. S. 1877, p. 824. n. 29. f. 1.

[Zamboanga, ♂ ♀, March.]

A new outer rectrix has the central band pure white, the central bands on all the other rectrices being bright rufous.

42. *LANIUS NASUTUS* (70).

[Zamboanga, ♂ ♀, April.]

Mr. Everett sends a nestling killed in April.

43. *LANIUS LUCIONENSIS* (72).

[Zamboanga, ♂, April.]

44. *GRAUCALUS STRIATUS* (73).

[Zamboanga, ♂, April: iris pale yellow.]

Two examples marked ♂ have uniform plumbeous breasts and banded underparts and uropygium. One marked ♀ is banded from the chin downwards as well as on the uropygium.

45. *VOLVOCIVORA MINDANENSIS*, sp. n.

[Zamboanga. *a.* ♂, April: iris dark brown; bill and legs black. *b.* ♀, April: iris dark brown. *c.* ♀, April: iris dark chocolate-brown.]

Adult male (*a*). Chin, cheeks, sides of head, space before the eyes, a broad supercilium, ear-coverts, forehead, throat, and upper breast jet-black. Remainder of breast, crown, and whole under surface of body dark leaden-grey, paler near the vent and on the under tail-coverts. Wing-coverts, nape, and axillaries a slightly lighter shade of leaden-grey, palest on the uropygium and upper tail-coverts, which are slightly mixed with white. Quills above black, with faint grey margins. Sixth and remaining primaries tipped with greyish white. Secondaries and tertiaries leaden-grey on their outer webs. Part of inner webs of quills, seen from underneath, pale grey. This colour commences at the base of the first primary, occupying but a small part of it, but is more extended on each succeeding quill, and reaches to the extremities of the inner quills. Rectrices jet-black; outer pair with a large grey terminal mark, the same colour being slightly indicated on the next pair. Carpal edge and wing-lining almost black.

Adult female (*b*). The same as the male, but the grey colour of the whole plumage of a paler shade, the uropygium more albescent, and no black about the head, throat, and breast. Carpal edge and axillaries pale grey.

Young female (*c*). Like the adult, but the grey colour not so pure. The chin, central part of the throat, a few scattered feathers on the breast and flanks, the wing-lining, and axillaries finely banded with white. Upper tail-coverts nearly pure white. Outer margins of some of the secondaries and carpal edge inclining to white.

Dimensions :—

	Wing. in.	Tail. in.	Tarsus. in.	Culmen. in.
♂ ad.	4·62	4·0	0·88	0·88
♀ ad.	4·50	4·0	0·88	0·88
♀ juv.	4·48	3·88	0·88	0·87

A representative form of *V. morio* ex Celebes, but altogether of a darker shade of grey, with a black forehead, and with the inner margins of the quills grey, and not pure white.

46. LALAGE DOMINICA (76).

[Zamboanga, ♀, April.]

47. DICRURUS STRIATUS.

Dicrurus striatus, Tweeddale, P. Z. S. 1877, p. 545. no. 20.

[Zamboanga, ♀, March : iris crimson.]

48. LEUCOCERCA NIGRITORQUIS (83).

[Zamboanga, ♀, April.]

49. CYORNIS PHILIPPINENSIS (84 *partim*).

Cyornis philippinensis, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 325.

[Zamboanga, ♀, March.]

50. HYPOTHYMIS AZUREA (85).

[Zamboanga, ♀, May : maxilla black, mandible light blue ; legs dark grey slate ; interior of gape yellow.]

51. BRODERIPUS ACORRHYNCHUS (90).

[Zamboanga.]

52. ERYTHROPITTA ERYTHROGASTRA (94).

[Zamboanga, ♂ ♀, March, April, May.]

These examples all belong to *E. erythrogastra*, and not to the Balabac race named *B. propinquus* by Mr. Sharpe (Tr. L. S. (2) Zool. i. p. 330). The young Dumalon (Mindanao) example obtained by Dr. Steere, and doubtfully identified with *B. propinquus* by Mr. Sharpe (*l. c.*), in all probability belongs to *E. erythrogastra*.

An immature bird, killed in April near Zamboanga, is dirty rufous brown above, with dashes of green ; rectrices blue ; wing-feathers without a trace of blue ; under surface dirty white, feathers margined with pale rufous brown ; some scarlet feathers on the breast ; vent and under tail-coverts washed with brownish red. The females differ in the scarlet colouring of the abdominal region not being so intense and vivid, and in the throat not being so dark brown, almost black. The blue colouring of the breast is not exhibited until complete maturity, that part remaining green. In fully mature birds of both sexes the green pectoral band is almost entirely replaced by blue.

53. MELANOPITTA SORDIDA (95).

[Zamboanga, ♂, March : iris chocolate ; bill black ; legs brownish grey. ♂ ♀, March, April, and May.]

This species has the black central abdominal patch much more largely developed than in *M. muelleri* ex Borneo. In no other respect does it appear to differ. The extent of pure white on the quills is dependent on sex. Of fourteen individuals with the sex noted by Mr. Everett, nine are males and five are females. The primaries of the male have a much greater white surface than is found in the primaries of the female. The 6th, 7th, and 8th primaries are scarcely tipped with black ; and the first five primaries have double the amount of white that exists on the primaries of the female. On examining Luzon and Negros examples with the sexes noted by Dr. B. Meyer, the same character differentiates the sexes. In Bornean individuals of *M. muelleri* (sex determined by Mr. Everett) the sexes can be discriminated by the amount of white on the remiges. In *M. cucullata* some of my examples exhibit a maximum of white on the quills and the others a minimum ; but as none have had their sexes determined by dissection, I am unable to affirm that in that species the same law holds good. In two Zamboanga skins the green of the breast and flanks is assuming the blue tint so prominent in the large representative form *M. steerii*.

54. MELANOPITTA STEERII.

Brachyurus steerii, Sharpe, 'Nature,' August 1876, Tr. L. S. ser. 2, Zool. i. p. 329, t. xlix.

[Zamboanga, ♂, March and April.]

55. MACRONUS STRIATICEPS.

Macronus striaticeps, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 331.

[Zamboanga, ♂, March : iris white : bill black ; legs purplish grey.]

56. IXUS GOIAVIER (99).

[Zamboanga, ♂ ♀, March.]

57. POLIOLOPHUS UROSTICTUS (101).

[Zamboanga, ♂, April : orbital ring light yellow.]

58. HYPSSIPETES RUFIGULARIS.

Hypsipetes rufigularis, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 335.

[Zamboanga, ♀, April ; iris crimson ; bill blackish brown ; legs brown.]

59. MONTICOLA SOLITARIUS (103).

[Zamboanga, ♀, April.]

60. COPSYCHUS MINDANENSIS (106).

[Zamboanga, ♂, March.]

61. *PHYLLOSCOPUS BOREALIS*.

Phyllopneuste borealis, Blasius, Naumannia, 1858, p. 313.

[Zamboanga, ♂ ♀, April.]

62. *ORTHOTOMUS CINEREICEPS?*

Orthotomus cinereiceps, Sharpe, Ibis, 1877, p. 113, t. ii. f. 2, "Basilau."

[Zamboanga, ♂, March: iris clay-orange; ♀, April.]

Mr. Sharpe's title is here adopted with doubt for this Zamboanga species of Tailor-bird, because it does not quite agree with the description and figure, and I have not been able to compare it with the type (now in America).

In the example marked as being of a male, the cheeks, chin, and entire throat are jet-black. In that of the female the chin and upper part of the throat are white, the middle of the breast, the abdomen, and vent are silky white, whereas in the male these parts are bright olive-green. The rectrices of the male are devoid of a subterminal bar; but in those of the female brown subterminal bars are conspicuous. It is not improbable that the male example with entire throat black is *O. cinereiceps* in full breeding-dress.

63. *ORTHOTOMUS FRONTALIS*.

Orthotomus frontalis, Sharpe, Ibis, 1877, p. 112, t. ii. f. 1, "Zamboanga."

[Zamboanga, ♂ ♀, March and April.]

The examples noted as belonging to males have no subterminal bar on the rectrices. Those marked as being of females have the subterminal bar well pronounced.

64. *BUDYTES VIRIDIS* (114).

[Zamboanga, ♂, April.]

65. *ZOSTEROPS EVERETTI*.

Zosterops everetti, Tweeddale, P. Z. S. 1877, p. 762. no. 42.

[Zamboanga, ♂ ♀, April.]

66. *DICÆUM CINEREIGULARE*.

Dicæum cinereigulare, Tweeddale, P. Z. S. 1877, p. 829. no. 50, "N. Mindanao."

[Zamboanga, ♀, April: iris dark brown; bill black; legs very dark grey, nearly black.]

The female differs from the male in wanting the orange-red interscapular patch, in the abdomen, vent, and under tail-coverts being pure yellow, and in the upper plumage being deeply tinged with olive-green.

67. *DICÆUM RUBRIVENTRE* (120 partim).

Pipra papuensis, Gm. S. N. i. p. 1004.

[Zamboanga, ♀, April: iris dark blood-red; bill and legs black.]

68. NECTAROPHILA JULIÆ.

Nectarophila julia, Tweeddale, P. Z. S. 1877, p. 547. no. 32, "Melanipa."

Cinnyris julia (Tweeddale), Shelley, *Cinnyridæ*, pts. vii. & viii.

[Zamboanga, ♂ ♀, April: iris brown; bill and feet black.]

In some examples of the male the breast is suffused with orange-red; in others little or no red is perceptible.

69. CYRTOSTOMUS JUGULARIS (123).

[Zamboanga, ♂ ♀, March and April.]

70. ANTHOTHREPTUS CHLOROGASTER.

Anthreptes chlorigaster, Sharpe, Tr. L. S. ser. 2, Zool. i. p. 342; Shelley, *Cinnyridæ*, pt. vi. pt. vii. t.

[Zamboanga, ♀, April: iris indian-red; bill light umber-brown; legs greenish leaden.]

71. RHABDORNIS MYSTACALIS (124).

[Zamboanga, ♂, April.]

A single example, which differs from the Luzon species in its much shorter bill. Culmen barely 0·62, in the Luzon bird fully 0·75. The wing is also shorter; and the colouring of the wings and back is warm brown, and not greyish olive-brown.

72. CORVUS PHILIPPINUS (125).

[Zamboanga, ♂, March.]

73. CALORNIS PANAYENSIS (128).

[Zamboanga, ♂, March.]

74. SARCOPS CALVUS (129).

[Zamboanga, ♀, March.]

75. MUNIA JAGORI (132).

[Zamboanga, ♂ ♀, March.]

76. OSMOTRERON VERNANS (135).

[Zamboanga, ♂ ♀, March, April, May.]

77. PTILOPUS MELANOCEPHALUS.

Columba melanocephala, Forster, Zoologia Indica, p. 16. no. 7, t. viii., ex Java (1781).

[Zamboanga. *a.* ♂, March: iris, orbital skin, and bill yellow, with more or less of a green tinge; feet carmine, nails dark grey. *b.* ♂, April: iris yellow; bill yellow-green.]

Hardly separable from the Javan species. Wing 4·50. The tint of the throat-patch resembles that of *P. xanthorrhous*; but the abdomen and crissum are yellow, and not orange. New to the Philippines.

78. *RAMPHICULUS OCCIPITALIS* (138).

[Zamboanga, ♀ (juv.), March : iris dark brown ; bill light brown, the basal half dull red ; feet coral-red.]

Sexes alike.

79. *PHABOTRERON BREVIROSTRIS*.

Phabotreron brevirostris, Tweeddale, P. Z. S. 1877, p. 549. no. 38.

[Zamboanga, ♂ ♀, March and April.]

The pale, and not rufous, chin and throat distinguishes this species from *P. leucotis*.

80. *CARPOPHAGA ÆNEA* (141).

[Zamboanga, ♀, March.]

81. *PTILOCOLPA GRISEIPECTUS* (142)?

Mr. Everett remarks *in epist.* :—"The *Carpophaga* of the Zamboanga list is a bird markedly smaller than *C. ænea* ; and those parts which in the latter are coloured fine bronzy green, are in the smaller species dark iron-grey." The above-given description, so far as it goes, agrees with *Ptilocolpa griseipectus*, a rare species in museums, and the exact habitat of which in the Philippines remains to this day (unless this identification is correct) undetermined.

82. *MYRISTICIVORA BICOLOR* (143).

[Zamboanga, ♀, May.]

83. *HEMIPHAGA POLIOCEPHALA* (144).

[Zamboanga, ♀ (not quite adult) : bill black ; orbital skin crimson.]

Sexes alike. The margin of the inner web of the first primary is scooped out, and that of the second a little less so.

84. *MACROPYGIA EURYCERCA*.

Macropygia eurycerca, Tweeddale, *antea*, p. 288. no. 49.

[Zamboanga, ♂ ♀, March and April.]

Considerably smaller than the Negros type, but otherwise undistinguishable. Wing 6·75, as against 7·50 ; tail 7·00, against 8·00.

85. *TURTUR DUSSUMIERI* (147).

[Zamboanga.]

Included on the authority of Mr. Everett.

86. *PHLOGENAS CRINIGERA*.

Phlogœnas crinigera (Pucheran), Tweeddale, P. Z. S. 1877, p. 833. no. 66.

[Zamboanga, ♂ ♀, March and April.]

Sexes alike. An example marked "♂ juv." by Mr. Everett has the claret-coloured pectoral plastron only indicated by a few red

plumes, and the terminal margin of the major coverts fulvous instead of pale grey, the remainder of the plumage being marked and coloured as in the adult.

87. *CHALCOPHAPS INDICA* (150).

[Zamboanga, ♂ ♀, March.]

88. *GALLUS BANKIVA* (153).

[Zamboanga, ♂ ♀, March.]

89. *MEGAPODIUS DILLWYNI*.

Megapodius dillwyni, Tweeddale, P. Z. S. 1877, p. 766.

[Zamboanga, ♀, March: iris burnt sienna-brown; bill horn-brown; orbital skin dirty crimson; legs reddish-brown; tarsi¹ dark brown. ♂, March: orbital skin dark purplish brown.]

90. *GALLINULA CHLOROPUS* (169).

[Zamboanga, ♀, May: iris light warm brown; bill greenish yellow; frontal plate orange-red; legs grass-green.]

91. *GALLICREX CINEREA* (170).

[Zamboanga, ♂, March and April.]

92. *ERYTHRA PHŒNICURA* (171).

[Zamboanga, ♀, March.]

93. *ORTYGOMETRA CINEREA* (172).

[Zamboanga, ♂, April.]

94. *PORZANA FUSCA* (174).

[Zamboanga, ♂, April: iris brick-red; legs dull wax-red.]

95. *GALLINAGO MEGALA* (188).

[Zamboanga, ♀, March.]

96. *RHYNCHÆA CAPENSIS* (189).

[Zamboanga, ♂, May.]

97. *ARDETTA CINNAMOMEA* (192).

[Zamboanga, ♀, March.]

98. *HERODIAS INTERMEDIA* (196).

[Zamboanga, ♂, March.]

99. *MELANOPELARGUS EPISCOPUS*.

Ardea episcopus, Bodd. Tabl. d. Pl. En. p. 54.

[Zamboanga, ♀, March.]

In full dress.

¹ So written on label; perhaps a slip of the pen for the word "toes" or "claws."

100. *DENDROCYGNA VAGANS* (203).

[Zamboanga, ♀, April.]

101. *DYSPORUS SULA* (214).

[Zamboanga, ♀, May: iris white; bill dirty white; orbital and gular space pale green; feet very light greenish yellow; nails grey.]

A young female in dirty-brown plumage, darkest on breast, throat, neck, head, and back.

5. Supplementary Note on the Neotropical Squirrels.

By EDWARD R. ALSTON, F.L.S., F.Z.S., &c.

[Received November 8, 1878.]

I regret to say that several errors have crept into my paper "On the Squirrels of the Neotropical Region,"¹ owing in part to my absence from town when the sheets were passing through the press. Two or three of these appear sufficiently serious to require correction.

SCIURUS VARIABILIS. In the remarks on this species *S. rufo-niger* is a clerical error for *S. brunneo-niger*, at p. 666, seventh line, and at p. 667, second line.

SCIURUS PUSILLUS. At p. 670 I remark that I was not able to ascertain Geoffroy's type in the Paris Museum. It appears that I had overlooked it; for Professor A. Milne-Edwards has kindly informed me that it is still there. Unfortunately the skull is wanting, so that its age cannot well be ascertained. The want, however, is supplied by the British-Museum specimens, of which the skulls and teeth show them to be *fully adult*, although an unhappy misprint (p. 671, eighteenth line) makes me state the exact contrary. M. Milne-Edwards has sent me the following measurements of the types of *S. pusillus* and *S. rufo-niger*:—

S. pusillus.

	millim.	inches.
Length of head	0·039	1·56
„ head and body	0·089	3·56
„ tail (imperfect)		

S. rufo-niger.

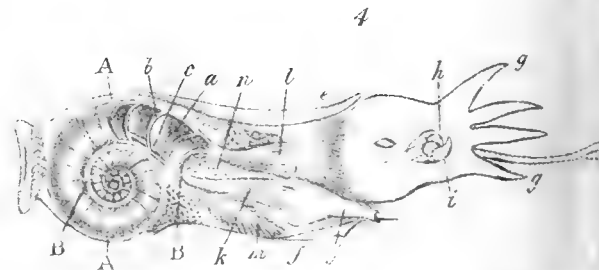
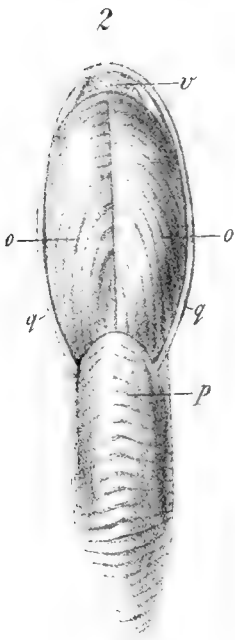
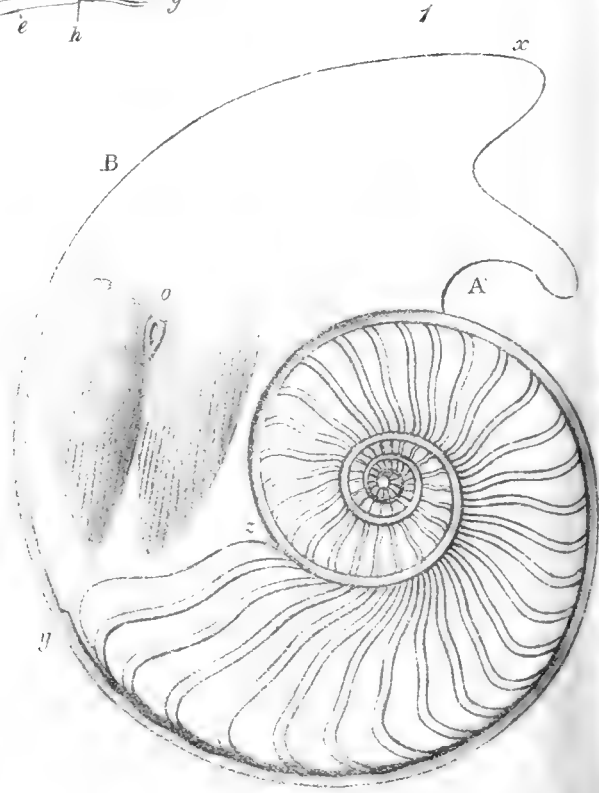
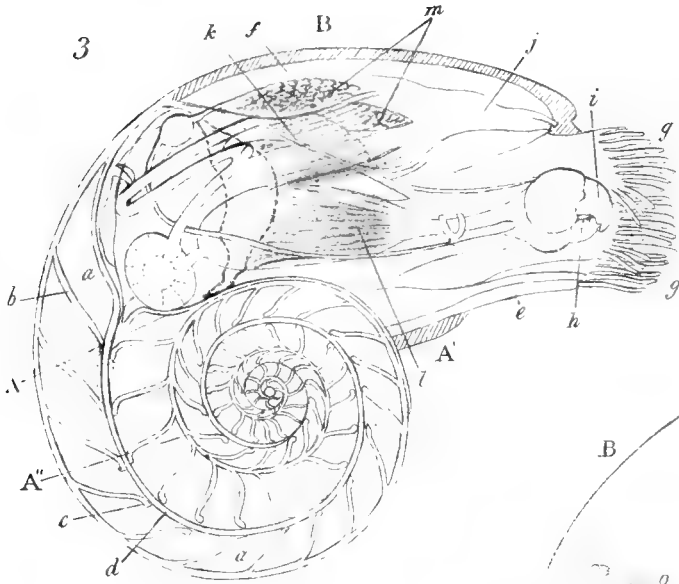
	millim.	inches.
Length of head	0·048	1·92
„ head and body	0·178	7·12
„ tail (with hair)	0·139	5·56

This last specimen appears to me to have been considerably over-stretched in mounting.

In conclusion I may add that I have had the pleasure of receiving a letter from Mr. J. A. Allen, in which he accepts almost all the determinations at which I arrived in the paper in question.

¹ *Suprà*, pp. 656-670.





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CHAMBERED SHELLS OF CEPHALOPODS.

6. On the Relative Positions to their Constructors of the Chambered Shells of Cephalopods. By Prof. OWEN, C.B., F.R.S., F.Z.S., &c.

[Received October 4, 1878.]

(Plate LX.)

The relations of the chambered and siphonated shells to their constructors can now, owing to the extent to which they have been subject to extinction, only be fully elucidated by a study of species or varieties of two of the genera, *Nautilus* and *Spirula*.

The fossil shells of Cephalopods, as is well known, exhibit a progressive uncoiling from *Nautilus* to *Orthoceras* and from *Ammonites* to *Baculites*, with various modifications of the process; but that this had been carried out to a coiling in the reverse direction, required anatomical evidence for its demonstration.

The insight, however, gained into the organization of *Spirula peronii* at the date of the publication of the 'Zoology of the Voyage of the Samarang'¹, added to that previously obtained on the organization of *Nautilus pompilius*², led me to express a conviction of their shell-relations in the following terms:— "These shells (*Nautilus* and *Ammonites*) are revolutely spiral or coiled over the back of the animal, not involute like the *Spirula*"³. And, if the direction of the coils be determined by their relation to the back and belly of the framer of the shell, no other interpretation can be given of such relation as it is exhibited in *Spirula* (Plate LX. fig. 4) and *Nautilus* (ib. fig. 3) respectively.

It is, however, to the exposition and characters of the extraordinary number and manifold variety of the extinct Cephalopods, now known only by their polythalamous and siphonated shells, that an exact and accepted determination of their relative position to the body of the framer is most needed.

In the year 1829 LEOPOLD VON BUCH initiated, in his notable memoirs on the *Ammonites*⁴, the definition and nomenclature of the shell-characters by which the species, genera, and families might be defined.

Assuming, and correctly in my judgment, that the shells of an *Ammonite* and a *Nautilus* were coiled in the same direction, he premises:—"Le caractère distinctif entre ces deux genres de Céphalopodes, consiste en ce que le syphon des *Ammonites* est toujours dorsal, et qu'il ne l'est jamais dans les *Nautilus*"⁵. Next, calling attention to the lobed and foliaceous sutures of the *Ammonitic* shells, he defines the parts which he calls "lobes" and "selles" (saddles)—specifying of the former, "*le lobe dorsal*," "*le lobe ventral*," and "*les lobes latéraux*"⁶. Von Buch's descriptions and figures admit of no

¹. "Mollusca," Part 1, 4to, p. 6, pl. iv.

² Memoir on the Pearly *Nautilus*, &c. 4to, 1832.

³ Palæontology, 8vo, 1861, p. 97.

⁴ *Annales des Sciences Naturelles*, 8vo, tome xvii. p. 267, tome xviii. p. 417.

⁵ *Ib.* p. 268.

⁶ *Ib.* *ib.*

doubt as to his conclusion that the outer convex curve was the "dorsal" one, the inner concave curve the "ventral" one, in both *Nautilus* and *Ammonites*.

Such, indeed, seemed the obvious relations to back and belly of the *Nautilus*-shell before the structure and position of its framer were made known. And it should be remembered that my conclusions on the latter point were inferential, a mere fragment only of the shell having been left attached to the unique specimen submitted to my scalpel in 1832.

Accordingly, in 1835, M. DE BLAINVILLE¹, adopting Von Buch's view of the "dorsal" position of the siphuncle in *Ammonites*, and conceiving the shell of *Spirula* to be convoluted in the same direction as in *Nautilus*, characterizes its siphuncle as "ventral," and that of the Ammonite as "dorsal."

In his applications of these views of relative position to the Ammonites, with little change of the families into which these fossils had been arranged by Von Buch, he proposes new names for them, and adopts the shape and proportions of the outer curve or border of the shell as the family characters. Thus, when such outer, and in my view *ventral*, curve of the shell is broad, as in *Ammonites dilatatus*, a family of "*A. latidorses*" is diagnosed; a reverse proportion, as shown in *Ammonites discus*, characterizes the family "*A. compressidorses*;" but neither these families, nor those of the "cavidorses," "cristidorses," "lævidorses," &c. have gained currency or acceptance.

ALCIDE D'ORBIGNY² adopts the view of relative position, the terminology, and in the main the classification proposed by Von Buch.

By MORRIS³ and ANSTED⁴ the aspects of the Nautiloid and Ammonitoid shells propounded by Von Buch are retained. Prof. Ansted associates *Spirula* with *Nautilus* in his family NAUTILACEA, and writes:—"The next point of difference to be attended to is in the siphuncle; and it is one both of position and magnitude. In the genera of the first family, NAUTILACEA, this important part is sometimes ventral, or on the inner margin, more frequently central, and is very rarely observed to approach the dorsal or outer margin. On the other hand, it is almost always very near the dorsal margin in the AMMONEATA, and sometimes is actually placed outside, in a channel opened for it, and projecting from the back of the shell in the shape of a keel"⁵.

In fact, to have propounded that the siphuncle in the Ammonitidæ was *ventral*, as in *Spirula*, would have implied that the shells were coiled in reverse directions—an assumption seemingly held to be too

¹ Prodrôme d'une Monographie des Ammonites, 8vo, 1840.

² Paléontologie Française, 8vo, 1842, p. 185:—"Les lettres suivantes, les mêmes que celles qu'emploie M. de Buch, indiquent toujours les mêmes parties dans les figures—*c. g.* D. lobe dorsal, V. lobe ventral," &c.

³ "On some new Species of the Genus *Ancyloceras*" ("The ribs ornamented with two conical tubercules on the dorsal part"), Ann. & Mag. of Nat. History, 1845, vol. xv. p. 32, pl. vi. figs. 3, *a, d.*

⁴ Observations on the Animals inhabiting multilocular Shells, 8vo.

⁵ *Ib.* p. 278.

extravagant for adoption. And yet, if the Ammonite was tetrabranchiate like the Nautilus, no other conclusion could logically be drawn.

Accordingly, such view is formally repudiated by the experienced zoologist Dr. J. E. GRAY, in his paper "On the Animal of the *Spirula*"¹. "The examination," he writes, "of this animal confirms me in the opinion which I expressed in the 'Synopsis of the British Museum' (1840, p. 149), that the Ammonites, from their texture and the small size of the last chamber, are internal shells and should be arranged with the decapodous Cephalopods, being chiefly distinguished from the *Spirula* by the siphon being always on the dorsal margin of the whorls and the septa foliated on the edge. I am aware," he adds, "that this opinion is not in conformity with the ideas of many zoologists and comparative anatomists; for Mr. Owen, in the last arrangement of these animals (Todd's Encycl. Comp. Anat.), though he places the *Spirula* with the *Dibranchiate* Cephalopods, places the *Ammonites* with the *Tetrabranchiate* next to *Nautilus*" (p. 259).

Before recapitulating the grounds on which it was inferred that the *Ammonitidæ* were external shells, I will, finally, cite the valuable Memoirs of the Geological Survey of India, published under the direction of the accomplished and lamented Superintendent of the Survey, THOMAS OLDHAM, LL.D., F.R.S., in which the sanction given to the views of Gray and before-cited authors as to the aspects of the shells of the Ammonites has mainly induced me to offer the present elucidation of the grounds on which I still hold the contrary opinion, viz., that the siphuncle in the *Ammonitidæ* is "ventral" or "margino-ventral," as it is in *Spirula*, but that it is "external" in the one and "internal" in the other, through the reversed direction of the spiral whorls.

In the "Monograph of the Cretaceous *Cephalopoda* of Southern India," the preparation of which was confided to the accomplished naturalist F. STOLICZKA, too early lost to science, he premises the following characters of the *Ammonitidæ*:—

"Animal not known: shell spiral, more or less involute with numerous regularly (?) and gradually increasing whorls in the same plane, many-chambered, the last or body-chamber extending generally over about two thirds of the last whorl. The margins of the septa are deeply divided into lobes and saddles, the first having their subdivisions always pointed, the latter more rounded. The *dorsal* lobe is divided by a small saddle into two parts, corresponding to the siphuncle: in the regular forms of Ammonites this is always placed in the middle of the back; the siphuncle is also similarly placed inside the shell."

It is to be observed, however, that the author associates the *Ammonitidæ* in the same order "TETRABRANCHIATA" with the *Nautilidæ*; and it would seem therefore that he entertained the doubts originally expressed by Gray² and supported by Grant³ as

¹ Annals and Magazine of Natural History, vol. xv. 1845.

² Phil. Trans. 1833, p. 774.

³ My description and figures were called in question, with more detail, by

to the correctness of the position assigned by me to the soft parts of *Nautilus* in the shell¹; but the sole reason assigned by Stoliczka for adhering to Von Buch's view of the position of the shell and his consequent denomination of its parts is the following:—"Our descriptions are of the shell (*Am. testa*), not of the animal which was living in it, and which we know not"².

We shall never know the organization of that animal *ex visu*. But there are, in respect of the Ammonite as of most extinct animals, other sources of knowledge in kind and degree sufficient to decide such a question as the relations of soft parts to shell in a Molluscous species.

With regard to those relations in *Nautilus* I may merely cite the subjoined works on its anatomy confirmatory in the main of my own, and fully so in regard to the relative position of the soft parts to the shell³.

the accomplished Professor of Comparative Anatomy in University College, Dr. ROBERT E. GRANT, F.R.S., and begat a general belief, in 1833, that I had placed the animal of the Pearly Nautilus in a position the reverse of the real one, in the 'Memoir' of 1832. In the report of the Lecture on the Shells of the Cephalopoda, given in the 'Lancet,' vol. i. 1833, with the sanction and revision of the Professor, Dr. Grant remarks:—

"The exact position of the animal in the recent *Nautili*, *Spirulæ*, and other polythalamous spiral shells, although important in the interpretation of the fossil forms, has not yet been satisfactorily observed by naturalists. In our present uncertainty, therefore, regarding the position of the living Cephalopods in these convoluted shells, we can only be guided by analogy."

That which guided Dr. Grant to his conclusion he illustrated by figures of sections of the external shell of *Nautilus* and of the internal shell of *Sepia* (p. 506), and explained them as follows. Comparing the layers of the "cuttle-bone" to the septa of the Nautilus shell, he states:—"These layers begin in the *Sepia* by forming a small hollow shell, which receives into its interior another hollow shell; this receives within it a third and a fourth hollow shell; and so they go on in the first stages of its growth. If these cones continued thus to extend outwards, and with an oblique direction, turning on the same vertical plane, they would have formed a convoluted suborbicular shell, like that of the Ammonite or the Nautilus. Where, then, in this so convoluted shell of the *Sepia*, would have been the convex outer border of the shell, or the upper lip, with relation to the body of the *Sepia*? The *Sepia* would have looked forwards over the spire from the last-formed chamber, keeping the exterior convex part of the chamber" (answering to B in fig. 3) "or the upper lip extending across its back, as in all other known orbicular shells of Pteropodous and Gasteropodous Mollusca." (P. 509.)

¹ Memoir, *ut supra*, pp. 12, 44, pl. i.

² *Op. cit.* p. 44. So, likewise, affirms a later writer:—"We have only the shells preserved to us. We know nothing of the animals."—H. Woodward, Geol. Mag. vol. v. p. 497.

As well might it be affirmed of *Anoplotherium*, e. g.:—"It must always be borne in mind, when arguing from these early fossil remains, that we have only the skeleton preserved to us. We know nothing of the soft parts."

³ VALENCIENNES, M. A. "Nouvelles Recherches sur le Nautilé flambé (*Nautilus pompilius*, Lam.)," Archives du Muséum d'Histoire Naturelle, Paris, 4to, tome ii., 1841, p. 275, pls. viii., ix., x.

VAN DER HOEVEN, J. "Contributions to the Knowledge of the Animal of *Nautilus pompilius*," Trans. Zool. Soc. vol. iv. p. 21, pls. 5, 6, 7, 8.

VROLIK, W. "Lettre sur quelques points de l'organisation de l'animal du Nautilé flambé," Mémoires de la Soc. Linnéenne de Normandie, tom. x., 4to, 1855, pp. 1-18, pls. i. and ii.

A colleague of Stoliczka, accepting the recorded structure and relative position of *Nautilus*, frames his nomenclature of the parts and aspects of the fossil shells of the *Nautilidæ* accordingly¹, the grounds for such being those of positive or direct evidence from dissection. I am led, therefore, to submit remarks on the guiding knowledge in regard to the structure and shell-relations of the extinct Ammonites, which may be gained from negative or inductive testimony.

J. E. Gray, we have seen, deemed that testimony to be such in kind and amount as to warrant his rejection of the affinity of *Ammonites* to *Nautilus*, and his adoption of the association of *Ammonites* with *Spirula* in the Dibranchiate order of Cephalopoda.

Examples of unmutilated Ammonite shells are, indeed, very rare; seldom is a specimen acquired with any considerable proportion of the last chamber. Yet some such were to be seen in an accessible museum in London long anterior to 1845.

A bisected specimen of the *Ammonites obtusus*, Sow., in the Hunterian collection (No. 188), shows well the extent of the last or inhabited chamber of the shell, and the effects of the influence of the animal matter of the decaying Cephalopod upon the petrifactive processes after death. The liassic clay has penetrated as far as the retracted soft parts of the Ammonite permitted; the decomposing mollusk has been partially replaced by crystals of spar discoloured by the pigmental or carbonized parts of the animal; the spar which has more slowly infiltrated through the pores of the shell into the air-chambers is of a much lighter colour.

In the same collection may be seen exemplifications of injury and repair of the cell. In No. 195, *Ammonites goliathus*, D'Orb., from the Oxford Clay, a portion of the shell, at the period when it formed the dwelling-chamber, "had been broken away during the lifetime of the animal, and has been repaired by fresh material, wanting the ribbed structure of the originally formed shell"².

The reparation closely resembles that which recent *Nautilus*-shells occasionally present, and which we know was effected by the formative border of the mantle reflected over the last chamber and applied to the fractured part. No such process could take place in *Spirula*, the mantle of which is muscular, and inapplicable to the last chamber. There is no need of a living Ammonite to assure us that its mantle, like its porcellano-nacreous shell, had the same structure as that of the living *Nautilus*.

¹ Memoirs of the Geological Survey of India, 4to, 1866. "The Fossil Cephalopoda of the Cretaceous Rocks of Southern India: *Belemnitidæ*—*Nautilidæ*," by HENRY F. BLANFORD. "Throughout the following descriptions I have employed the terms *ventral* and *dorsal* strictly with reference to the position of the animal, and therefore in an opposite sense to that in which they were used by palæontologists before the anatomy of the animal was known," p. 7. (And Mr. Blanford might have added "long after."—R. O.)

² Catalogue of Fossil Invertebrata, Mus. College of Surgeons, London, 4to, 1856, p. 43, in which work I described upwards of 350 specimens, illustrative of the different families and genera of *Ammonitidæ*, collected by JOHN HUNTER in the last century.

The perfect specimen (Plate LX. fig. 1) of the last chamber of the Ammonite was derived from that eminently conservative matrix, the lithographic slate of Solenhofen, Bavaria. The extent of the outer curve of the dwelling-chamber to the outer border of its floor (the last septum, x to y) is 4 inches; the extent of the outer curve of the chambered part of the shell to the inner border of the chamber-floor (last septum, y to z) is 6 inches. In the *Nautilus pompilius* transmitted in its perfect shell to Prof. Vrolik the corresponding admeasurements are 7 inches 9 lines and 11 inches 6 lines. The correspondence in the proportion of the dwelling-chamber to the camerated part of the shell in the Ammonite and Nautilus is thus, as in numerous other instances, shown to be instructively close.

In the last chamber of *Ammonites lingulatus*, moreover, as if to proclaim to the most sceptical its function of lodging its constructor, is preserved the only fossilizable part of such (ib. fig. 1, o).

Since the publication of the 'Paléontologie' of Pictet¹, who refers the Trigonellites to the Cirripeds, abundant evidence has been obtained of the accuracy of the opinion of Volz², that the *Trigonellites* of Parkinson³ (*Aptychus* of v. Meyer⁴) were parts of the animal of the Ammonite, and stood in opercular relation to the shell of that extinct Tetrabranchiate. Pictet takes no note of the confirmation contributed by Morris to the Volzian examples of Trigonellites within the last or dwelling-chamber of *Ammonites*, in the portion of an *Ammonites walcotti* in which "the *Aptychus*, of a corneo-calcareous nature, was found imbedded in the matrix filling the last chamber about 6 inches from the aperture"⁵.

This common, though not constant, position led some palæontologists to surmise that the Trigonellites might be parts of the *Ammonites*' gizzard, like the triturating plates in *Bulla lignaria*. M. Valenciennes believed them to be lateral supports of the funnel⁶. Van der Hoeven "hazards the opinion that the two juxtaposed fossil shells, known by palæographers as *Aptychus*, were two shelly supports of the hood of *Ammonites*" (Trans. Zool. Soc. vol. iv. p. 22). In this opinion I concur; but it has been rejected by some experienced students of the extinct polythalamous shells. Keferstein and Waagen⁷, *e. g.*, deem the Trigonellites to be sexual characters, and to have served as protective plates of the nidamental glands of the female Ammonite. Waagen adduces, in support of this view, the

¹ Traité de Paléontologie, &c., vol. ii. p. 551, 8vo (1854).

² "Sur le *Belopeltis*," in Mémoires de la Soc. d'Hist. Nat. de Strasbourg, tome iii. (1836).

³ 'Organic Remains of a Former World,' 4to, 1811, p. 184, pl. xiii. figs. 9-12.

⁴ Nova Acta Acad. Nat. Cur. t. xv. pt. 2, p. 125, pl. lviii. (1831).

⁵ "Note on *Aptychus*," in Ann. & Mag. Nat. Hist. vol. x. (2nd ser.), p. 356, pl. v. D. fig. 1.

⁶ "Je crois qu'il faut admettre que l'entonnoir de l'ammonite, s'il était formé de deux valves, ne contenait pas de cartilage interne; mais que cette pièce était remplacée par un organe extérieur composé de deux pièces paires symétriques comme le sont les *aptychus*."—Ib. p. 304.

⁷ "Ueber die Ansatzstelle der Haftmuskeln beim Nautilus und Ammoniten," Palæontographia, 4to, p. 185, taf. xxxix., 1871.

correspondence of the relative position of the *Aptychus*¹, in the body-chamber, to that of the nidamental glands of *Nautilus pompilius*² to the shell; and he deems each valve of *Aptychus* to have been applied to a lateral lobe of the nidamental gland³. But these lateral lobes are divided from each other by a part of the middle lobe⁴, while the valves of the *Aptychus* are usually in contact (as in Plate LX. fig. 1, *o*), or may be suturally united along the mid line (as in *ib.* fig. 2, *o*). But to return to Waagen's argument from position in the fossil shell. In the course of decomposition after death the calcareous plates would be likely to gravitate or sink deeper into the body-chamber than their natural position in the living Ammonite. So sinking, they would rather lodge or settle in the hollow of the outer (ventral) wall of the body-chamber (B) than upon the involute convexity on the opposite (dorsal) wall (A). Moreover there are examples (as in Plate LX. fig. 2) in which the Trigonellites (*o, o*) have been found in an opercular relation at the mouth of the shell. And, considering the movements to which an Ammonite must have been subject from the time of its death to the solution of the soft parts and final imbedding of the shell in the matrix or seat of its petrification, one is prepared for the rarity of the conservation with the shell of its loose operculum, and for the still more rare retention of the *Aptychus* in its original position. Waagen admits that there are five specimens of Ammonite in the Munich collection exhibiting this position⁵. He, however, contends that the breadth of the aperture of the body-chamber is less, in certain Ammonites (*A. steraspis*, e. g.), than the united breadth of the aptychal plates. But so, likewise, if the side lobes of the hood of *Nautilus*⁶ were outstretched horizontally, it would exceed the breadth of the outlet of the dwelling-chamber in *N. pompilius*. But the side lobes of the hood are bent back obliquely in order to close the dorsal side-curved borders, or notches, of that part of the shell-aperture, just as the aptychal lobes or valves are bent down in Plate LX. fig. 2, *o, o*.

It may be further remarked, in respect to the nidamental glands, that they are subject to seasonal changes, and gain the relative bulk with which the size of the aptychal plates accord only at the period of discharge of the impregnated ova, for which they have to furnish the protective coat or nidus. Such seasonal change is exemplified in the figure of these glands given in the 'Memoir on the Nautilus' of 1832, and in that which is shown in Taf. xix. of Waagen's Treatise, 1871. Moreover, in not one of the existing genera or species of Cephalopod, *Nautilus* included, in which these glands are superadded to the more essential organs of generation, are they encumbered in any way or degree with such calcareous plates as Keferstein's hypothesis applies to them in the Ammonite.

¹ Palæontographia, 1871, taf. xl. fig. 4.

² See Memoir on the Nautilus, 1832, pl. i., e.

³ *Ib.* pl. viii. fig. 10, *b, b*.

⁴ *Ib.* *ib.* *a*.

⁵ "Unser Museum besitzt gegen 100 exemplare von Ammoniten mit erhaltenen *Aptychus*; unter dieser ganzen Anzahl sind 5, welche den *Aptychus* in senkrechter Stellung am Ende der Wohnkammer liegend haben" (*op. cit.* p. 192).

⁶ Memoir on the Nautilus, 1832, pl. iii. fig. 1, *g, g*.

In the application of the anatomy of the constructor of the Pearly Nautilus to the solution of the problem of the nature and function of the Trigonellites, I was led to regard them as the homologue of the organ, or a portion of the organ, in *Nautilus*, which is "of a fibrous texture, resembling dense corium," called from its shape and position the "hood" (Plate LX. fig. 3, *e*), and which, when the animal had withdrawn into its dwelling, "would serve as a rigid defence at the outlet of the shell"¹. It needed only that this part should be more or less calcified to form the preserved portions of an operculum like that ascribed to the Ammonite. If, for example, calcification had commenced in each half of the symmetrical "hood," and had stopped at the mid line (where the hood is thinnest), the pair of the there-often-suturally-joined symmetrical pieces of the *Aptychus* would have resulted. The relative size of *Aptychus* agrees with that of the shell. It has been found to measure 7 inches 6 lines in length and 6 inches in breadth in gigantic Ammonites². It may be doubted whether the nidamental glands ever increased in the same ratio; and it is still less likely that they needed such defensive plates in their season of rest and attenuation.

If, therefore, my homology of the symmetrical halves of the *Nautilus*' hood with the parial Trigonellites (*Aptychus*, v. M.) be preferably accepted, the supposition that these parts are calcifications of an Ammonite's hood may be deemed reasonable. That the fibrous basis of the hood was retained in different degrees in the Ammonites is indicated by the simply corneous or chitinous condition of the *Aptychus* which has been preserved in some examples of *Ammonites falcifer*, Sow., and its allies. In other species, as in the *Ammonites lingulatus* (Plate LX. fig. 1, *o*), the lateral calcifications have partially met and joined at the mid line; in a third series these opercular plates are thicker and are there suturally united. This is the case in the small or young specimen of *Ammonites subradiatus*, Sow., in the British Museum, which is described and figured by S. P. Woodward, F.G.S., in 'The Geologist'³. As the view of the specimen there given is an oblique side one, I here append a direct view of the aperture of the dwelling-chamber as closed and protected by its operculum (Plate LX. fig. 2, *o*). The correspondence of general shape with that of the "hood" of the *Nautilus pompilius*, as figured in plate iii. fig. 1 of my 'Memoir,' is close⁴.

The conjoined plates of the *Aptychus* (ib. fig. 2, *o, o*) form a triangular disk, of which the base is backward, excavated to receive the involute part of the shell, *p*, with the sides of the base, like the corresponding lobes of the "hood," bent down to cover the laterally extended parts of the wider terminal coil of the shell, *q*. Even in the contrast between the papillose wrinkled outer surface and the

¹ Memoir on the Pearly Nautilus, 1832, p. 12, pl. i. *n*, and pl. iii. fig. 1.

² See de Zigno, Memorie del R. Istituto Veneto, tom. xv. tab. viii., 1870.

³ 8vo, 1860, p. 328.

⁴ Woodward gives the following description of its ammonitic homologue:—"The operculum is flat in the middle, with a slight furrow along the suture, and is much bent down at the hinder corners, where it abuts against the inner whorl of the shell. It is sculptured externally with about twelve angular concentric furrows; the inner surface is smooth."—*Ib. ib.*

smooth inner surface of the "hood" of *Nautilus* the resemblance to the "Aptychus" of the Ammonite is carried out. Anterior to the apex of the triangular operculum in the *Ammonites subradiatus* a small portion of the dwelling-chamber (ib. *v*) is left uncovered, through which a slender stream of water might pass from the retracted funnel.

As the soft parts of the *Ammonites lingulatus* decayed and were dissolved the calcareous or opercular parts of the hood (ib. fig. 1, *o*) have subsided to near the bottom of the dwelling-chamber, probably with such change of their original relative position, as exemplifies the value of the demonstration given in the specimen described by Woodward. If an independent centre of calcification were set up in the mid region of the "hood" (*Mem. cit.* pl. iii. fig. 1, *f*), a part corresponding to the *Anaptychus* might result.

In further ventilation of the mooted affinity of *Ammonites* to *Spirula*, it may be remarked that in not one of the examples of *Ammonites* in which the dwelling-chamber has been in any proportion preserved has there been any trace of an ink-bag. Yet fossilization of this or of its secretion is abundantly exemplified in the extinct Belemnites¹. Hence the inference may as confidently be drawn, as from a dissection of the animal of the Ammonite, that this Cephalopod lacked, like the *Nautilus*, the singular defensive contrivance with which the more active Dibranchiate Cephalopods were endowed, and that the animal of the Ammonite was compensated, like that of the *Nautilus*, by having an external protective shell into which it could retreat and close the entry against the assaults of an enemy. Moreover, admitting the homology of the "Aptychus" with the "hood," we further learn that the defensive door of the house was "dorsal," and that the relative position of the soft parts to the external shell was the same in *Ammonites* as in *Nautilus*.

It cannot be averred, therefore, in excuse of a nomenclature implying a different and opposite relative position of the soft parts to the shell, that "the animal of the Ammonite is unknown."

To the composite porcellano-nacreous structure by which the Ammonitic agree with the Nautiloid series of shells, and their difference in this character from the simply nacreous structure of the *Spirula*-shell, reference is here made in illustration of the "Law of Correlation." The conformity, in this respect, with the Nautiloid series is maintained under every modification of shape from straight to convolute.

But the persistence with which monographers of these numerous and beautiful fossils, notwithstanding the appeals of Pictet² and McCoy³, and the practice of Barrande, adhere to the erroneous views of Von Buch as to which was the dorsal and which the ventral aspect of the shells, has moved me to supplement the original grounds of

¹ Buckland, Bridgewater Treatise, vol. i., 1835; Owen, "On certain Belemnites from the Oxford Clay," Phil. Trans. 1844.

² Palæontology, vol. ii. p. 618.

³ Ann. & Mag. Nat. Hist., 2nd ser. vol. viii. p. 481.

my conclusions on that question by additional or confirmatory evidence from autopsy of the fabricators of the still existing polythalamous and siphoniferous Cephalopods.

Having prevailed upon Mr. Cuming, subsequently to my Monograph on the anatomy of *Spirula* in the 'Zoology of the Samarang,' to permit me to test that anatomy by dissection of his unique specimen, I proceed to point out such structural facts, confirmed by that dissection, as demonstrate the ventral position of the marginal siphon of the internal shell of *Spirula*—and to combine therewith corresponding anatomical observations on *Nautilus*, which, with the demonstrated affinity thereto of *Ammonites*, equally prove the ventral position of the marginal siphon of the external shell of that extinct genus and its allies.

The dorsal aspect of a Cephalopod is determined by the position of the brain and eyes, *i. e.* by that predominating part of the brain which sends off the optic nerves. The ventral aspect is shown by the respiratory funnel (Plate LX. figs. 3 and 4, *j*, and gills, *m*). No malacologist has questioned these conclusions. The proposition might be simplified by stating that the funnel shows the "ventral side" of the animal, and that the opposite one is the "dorsal side."

Accordingly, all who have occupied themselves with the organization of the Cephalopods have pointed out the singular reversed positions of the mandibles as compared with those in such vertebrate animals as repeat the cephalopodic condition of a "beak," as, *e. g.* *Chelonia* and *Aves*.

Instead of the dorsal or upper mandible being the largest and longest, so as to overlap the ventral or under mandible, as in birds, the dorsal mandible, *h*, figs. 3 and 4, is the smaller and shorter one, and is underlapped by the larger and longer ventral mandible, *i*, in all Cephalopods.

So, likewise, the branchiæ, *ib*, figs. 3 and 4, *m, m*, lie in the ventral part of the pallial cavity; and, in short, the several viscera occupy similar relations to back and belly in both Tetrabranchiate and Dibbranchiate Cephalopods¹.

The aspects of the body being thus abundantly and unmistakably determined, they can be as unequivocally predicated of the shell under whatever shape or proportion it may be present.

The portion of the shell of *Nautilus* which extends from the fundus of the last chamber, along the dorsal aspect of the mantle, as from A to A', fig. 3, is the "dorsal wall" of such shell, and so must be its continuation backwards.

The portion of the shell of *Spirula* which bears the same relation to the dorsal aspect of the body is the "dorsal wall" of the shell, A, A', fig. 4; while that part of the last chamber which protects the ventral side of the muscular and visceral mass which it contains, small though it may be, is part of the "ventral wall" of the shell, B, and so must be its continuation as far as it extends, *viz.* to the "protoconch" (fig. 5, *a*) or incipient nuclear chamber.

¹ See "Supplementary Observations on the Anatomy of *Spirula*," in *Annals and Magazine of Natural History* for January 1879.

Accordingly, the dorsal wall, A, of the spiral shell of *Spirula* describes a convex curve, the ventral wall, B', a concave curve. In *Nautilus* the curves are reversed. If the shell of *Orthoceras* or *Baculites* were curved so as to present the same relative positions of convexity and concavity which exist in that of *Spirula*, they must have been coiled in a reverse direction to that which is presented in the shells of *Nautilus* and *Ammonites*.

Admitting that the siphon in *Ammonites* and *Spirula* are both "ventral" or "ventro-marginal," yet the relative position to the shell is so contrasted as to call imperatively for terms indicative of such contrast. And such terms are obvious. Of a convolute shell the convex curve is the *outer* one, the concave curve the *inner* one, whatever may be the relative position of its constructor.

Had Von Buch been content to call those curves in a convolute Ammonite "external" and "internal," and to define the position of the siphon as "externo-marginal" and "interno-marginal" respectively, his terminology would have stood and been unquestioned to the present day. But he proceeded to a conclusion as to their relations to the constructors of the shells; and, as no specimen of either a *Nautilus* or a *Spirula* had been dissected in 1829, such conclusion could only be a guess.

So probable, however, seemed the guess, that his most experienced contemporaries, De Blainville, Grant, and Gray, after the organization of the Pearly *Nautilus* had been made known, preferred, as we have seen, the opinion of the conchologist to that of the anatomist, and deemed the latter to have reversed the true position of the animal of the *Nautilus*¹. And, with most², the nomenclature of the parts of the shell of the *Ammonitidæ* has continued in concordance with that opinion to the present day.

If, however, the facts and inferences now submitted to the Zoological Society should be accepted with their logical applications in conchology, and the siphon in both *Ammonites* and *Spirula* be acknowledged to be "ventral," or "ventro-marginal," nevertheless the different positions of the siphon in these shells and in that of *Nautilus* demand to be defined by distinctive terms. And these are easy, obvious, and incontrovertibly applicable. The siphon in the *Ammonitidæ* is "external," "externo-marginal," or "ecto-marginal." The siphon in *Spirula* is "internal," "interno-marginal," or "ento-marginal." The siphon in the *Nautilidæ* may be "central," or "subcentral;" and if the latter, either "ectocentral" or "entocentral," according as it deviates from the typical central position toward the

¹ See notes 2 and 3, p. 957.

² Even in S. P. Woodward's classical 'Manual of Mollusca,' 12mo, "dorsal" and "ventral," are used as synonyms of "external" and "internal." Thus the genus *Ammonites* is characterized by "siphuncle dorsal" (p. 94, and p. 197, ed. 1868). The genus *Goniatites* is characterized by "siphuncle dorsal" (p. 93). The experienced Editor, in a later edition of the 'Manual of the Mollusca,' in his 'Appendix' (12mo, 1868) approximates to the conclusion here advocated, by amending the character of Fam. iii.—*Ammonitidæ*, thus:—"Siphuncle—convexo-marginal?" (p. 10). If the present paper should serve to dissipate Mr. Tate's remaining doubt it will be an acceptable return for my labour.

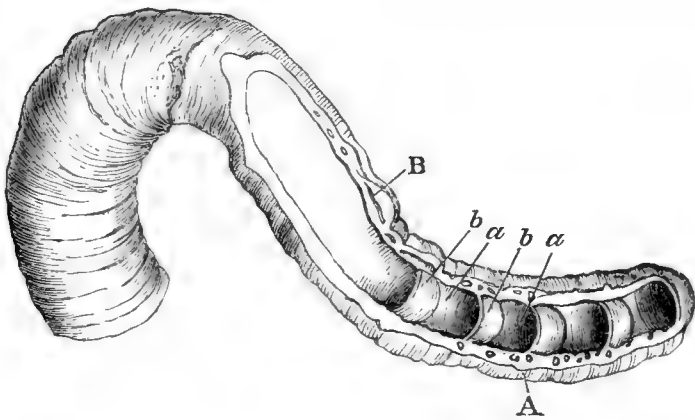
external or internal part of the shell : in some rare cases (*Cryptoceras*) the siphuncle is ectomarginal, as in *Ammonites*; and in still rarer instances (*Clymenia*) it is entomarginal, as in *Spirula*. There are also species in which it begins by being marginal, and gradually shifts to the more typical position as the shells grow and the number of the septa increases.

In the *Nautilus imperialis*, e. g., the siphuncle is at first, i. e. along the first twenty chambers, entomarginal, or near the concavity of the shell-curve, as in *Spirula*; but in opposite relations to the back and belly of the animal. After the twentieth chamber the siphuncle gradually gains the central or excentral position¹. *Nautilus ziczac* shows a similar structure. The immature position of the siphon in the existing *Nautilus* was longer retained in the old Tertiary species.²

Various suggestions have been made as to the efficient as well as final cause of the successively vacated parts called "chambers," with their partitions and connecting siphon, in the polythalamous and siphoniferous shells of Cephalopods.

In elucidation of this question, much mooted by different writers³

Fig. 1.



Vermetus gigas.

Section of chambered part of shell.

after the publication of my Memoir on the Pearly Nautilus, I adduced the instances of such vacuities or chambers in the Mollusca,

¹ Catalogue of Hunterian Cephalopoda, 4to, no. 137, p. 32.

² See the just remarks of Barrande on the variation of the siphuncular character in certain nominal species (*Céphalopodes Siluriens de la Bohème*, 8vo, 1867, p. 24).

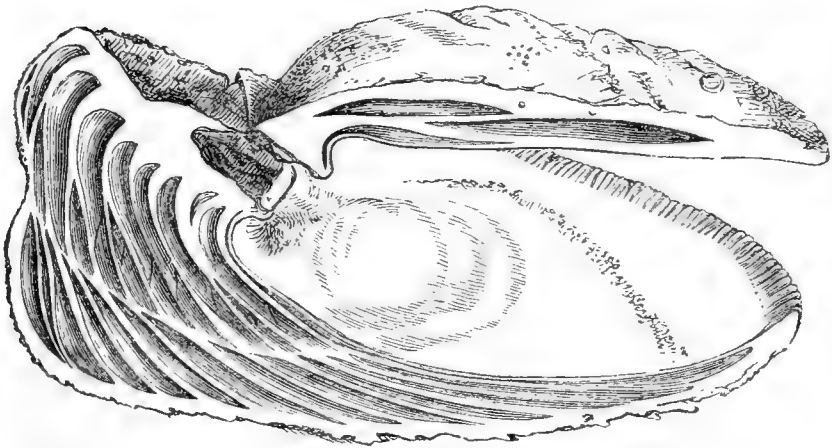
³ Buckland, 'Geology and Mineralogy considered with reference to Natural Theology,' 1835, vol. i. p. 329. De Blainville, "Sur l'usage du siphon des coquilles polythalamées," *Annales françaises et étrangères d'Anatomie et de Physiologie*, t. i. 1837.

as, e. g., *Fistulana clava*, *Vermetus gigas*, *Helix decollata*, the *Ostrea*, *Estheria*, and other Bivalves, more especially the *Spondylus varius*¹.

In *Fistulana* and the gastropodal *Vermetus*, the animal periodically withdraws itself from its dwelling-chamber; the growth of the walls is continuous and uninterrupted; but a thin new floor is formed at some distance from the old one left behind, and a series of chambers fig. 1, *a a*, results. If the calcareous deposit had been continuous in every part of the shell, a solid tract would have been left behind, as in *Magilus*. The successive floors or "septa" in *Vermetus* (fig. 1, *b b*), extend freely across and are concave toward the outlet; they are entire and adherent only by their marginal circumference to the shell-wall (A, B). The contents of the chambers in the living *Vermetus* are unknown. Both chambers and partitions are the consequence of a mode of shell-growth; physiological ken stretches not beyond this.

In *Spondylus varius* (fig. 2) the "septa" are not continued freely across the shell, but are united together near the middle or centre of their extent, at the position of the impression of the adductor

Fig. 2.



Spondylus varius.

Section of chambered part of shell.

muscle. This, in the forward movement of the mollusk, does not quit its attachment to the nacreous layer of the valves; whilst the pallial lobe, except at its circumference and where it adheres to the adductor, can and does detach itself from the surface of the valve about to be abandoned, in the progressive growth of the visceral mass. The mantle at each period of repose, then secretes on the fluid occupying the deserted part of the shell, the new septum or

¹ Proc. Zool. Soc. 1837, p. 63. See also H. Woodward, "On the Structure of the Shell of the Pearly Nautilus," Report of the British Association, Liverpool, 1870, Trans. of Sections, p. 128.

basis of support of the mollusk. Thus the septa, as they are successively formed, adhere, not only to the circumference of the growing valve, but to a central part of the preceding septum, and for an extent more or less corresponding to the circumference of the correspondingly advancing adductor muscle.

If the adductor were a tube instead of a solid mass, the central confluent part of the septa would be perforated, and a siphon would result, the calcareous walls of which would be continuous, as in *Spirula*, *Nautilus striatus*, the Orthoceratites, &c.

The contents of the deserted chambers in *Spondylus varius* are sea-water with an increased proportion of the saline ingredients.

The efficient cause of the forward movement of the *Spondylus varius* appears to be the need of a shell of a size suitable to the growing bulk of the animal, coupled with the frequent fixation of the lower valves of the young shell to an overcrusting mass of coral, in advance of which the growing shell must increase. Such increase and the testaceous provision for it are not, therefore, attributable to special expansion of one organ, but to the concomitant growth of the whole of the soft parts of the Palliobranch.

It has been suggested that the periodical increase of the ovarium or testis might initiate and constrain the forward movement of the soft parts in the Cephalopods with chambered shells, and that a polythalamous structure is related conditionally to the generative function¹.

But it will be observed, in both *Spirula* and *Nautilus*, that the formation of the chambers commences from the embryonal cup (protoconch, fig. 5a, p. 973), and continues through an early period of growth antecedent to the acquisition of the procreative function, or the adult stage of existence—and, moreover, that those early chambers are relatively deeper² than the succeeding ones, indicative of a more extensive forward movement of the soft parts, in accordance with the more rapid growth of the animal which characterizes the period of nonage, when all the assimilative functions are concentrated on general increase and no degree of that power is diverted to the development of special organs, such as the testis or ovarium.

The last or open chamber of *Nautilus*, and, by analogy of size and certain known contents, in *Ammonites*, was occupied by the entire soft parts. In *Spirula* it contains only the hind end of the liver and portions of the origins of the retractor muscles of the head and funnel. It has been stated to contain the ink-bladder in *Spirula*³; but in my dissections of that Cephalopod made subsequently to that detailed in the 'Zoology of the Voyage of the Samarang,' I find the same positions and relations of the ink-bag as are described and figured in that monograph⁴.

¹ Prof. Seeley, Proceedings of the British Association, Bath, 1864, Section Zoology, "Nautiloid shells," 8vo, p. 229.

² By depth is meant the diameter from septum to septum; by breadth that between wall and wall.

³ Woodward, 'Manual of Mollusca,' p. 77.

⁴ "A very minute pyriform ink-bag, *z*, is situated close to the rectum; and its duct opens within the verge of the anus" (p. 10, pl. iv. fig. 11).

As to the function or "final cause" of the chambers, I hold by the opinion expressed in my original memoir¹ and in the 'Catalogue of the Fossil Cephalopoda in the Hunterian Museum,' 4to, ed. 1856², viz. that they so affect the specific gravity of the active, highly organized, cephalopodous mollusk, as to enable it with little effort to rise, in the case of the *Nautilus*, from its habitual position at the bottom of the sea—and in the case of the *Spirula*, to sink from its more usual zone at or near the surface,—such vertical movements being executed, like the horizontal ones, by means of the hydrostatic mechanism worked by the muscular forces of the mantle and funnel.

The contents of the vacated chambers in *Nautilus pompilius* are stated to be nitrogenous gas. Neither the contents nor the vital properties of the siphuncle are yet known; an artery and vein are assigned for its life and nutrition, and to extend a low degree of the vivifying influences to the shell. Vrolik confirms the existence of the siphonal artery described and figured in pl. vi. fig. 1, 14, of my 'Memoir,' and repeats this illustration in his pl. i. fig. 2, "i, artère allant au siphon"³.

The siphonic artery sends off, according to Keferstein, branches to the mantle which lines the bottom of the body-chamber before penetrating the siphon. Waagen figures the impression of these arterioles on the shell-surface⁴; and it has been suggested that these vessels may supply, by secretion, the chamber-gas which I inferred might occupy the space left free on the recession of the visceral sac from the chamber-floor prior to the formation of a fresh septum⁵.

Thus, in the analysis of the structure of chambered shells, we find:—septa simple, distinct, attached only by their circumference (woodcut fig. 1, p. 966); septa attached, subcentrally, to each other, as well as by their circumference to the shell-walls (fig. 2, p. 967); septa (fig. 3 *b*, p. 907) attached marginally to the shell-walls, *A*, and also to each other by tubular prolongations, *c*, with an organized, vascular, membranous canal, *d*, traversing such testaceous tube; septa with a calcareous siphuncle consisting of a series of superimposed, elongate, funnel-shaped tubes, with the wide end directed toward the aperture of the shell, as in *Spirula* (fig. 4, p. 971), or in the opposite direction, as in *Bathmoceras*. The more complex siphons of Orthoceratites will be presently referred to. Finally, we see in the existing *Nautilus* the shelly tube interrupted, forming the "collar of the siphon," and the septa and chambers traversed by a lime-coated membranous canal running through the interrupted shell-tube (Plate LX. fig. 3, *c*, *d*).

¹ "From the adhesion of the entire circumference of the mantle to the shell by means of the 'horny girdle' ('*annulus*,' Waagen, *op. cit.*), I am inclined to suppose that the whole of the chambers are excluded during the life-time of the animal from external influence, and are filled only by exhalations or secretions from the animal."—*Memoir on the Nautilus* (1832), p. 47.

² "The proportion of the air-chambers to the occupied dwelling-chamber of the *Nautilus* is such as to render the whole animal of nearly the same specific gravity as the surrounding water."—*Catalogue*, p. 29.

³ Mémoires de la Soc. Linnéenne de Normandie, tom. x. 1855, p. 17.

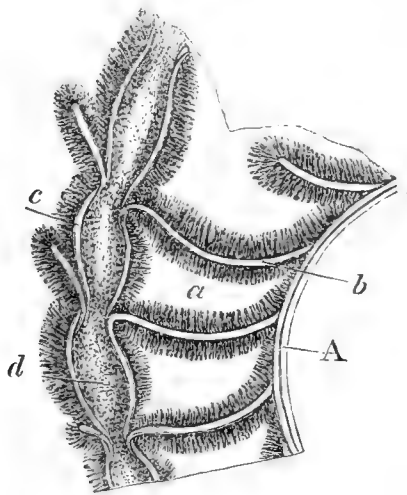
⁴ Waagen, *op. cit.* Taf. xxxix. fig. 4.

⁵ *Op. cit.* 4to, 1832, p. 47.

For the different views which have been propounded as to the nature and function of this complex siphon, reference may be made to the authors cited, p. 966. Some of these views were based on the partial knowledge of its structure at the date of the first dissection of the Pearly Nautilus.

The true structure of the siphon in *Nautilus pompilius* is rarely preserved; the somewhat loose calcareous matter by which the membranous part is incrustated is commonly lost with that part in the dry cast-off shells. The calcareous incrustation is apt to be dissolved, like that of the mandibles in Valenciennes's specimen, by the acetous change of the alcohol when charged with soluble parts of the animal during a prolonged transit to a European museum.

Fig. 3.



Nautilus striatus.
Section of part of shell.

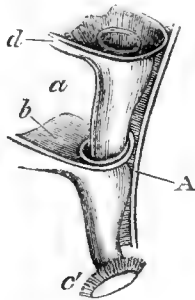
When cataloguing, in 1854 and 1855, the Hunterian Cephalopods, I saw sufficient to supplement the description of the siphon in the 'Memoir on the Nautilus,' as follows:—"An artery and vein are assigned for its life and nutrition, and to extend a low degree of the same influences to the shell; but the structure of the membranous siphuncle presents, beyond the first chamber, an inextensible and almost friable texture, apparently unsusceptible of dilatation and contraction; it is also coated beyond the extremity of the short testaceous siphuncle with a thin calcareous deposit"¹. The fact of this incrustation has been ascertained, independently, by Prof. Vrolik. The subject of his memoir in the volume cited in note 1, was

¹ Descriptive Catalogue of the Fossil Organic Remains of the Invertebrata contained in the Museum of the Royal College of Surgeons of England, 4to, 1856, p. 29. This volume was not issued until all the invertebrate fossils were described; and the first sheets were printed off before the 'Mémoires de la Société Linnéenne de Normandie,' vol. x. 1855, came to my hands.

in such a favourable state of preservation that the calcareous incrustation of the membranous siphon was entire, and formed the subject of the continuous inflexible composite tube represented in pl. i. fig. 5, *a, b*, in that accomplished naturalist's memoir. The notion of the dilating and contracting action of the siphon of the *Nautilus* upon its contents, whatever these may be proved to be, could be no longer entertained. Vrolik, confirming by his dissection the existence of the siphonal artery, infers, like myself, the coexistence of a returning channel, although no vein with definite tunics was demonstrable in either dissection.

Evidence of the capillary ramifications of the siphonal artery upon the pallial membrane lining, as periostracum, the interior of the shell-chambers has been adduced by the careful observers Keferstein and Waagen; but such channels of vitality are not supposed to penetrate the shell itself. Molluscous shells, like avian feathers and mammalian hairs and teeth, do not receive the terminal divisions of the blood-vessels supplying their several pulps or formative organs. Ordinary or hard dentine, like conchine, piline, and plumine, is extravascular, but not, therefore, extravital. The percolation by cellular passages and intervals of a rarer, plasmal exudation from the vital

Fig. 4.

*Spirula australis.*

Section of part of shell, magnified.

fluid renders intelligible the change and movements of pigment in the same hair and in the same feather. As the dentist distinguishes dead from living teeth, so the conchist regulates his estimate of the value of a "dead" as contrasted with a "living" shell. The estimable researches of Carpenter on the modifications of microscopic texture in shells parallel those that have demonstrated as many modifications of the microscopic channels by which the plasma percolates the dentinal as it does the chonchinal tissues¹.

The high organization of the Cephalopods compared with other

¹ Laborious studies of this kind in quest of truth beget a modest reticence and an abstaining from such dogmatic utterances as those of the writer who "denies the possibility of the siphuncle maintaining the vitality of the shell, because it is certainly a non-vascular structure."—"Recent and Fossil Cephalopods," *Geological Magazine*, vol. v. p. 490.

mollusks suggests to the physiological mind the probability that some corresponding step in advance of the ordinary condition of a testaceous defence would be likely ; and the retention of the parts of such defence vacated in the course of growth, with the superaddition of a vascular by-way running through the whole, verifies such anticipation of the means whereby the camerated and siphoniferous shell is thus brought into closer harmony with the rest of the organic structure.

When the first simple, single-chambered, nuclear dwelling is added to and, in part, abandoned, a closer connexion is therewith preserved than in *Vermetus*, *e.g.* ; and, as the artery penetrating the membranous siphon continued from the last-formed dwelling-chamber was demonstrated by mercurial injection¹, there is no reason to doubt that such organic connexion was maintained between the fabricator of the second chamber after it had advanced from and vacated the first or nuclear one.

The constancy of this siphuncular connexion running through all the chambers of the largest and most complex of the polythalamous shells, with the great size and singular complexity of the siphuncle in several extinct species, form the grounds on which I still hold to my original belief in the function of the siphuncle as related to a maintenance of the vitality of the shell. But this relation may be connected, also, with a greater share assigned to the siphon in the protection of the soft parts of the Cephalopod at the earlier stages of its existence.

The chief character of the tetrabranchiate chambered and siphonated shell is its affording, besides a sheath or case to the whole animal, a special protection to a part of the animal.

Such twofold office is performed by the shell in certain Gastropods, conspicuously in the genus *Calyptrea*, in which an accessory "cup," springing from the concavity of the larger "saucer," lodges part of the muscular system².

Every chambered and siphonated shell begins in this simple fashion. The protoconch is cup-shaped or flask-shaped, and includes a similar but smaller blind beginning of the siphon.

The proportion of the inner partially protecting shell to the outer wholly encasing shell is greatest in the Silurian *Orthoceratites* ; and with the large proportional siphon are associated complexities characteristic of the genera *Ormoceras*, *Huronia*, &c.³

Modifications of the contents of such siphons in the Silurian *Vagi-*

¹ "The lesser aorta" sends off a small branch (14, pl. 5 & 6) "which, winding round to the ventral aspect of the ventricle (to which it is connected by a process of membrane), passes through a foramen in the septum dividing the pericardium from the cavity at the bottom of the pallial sac, is then continued through that cavity, passing between the ovary and gizzard, and lastly enters, without diminution of size, the membranous tube that traverses the partitions of the shell."—*Memoir on the Pearly Nautilus*, p. 36.

² "Its cavity is filled by what may be termed the apex of the foot, which here loses its muscular character, and assumes a gelatinous texture."—*Anatomy of the Calyptraidæ*," *Trans. Zool. Soc.* vol. i. p. 208, pl. 30. figs. 2, 6, f. 1831-1835.

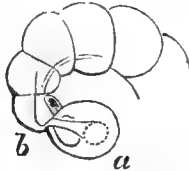
³ Charles Stokes, in *Geol. Trans.* 2nd ser. vol. v. p. 706, 1837.

nati of Bohemia led the exemplary and acute observer Barrande to conceive that a larger proportion of the soft parts had been therein lodged than is the case in the slender simple siphons of other Tetrabranchiates, and in all that are of later date, when the partial office of the siphon is reduced to reception of a trace of the vascular system.

Produce both the "saucer" and "cup" of *Calypeopsis*, with the resultant "false bottoms" or septa, as in *Vermetus* (fig. 1, p. 966), and an analogue, if not parallel, of *Endoceras* would ensue.

Hyatt has noted the resemblance of the cup-like internal chambers of *Beatricea* to a line of siphonal cæca. The protoconch (primal shell, nucleus, ovisac, embryo, &c., fig. 5, *a*) has been determined,

Fig. 5.



Spirula australis.

Protoconch and protosiphon, with following chambers, magnified.

described, and figured by De Blainville (in *Spirula*¹); also by Sandberger², by Barrande³, and, with exemplary care and patience, by Alpheus Hyatt⁴, in various species of tetrabranchiate shells. The results by no means support any doubt as to the externality of the shells of the Ammonitidæ, or at all support the notion of their closer affinity to *Spirula* than to *Nautilus*.

The supposed well-marked distinction between the protoconch of *Ammonites* and that of *Nautilus* is mainly due, as Hyatt has shown, to its decadence in *Nautilus* after the deuteroconch (fig. 5, *b*), or successional shell-chamber, is formed—the primal communication with the protoconch being then indicated by a linear cicatrix on the first septum⁵. On this indication of the original existence and attachment of the protoconch I may remark, that when the young *Nautilus*, becoming too big for its first shell, moved on to make another, part of that "making" encroached upon the space which the young had traversed, and reduced it more or less to the shape of a chink or scar. But it must not be concluded that this chink preexisted to the progress, and that the young crept or squeezed through such chink, as when Mr. Hyatt writes of "the central scar which marks the former aperture through which the animal probably passed into the fundus of the first whorl"⁶. It is only under such impression that it becomes "difficult to account for the passage of the large

¹ *Op. cit.*

² Oberhessische Gesellschaft für Natur und Heilkunde, 1858.

³ *Op. cit.*

⁴ Fossil Cephalopods of the Museum of Comparative Zoology.—Embryology (8vo, Cambridge, Mass.), vol. iii. no. v. 1872.

⁵ *Ibid.* p. 61.

⁶ *Ibid.* p. 73.

body of the embryo through the narrow aperture thus made”¹. The difficulty merely depended upon the “time of the making” the communicating aperture so narrow.

A true “embryology” of the Tetrabranchiates will be the welcome result and reward of the fortunate and equal student of the living *Nautilus* and *Spirula*, on the shores or in the seas they still frequent, or in the aquarium adapted to conserve and exhibit the male and female of these representatives of the almost extinct order.

I cannot conclude the present paper without expressing the pleasure with which may be confidently expected the determination of important points in the physiology of the Tetrabranchiate and Dibranchiate constructors of chambered and siphonated shells by observations made on the living specimens, under the favourable opportunities afforded by their capture to the accomplished Naturalists of H.M.S. ‘Challenger,’ whose attention had no doubt been directed to the following needful observations and experiments suggested in previous works on the subject.

“It would be advisable in the event of another fortunate capture of the *Nautilus*, to lay open the chambers under water, when the presence of gas in any of them would be ascertained; and it might be received and analyzed; the contents also of the central tube, if gaseous, would at once be detected”².

Prof. Vrolik records similar appeals on more than one point in the structure and physiology of the constructor of the chambered shell.

“M. Owen a eu raison de dire que l’orifice *h* (pl. ii. fig. 2) est en communication avec le péricarde.”...“D’après ce que j’ai vu, le siphon s’ouvre dans la cavité abdominale, comme la pl. i. fig. 5, *c*, le démontre, et dans laquelle j’indique aussi la communication entre la cavité branchiale et le péricarde en *d*, et entre celui-ci et la cavité abdominale ou splachnique en *e*.”...“En ouvrant la paroi postérieure du péricarde, je me suis assuré qu’au fond de celui-ci il y a une ouverture, que M. Owen a déjà reconnue, et dans laquelle pénètre une petite artère (pl. i. fig. 2, *l*). Cette ouverture est mise en rapport, près de l’ovaire et du gésier, avec la cavité abdominale.”

With regard to the course of sea-water from the branchial to the pericardial or peritoneal cavity and thence to the cavity of the siphon, or the reverse course, Vrolik appeals to the fortunate possessors of the living *Nautilus*:—“L’observation directe seule pourrait les décider”³.

And again, in regard to the circulation, especially of the venous blood:—“Serait-il possible que le sang veineux du canal intestinal fut versé dans ces interstices ou dans ces *lacunes*, pour passer plus tard, par les orifices cités, dans la veine cave; et le sang veineux des autres

¹ *Op. cit.* p. 74.

² Memoir on the *Nautilus pompilius*, 4to, 1832, p. 47. The same might be urged in the case of the capture of a living *Spirula*.

³ “Sur quelques points de l’organisation de l’animal du Nautille Flambé.” Mémoires de la Société Linnéenne de Normandie, tom. x. (1835), p. 7, pls. i. and ii.

viscères abdominaux serait-il reçu dans des vaisseaux veineux qui se réuniraient en suite pour former les troncs que M. Owen représente planche vi. 3, 3? Je n'ai pas de réponse à donner à ces questions. L'injection du système vasculaire d'un individu à l'état frais, et l'observation d'un *Nautilus* vivant pourraient seules les éclaircir."—
 VROLIK, *op. cit.* p. 11.

EXPLANATION OF PLATE LX.

- Fig. 1. Section of *Ammonites lingulatus*, showing the opercula, *o*, displaced but retained in the dwelling-chamber.
2. *Ammonites subradiatus*, with the operculum, *o*, *in situ*, closing the aperture of the shell, save the space, *v*, for the passage of the respiratory currents.
3. Section of *Nautilus pompilius*, with diagrammatic outlines of the muscles of the shell and of the soft parts indicative of the relative position of the animal.
4. Section of *Spirula australis*.

In the figures 3 and 4 the parts are indicated by the same letters, as follows:—

Shell.

A. Dorsal wall. B. Ventral wall. a. Chambers. b. Septa. c. Hard siphon.
 d. Soft siphon.

Mantle.

e. Dorsal wall. f. Ventral wall.

Head.

g. Tentacles or prehensile organs.

Beak.

h. Dorsal mandible. i. Ventral mandible. j. Funnel. k. Retractores infundibuli. l. Retractores capitis. m. Branchiæ. n. Liver.

December 3, 1878.

Robert Hudson, Esq., F.R.S., V.P., in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during November 1878:—

The total number of registered additions to the Society's Menagerie during the month of November was 66, of which 2 were by birth, 26 by presentation, 28 by purchase, 1 received in exchange, and 9 received on deposit. The total number of departures during same period, by death and removal, was 89.

The most noticeable additions during the month were:—

1. Two examples of Horsfield's Tortoise, *Testudo horsfieldi*, from the neighbourhood of Tschina in Turkestan, presented by Dr. A. Strauch, C.M.Z.S., of the Imperial Zoological Museum of St. Petersburg, November 15th.

The species having been established by Dr. Gray upon a single young specimen¹, said to have come from Afghanistan, Dr. Strauch was anxious to have examples of the Central-Asiatic species (which

¹ Gray, *Cat. Tort. Brit. Mus.* p. 7 (1844), and *Cat. Shield Rept. in Brit. Mus.* p. 7, tab. i. (1855).

he has excellently described in his 'Chelonologische Studien,' p. 86) compared with the original type. This, through Dr. Günther's kindness I have now been able to do; and I have no doubt of the identity of the species, in which opinion Dr. Günther fully concurs.

Besides the original type, there are two small examples of this Tortoise in the British Museum, obtained in Persia, during the Survey of the Persian Boundary Commission¹; so that the species would appear to range from Afghanistan through Persia onto the shores of the Caspian and Aral seas and so into Turkestan, whence the present specimens were forwarded to the Imperial Zoological Museum of St. Petersburg by their conservator, von Russow.

Testudo horsfieldi in general appearance much resembles *Testudo græca*, but has only four toes on the front limbs.

2. A small blue Macaw, apparently referable to Spix's Macaw (*Ara spixi*), purchased of the Jardin d'Acclimatation of Paris, November 15, and new to the Society's collection.

This bird seems to agree in every respect with the species as described by Finsch², except that the bare space round the eye and lores are black, and not yellow as described by Finsch and as also described and figured by Spix.

I have examined the single specimen of this species in the British Museum (obtained by purchase from a dealer in 1859), and believe it to be the same as our bird. Our specimen, of which I exhibit a figure by Mr. Smit (Plate LXI.) is generally of a bluish grey, the head of a paler light grey, a narrow naked ring round the eye; naked lores and bill black; total length about 18 inches, wing 10, tail 12. The iris is of a pale yellow.

This is the first example of this rare species I have ever seen alive. It is immediately distinguishable from *Ara hyacinthina* and *A. glauca* (of both of which we have living specimens in the collection) by its small size and small bill.

Mr. H. Seebohm exhibited a large series of specimens of the Hooded and Carrion Crows (*Corvus cornix* and *C. corone*) and of the intermediate forms between these species, and made remarks on their geographical range and on the origin of the hybrids.

Col. Irby, F.Z.S., exhibited and made remarks on some nests, eggs, and young of *Cypselus pallidus* taken at Gibraltar.

Mr. Howard Saunders exhibited and made remarks on some Indian eggs, especially those of *Sterna bergii* and *Larus hemprichii*, on behalf of Capt. Butler, H.M. 83rd Regiment. These specimens had been taken on the island of Astola, on the Mekran coast.

Dr. F. Day, F.Z.S., exhibited and made remarks on three jaws of Indian Sharks—one belonging to the genus *Galeocerdo*, and two belonging to the genus *Carcharias*,—and pointed out that one of the

¹ See Blanford's 'Zoology of Persia,' p. 308.

² *Sittace spixi*, Finsch, Papag. vol. i. p. 393.



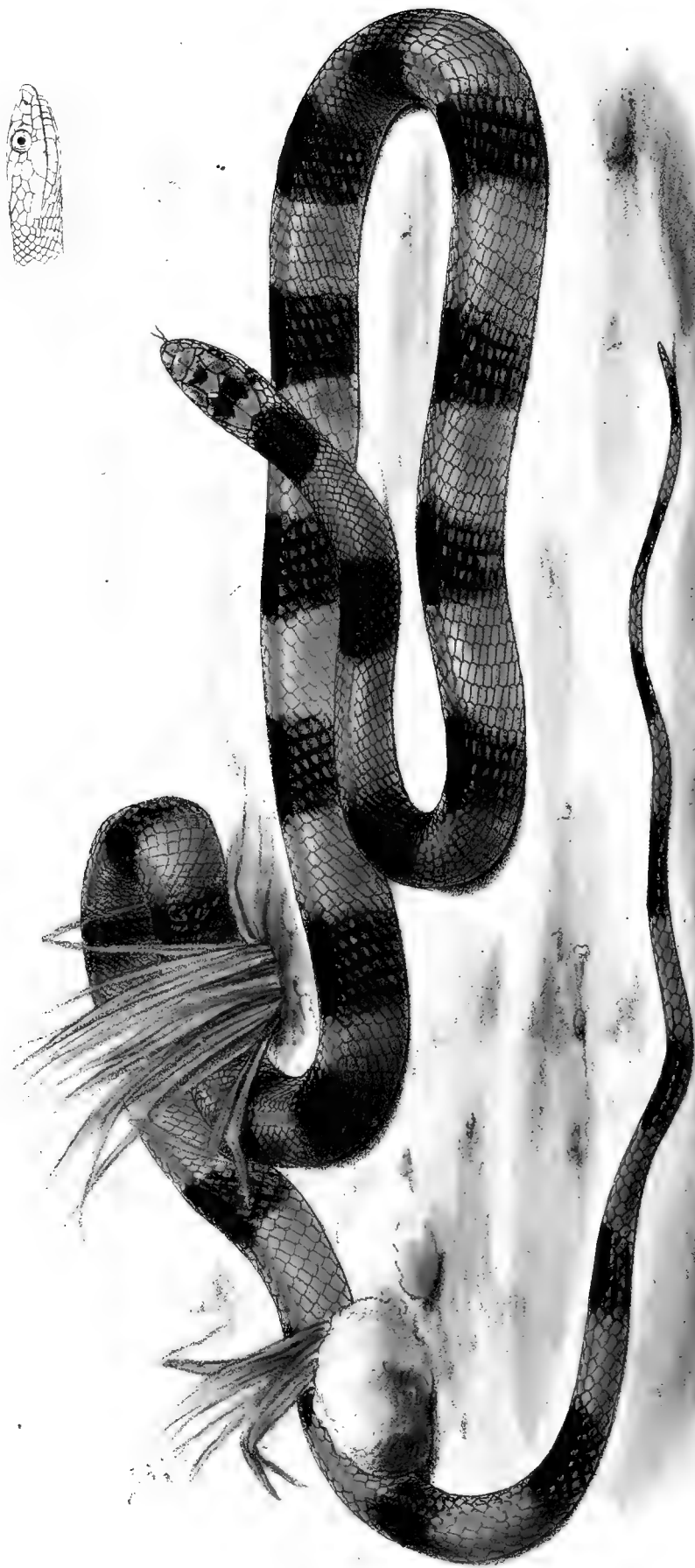
J. Smit lith.

Barbary 24

ARA SPIXI.







latter had the teeth of *Odontaspis*, whereas the other had the teeth in the upper jaw furnished with cross serrations, approaching in this respect *Galeocerdo*, while the teeth in the lower jaw were more like those of *Odontaspis*.

Mr. Selater read a letter with enclosures from Mr. R. Davenport, of 124 Georgiana Street, Bury, whereby it appeared that there could be no doubt of the specimen of the Black-throated Wheatear (*Saxicola stapazina*) exhibited at the last meeting having been obtained in Lancashire, as there stated¹. The bird was shot by Mr. David Page, of 103 Spring Street, Bury, on or about the 8th May, 1875, whilst sitting on the ridge of the outbuildings belonging to the Bury Angling Association near the reservoir. It was taken in the flesh to Mr. Wright Johnson, of Prestwick, to be mounted. Mr. Johnson had ascertained the sex by dissection to be male.

The Secretary called attention to the error that had accidentally taken place in reference to the Collection of Butterflies from Billiton, on which Messrs. Salvin and Godman had reported in the last number of the Society's 'Proceedings' (*antea*, p. 637). The collection had been made and forwarded to England by Hr. J. G. F. Riedel, of Koepang, Resident of Timor and its dependencies.

The following papers were read:—

1. On Reptiles from Midian collected by Major Burton. By
Dr. ALBERT GÜNTHER, F.R.S., F.Z.S.

[Received October 31, 1878.]

(Plate LXII.)

Major Burton has kindly presented to the Trustees of the British Museum the zoological specimens collected by him in Midian². The reptiles are five in number, viz. *Gongylus ocellatus*, *Zamenis cliffordii*, *Zamenis elegantissimus* (sp. n.), *Echis carinata*, and *Echis colorata* (sp. n.),—all of which are characteristic of the Circum-mediterranean fauna. A toad proved to be the common *Bufo vulgaris*.

Major Burton does not seem to have had the means of preserving any mammals and birds; and it is to be hoped that travellers who may succeed him in the exploration of this interesting country will be more fortunate in this respect, as, at present, we are entirely ignorant of this part of the Midianitish fauna.

ZAMENIS ELEGANTISSIMUS. (Plate LXII.)

The body is moderately slender, head rather narrow, eye of moderate size. Rostral shield convex, reaching the upper surface of the head. The scutes of the upper surface of the head are not

¹ Above p. 881.

² See Burton's 'Gold-mines of Midian,' London, C. Kegan Paul & Co., 1878.

subdivided: anterior frontals much smaller than the posterior; vertical large, broad in front, with the lateral margins concave; occipitals rounded behind. Loreal nearly square; three antecoculars, the upper of which is large, concave, extending onto the vertical shield; the two lower are small, and may be regarded as detached portions of the fourth upper labial. Two postoculars; eight upper labials, of which the fifth enters the orbit. Temporals scale-like, 2+3+3, the lower of the anterior pair being larger than the upper. The scales smooth, in 19 rows. Ventrals 197; anal bifid; subcaudals 79. Abdomen with a slight ridge on each side.

The ground colour of this most beautiful snake is olive; a bright orange streak begins on the vertical shield and runs along the entire median line of the back and tail. It is interrupted by broad black cross bands, of which the two anterior occupy the crown of the head, twenty-one encircle the trunk, and eight the tail. The bands on the trunk do not reach across the middle of the abdomen; but the rings on the tail are complete.

The length of the entire specimen is 26 inches, that of the tail being $6\frac{1}{2}$. It was found on the mountains east of El Muwayláh.

ZAMENIS CLIFFORDII, Schleg.

A young specimen from the sandy coast-region of Tihamat Midian.

ECHIS CARINATA, Merr.

One specimen from the sandy coast-region.

ECHIS COLORATA.

This specimen approaches the true Vipers in general habit; but the scales on the side are arranged in the same peculiar manner which is characteristic of *Echis*. In the thickest part of the body the scales form about 35 longitudinal series. There are four series of small scales between the eye and the upper labials. Greyish with large pinkish spots on the upperside; they are rounded on the front part of the body, but more irregular and broken up on the posterior. Lower parts whitish, speckled and powdered with greyish.

Ventrals 208; subcaudals 48.

The single example, which is much injured, was caught on Jebel Shárr, at an altitude of 4500 feet above the level of the sea. It is 27 inches long, the thin tail measuring 3 inches only.

2. On a new Species of *Sylvia* from Abyssinia, and on some other Abyssinian Sylvians. By HENRY SEEBOHM, F.Z.S.

[Received November 7, 1878.]

The only species of the genus *Sylvia* obtained by Jesse on the Abyssinian expedition, was the common Whitethroat. This species was also obtained by Blanford; and in addition he records (Geol. and

Zool. of Abyss. p. 379) a single specimen of *Sylvia melanocephala*, Gm., shot at Rairo in Habab. We learn from the personal narrative that Blanford was at Rairo between the 10th and 15th of August. The skin, doubtless obtained between these two dates, is in the British Museum, and appears to me to belong to a hitherto undescribed species, which I propose to call

SYLVIA BLANFORDI.

The general colour of the upper parts is brown, the innermost secondaries, the quills, and the wing-coverts being narrowly margined with brownish white. The cheeks, head, and nape are brownish black. The tail is very dark brown, the outside tail-feathers (which are much abraded) showing traces of having been tipped with white. The general colour of the underparts is white, shading into brown on the sides of the breast, flanks, axillaries, and under tail-coverts. The bastard primary projects $\cdot 3$ inch beyond the primary-coverts; and the second primary is between the eighth and ninth in length. The bird is moulting some of the primaries between the third and the eighth. Both mandibles of the bill are dark, and the tarsus and feet are dark slate-grey. The wing measures 2.52, and the tail 2.62. The culmen, which is slightly injured, measures about $\cdot 51$ when perfect.

The only species with which this bird can be confounded are *S. curruca* (Linn.), *S. melanocephala*, Gm., and *S. rubescens*, Blanf. From *S. curruca* it is easily distinguished by its head being brownish black instead of pale slate-grey, and by its tail being longer instead of shorter, than its wing. From *S. melanocephala* it may be distinguished by the length of wing being 2.52, instead of varying from 2.15 to 2.35, and the colour of the tarsus and feet being dark slate-grey instead of brown. Besides being a larger bird with darker feet, it has a larger bastard primary, a shorter second primary, and has less white on the outside tail-feathers. From *S. rubescens* it may be distinguished by its tail being longer, instead of shorter, than the wing, by its feet being dark slate-grey instead of palish brown, and by its larger size, the less amount of white on the outside feathers of its tail, its longer bastard primary, and more rounded wing.

Sylvia blanfordi appears to be quite distinct from any of the birds described by Rüppell in his 'Neue Wirbelth. Abyss.', or by Heuglin in his 'Orn. Nordost-Afrika's,' and also from the types of Hemprich and Ehrenberg, in the Berlin Museum, described by Dresser and Blanford in the *Ibis* (1874, p. 335).

Another error of identification in Blanford's 'Abyssinia' will be found on page 358. The skin from Senapé in the British Museum, labelled *Ruticilla phœnicura*, Linn., does not belong to that bird, but to the nearly allied species *Ruticilla mesoleuca*, Ehr. I have also examined the *Pratincola* from the Abyssinian collection in the British Museum; and Mr. Sharpe has pointed out to me that *Pratincola semitorquata*, Heugl., is undoubtedly the breeding-plumage of *P. albofasciata*, Rüpp., and that Blanford's skins labelled *Pratincola*

pastor, Strickland, are undoubtedly *P. indica*, Blyth. This species, distinguished, amongst other characters, from *P. rubicola* (Linn.), by its pure white unspotted rump, and its almost entirely black axillaries, was first discovered in Europe by Harvie-Brown and myself in the valley of the Petchora; Drs. Finsch and Brehm found it on the Obb; and I brought home several skins from the Yenesay. Although Severtzoff records both species from Turkestan, there can be scarcely any doubt that Pallas's birds from the Irtish and the Tobol belong to the eastern species, which must therefore stand as *Pratincola maura*, Pall. (Reise Russ. Reichs, ii. p. 708).

3. On the Identity of *Horornis fortipes*, Hodgson, *Neornis assimilis*, Gray, *Horeites robustipes*, Swinhoe, *Horeites pallidus*, Brooks, and *Horeites brunnescens*, Hume. By HENRY SEEBOHM, F.Z.S.

[Received November 7, 1878.]

CETTIA FORTIPES (Hodgson).

Salicaria — ?, Hodgson, icon. ined. nos. 900 & 928.

Horornis fortipes, Hodgson, J. A. S. Beng. xiv. p. 584 (1845).

Drymœca brevicaudata, Blyth, J. A. S. Beng. xvi. p. 459 (1847).

Horornis assimilis, Gray, Cat. Mamm. &c. Nepal coll. Hodgson, p. 30, no. 143 (1863, ex Hodgson).

Horeites robustipes, Swinhoe, Ibis, 1866, p. 398.

Neornis assimilis, Gray, Hand-list of Birds, no. 3096 (1869).

Horeites pallidus, Brooks, J. A. S. Beng. xli. p. 78 (1872).

Horeites brunnescens, Hume, Ibis, 1872, p. 109.

An examination of thirty-two skins of *Horornis fortipes*, Hodgson, *H. assimilis*, Gray, *Horeites robustipes*, Swinhoe, and *Horeites pallidus*, Brooks, leads me to the conclusion that they all belong to one species.

They agree in having the general colour of the upper parts russet (not olive) brown, somewhat yellower on the rump. The wings are brown, fringed externally with russet-brown, and margined internally with white. The tail is brown, fringed with russet-brown. An indistinct eyebrow and the underparts are buffish white, shading into ochraceous brown on the flanks, thighs, and under tail-coverts. Axillaries and under wing-coverts pale yellow. Young birds have the underparts yellower. The bill is moderately stout, dark horn-colour above, pale horn-colour below, but darker towards the tip. Rictal bristles slender. The wing is very rounded, the first primary rather more than half the length of the second, and the fifth, sixth, and seventh are nearly equal and longest. The tail consists of ten feathers only, and is rounded, its outside feathers being about 0·45 inch shorter than the longest. The foot and tarsus are robust, pale brown in colour; and the latter is very indistinctly scutellated in front. The length of wing varies in adults from 1·9 to 2·28, the tail being about one-twentieth shorter. The culmen measures about 0·5.

Brooks obtained this species in Cashmere; Mandelli has sent skins from Darjeeling; Hodgson found it in Nepal, and Godwin-Austen in Assam. Swinhoe's type from Formosa seems less remotely situated when we remember that Père David obtained the nearly allied species (*Horeites major* and *H. brunneifrons*) in China, where the species under consideration doubtless also occurs.

I place this species in the genus *Cettia*, because it agrees with the type of that genus in having only ten tail-feathers, somewhat similarly graduated, and because both species have a somewhat similar bill, and a rounded wing, not flat like that of a Thrush, but twisted like a plough-plate to fit the body, evidently adapted less for extended flight than to be out of the way when the bird is creeping through dense foliage. Both species agree in having the feathers of the rump considerably developed, and in laying eggs of a uniform dark-red colour in a cup-shaped nest.

The position of this genus is somewhat intermediate between the *Turdinæ* and the *Timeliinæ*. So far as I can see at present, I feel disposed to restrict the *Turdinæ* to birds with a comparatively flat wing, in which the first primary is almost obsolete, whilst the second is lengthened with the other primaries, forming a long pointed wing, adapted for the extended flight of species whose winter-home may be thousands of miles away from their breeding-stations. This scheme would include the Chats, Thrushes, Redstarts, Warblers, and Accentors in the *Turdinæ*, and leave the short-winged Warblers, such as *Prinia*, *Cisticola*, &c., to take their place along with the Babblers and Bulbuls in the *Timeliinæ*. This latter group of birds is characterized by having strong legs and feet, adapted for creeping through tangled foliage, whilst their wings, instead of being flat, are moulded to fit the body of the bird and to occupy as little room as possible. The conformation of the wing is ill-adapted to extended flight. The first primary is large and takes its place naturally beside the shortened second primary, so that it no longer deserves to be called a bastard primary. The other primaries are also short and graduated in length, making a short rounded wing, sufficient for birds whose annual migrations are confined to such narrow limits that they can often look down from the mountains where they breed onto the plain or into the valleys, where they find an abundant supply of winter food.

It must be admitted, however, that in many genera of the *Turdinæ* we find approaches to the *Timeliinæ*, so as to make the two subfamilies not only to come into contact with each other but sometimes to overlap, so that we may have occasionally a turdine species of the *Timeliinæ* more turdine than the most timeliine species of the *Turdinæ*. These little difficulties are very puzzling to the systematic ornithologist; but possibly they may be evidence that his system is a natural one rather than otherwise.

The following list of skins examined will show how impossible it is to draw any distinction in respect of size between the four reputed species which I propose to unite:—

Length of wing.			
in.			
2.28	Sikkim.	G. Austen.	Horornis fortipes.
2.24	Naga hills.	"	Neornis assimilis ♂.
2.2	Sikkim.	Brooks.	Horornis fortipes.
2.2	Darjeeling.	Hume.	Horeites brunnescens.
2.2	Nepal.	Hodgson.	Neornis assimilis.
2.2	Naga hills.	G. Austen.	" ♀.
2.18	Shillong.	"	"
2.18	Nepal.	Hodgson.	"
2.15	Darjeeling.	Brooks.	Horeites pallidus.
2.15	Khasa.	G. Austen.	Neornis assimilis.
2.14	Sikkim.	"	Horornis fortipes.
2.14	Shillong.	"	Neornis assimilis ♂.
2.14	Cashmere.	Brooks.	Horeites pallidus.
2.13	Shillong.	G. Austen.	Neornis assimilis ♂.
2.13	Darjeeling.	Blyth.	Drymœca brevicaudata.
2.11	Nepal.	Hodgson.	Neornis assimilis.
2.11	"	"	"
2.1	"	"	"
2.1	"	"	"
2.1	Shillong.	G. Austen.	" ♂.
2.07	Naga hills.	"	" ♀.
2.05	Munipur	"	"
2.0	Formosa.	Swinhoe.	Horeites robustipes.
2.0	Nepal	Hodgson.	Neornis assimilis, juv.
1.96	"	"	"
1.95	"	"	Neornis assimilis.
1.95	Khasi.	G. Austen.	"
1.9	Formosa.	Swinhoe.	Horeites robustipes.
1.9	Darjeeling.	Brooks.	Horeites pallidus.
1.9	Nepal.	Hodgson.	Neornis assimilis, juv.
1.88	"	"	"
1.88	"	"	"
1.81	"	"	"

4. Description of new Species of Phytophagous Coleoptera from Central and South America. By MARTIN JACOBY.

[Received November 13, 1878.]

1. LEMA SUFFRIANI, sp. nov.

Oblong, light testaceous. Head and breast black; elytra striate-punctate, testaceous, a short sutural and submarginal stripe at the base and two small spots, one before, the other behind the middle of each elytron, violaceous black.

Length $2\frac{3}{4}$ – $3\frac{1}{2}$ lines.

Head shining black, impunctate, not constricted behind the eyes, the lateral grooves very deep; antennæ nearly as long as half the body, of a uniform light rufous or testaceous colour, only the basal joint stained with piceous; thorax scarcely longer than broad, deeply

constricted behind the middle, smooth, impunctate, testaceous; scutellum subquadrate, black. Elytra strongly and very regularly punctate-striate, the ninth stria entire, the interstices slightly raised towards the apex; a short longitudinal sutural stripe at the base, another of equal length covering the shoulder and pointed posteriorly, where both stripes finish a little before the middle, a small round spot between these stripes at their end, and another spot at a little distance from the apex of each elytron, shining violaceous black. Abdomen and the legs testaceous.

Hab. Volcano of Irazu, Costa Rica.

Collected by Mr. Rogers.

This species bears a close resemblance to *L. bifida*, Oliv., and *L. semisepta*, Lac., in coloration, but is distinguished from the first by the elytra having two spots instead of one, the uniformly coloured antennæ and the smooth thorax, while the same differences distinguish it from the latter species. I have seen about a dozen specimens, all of which agree exactly with each other in having the light-coloured antennæ and legs and the two spots on each elytron.

2. *MASTOSTETHUS SALVINI*, sp. nov.

Elongate, parallel, testaceous, the sides of the breast and the upper part of the head shining black. Thorax rufous, nitidous. Elytra light testaceous, a large semiquadrate patch from the base to the middle on each, and a broad transverse fascia behind the middle, common to both elytra, black.

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

Head distinctly punctured round the eyes, the other part smooth and shining, lower part of face flavous, upper part black; antennæ reaching to the base of the thorax, testaceous, the first to the eighth joint above stained with black, but diminishing towards the apex, and entirely disappearing from the ninth joint. Thorax narrowed from the base to the apex; surface very minutely and widely punctured, impressed near the hinder angles with a distinct fovea; scutellum black. Elytra subdepressed above, narrowed towards the apex, surface strongly but not very closely punctured; pale testaceous, a large spot on each elytron from the base to the middle, narrowed towards the suture, and a transverse fascia (neither of which extends quite to the lateral margin), the latter only separated from the former by a narrow interval, with the posterior margin irregular, black; the apex of the elytra are of the ground-colour to about the same extent as the width of the transverse band. The underside, with the exception of the sides of the breast, the dorsal surface of the four anterior femora, and all the tibiæ, which are black, testaceous; hinder femora and inner side of tibiæ of the same colour, the former with a distinct tooth near the apex.

Hab. Cache, Costa Rica.

Collected by Mr. Rogers.

3. *LAMPROSOMA CHAPUISI*, sp. nov.

Ovate, convex, dark violaceous; head, lateral and anterior margins

of thorax, apex of the elytra, outside of legs brilliant aureous or copper-coloured. Head distinctly punctured.

Length 2 lines.

Head finely granulose, rather deeply but not closely punctured, bright aureous; first and second joint of the antennæ of the latter colour, the rest black. Thorax with its sides straight, anteriorly much deflexed, the surface very convex and obtusely punctured, much less distinctly visible than the punctures of the head, of an almost black violaceous, with the anterior margin very narrowly and the sides to a greater extent, but diminishing in width towards the base, ornamented with bright metallic reddish-golden colour; the inner margin of this colour at the sides of the thorax is deeply dentate. Elytra very convex near their base, distinctly narrowed towards the apex; each elytron with ten rows of rather coarse and very regularly placed punctures, which scarcely diminish in size towards the apex, the interstices smooth and impunctate; the colour is of the same dark violaceous as that of the thorax; and at the apex of each elytron is an elongate-oval patch of the same metallic colour as the head and the thorax. Underside black, the outer sides of all the legs metallic aureous; tarsi black.

Hab. Costa Rica.

In my collection.

This species is very closely allied to *L. ignicaudatum*, Lac., and *L. coruscum*, Lac.; but differs from the former by the deeply punctured head, and the shape of the golden lateral band of the thorax, while it is distinguished from the latter species by the shape of the elytral spot, the colour of the thorax, and the colour of the legs.

4. LAMPROSOMA INORNATUM, sp. nov.

Ovate-globose, black, shining, above brilliant violaceous blue. Head finely, thorax distinctly punctate; elytra striate-punctate; prosternum smooth.

Length $2\frac{1}{2}$ lines.

Head rather convex, with a small roundish fovea in the middle, widely and finely punctured, violaceous blue, bordered anteriorly with metallic green; antennæ black, the second joint fulvous. Thorax transverse, the anterior angles much deflexed, the sides rounded; posterior margin sinuate on each side, with an obsolete short depression on each side of the median lobe; the surface much more distinctly punctured than the head, and increasing in size towards the base. Elytra very convex, their greatest convexity lying very near the middle viewed sideways, they are gradually narrowed towards the apex; and each elytron has ten rows of rather deep punctures, which diminish slightly towards the apex in size; the colour is a brilliant violaceous blue with a greenish tint. Underside and legs black, shining, finely alutaceous and punctured; prosternum elongate, quadrate, perfectly smooth, with a few rows of short whitish hairs.

Hab. Chiriqui.

In my collection.

Although this species is nearly allied to *L. testudineum*, Lac., as

well as to *L. cyaneum*, Lac., it is from both distinguished by its smooth prosternum, from the former by the punctured head, from the latter by the want of the depression at the head.

5. *NODA LEFEVREI*, sp. nov.

Broadly ovate, uniformly greenish æneous. Head coarsely, thorax less strongly punctured. Elytra semipunctate-striate, costate near the apex.

Length $1\frac{3}{4}$ line.

Head strongly and closely punctate, especially between the eyes, where the punctures are of an oblong shape. Eyes very prominent; clypeus also strongly punctured, separated from the face, its anterior margin crescent-shaped; antennæ as long as half the body, the last five joints much thickened, and the terminal one very robust and strongly pointed at the apex, the lower six joints shining greenish æneous above, fulvous below, the rest black and opaque. Thorax very narrowed towards the apex, with the posterior angles acutely produced; surface moderately punctured, the punctures not stronger near the sides than those on the disk, and not extending to the anterior or the posterior margin. Scutellum with a few punctures. Elytra convex, with a very obsolete depression below the base; surface very deeply and regularly punctate-striate near the outer margin, finer and more irregularly towards the suture; the intervals towards the apex raised in longitudinal costæ, of which the third and fourth (counting from the outer margin) are united posteriorly sending off a short costa towards the apex. Underside and legs æneous, extreme apex of the tibiæ and the tarsi darkish rufous.

Hab. Costa Rica (volcano of Irazu); Guatemala.

Closely allied to *Noda semicostata*, Lefèvre; but distinguished by the equal punctuation of the thorax, which, in the former species, is, according to the description, strong and dense at the sides.

6. *NODA BALYI*, sp. nov.

Broadly ovate, æneous, shining; antennæ, palpi, and legs ferruginous. Elytra punctate-striate, with a short round tubercle on the disk of each elytron.

Length $1\frac{1}{2}$ line.

Head rather deeply but widely punctured, the clypeus not separated from the face; antennæ with the third, fourth, and fifth joints of equal length, entirely ferruginous. Thorax of the same shape as in *N. viridis*, distinctly punctate throughout, greenish bronze-coloured. Elytra convex, a little more strongly punctured than the thorax, the punctures arranged in regular striæ, the intervals scarcely raised except near the lateral margin and the apex, where they are semicostate; the humeral callus prominent; and each elytron is furnished at a little distance before the middle with a short round tubercle, which is placed nearer the lateral margin than the suture; a very shallow transverse depression is also visible in certain lights immediately above this tubercle. Underside greenish black, opaque; legs ferruginous.

Hab. Guatemala.

Collected by Mr. Salvin. Collection Jacoby.

Allied to *N. propinqua*, Lefèvre, but differing in the stronger punctuation of the thorax and the sculpture of the elytra.

7. *NODA VIRIDIS*, sp. nov.

Broadly ovate, shining metallic-green above, below greenish black, the first six or seven joints of the antennæ and the legs entirely ferruginous.

Length $1\frac{1}{4}$ – $1\frac{1}{2}$ line.

Head coarsely but widely punctate, the clypeus distinctly separated, also strongly punctured, with the anterior margin emarginate; labrum dark ferruginous or brown; vertex of head with an obsolete longitudinal groove. Antennæ of half the length of the body, very robust, with the exception of the short second joint, gradually thickened towards the apex, the three penultimate joints of nearly equal length and cylindrical, the terminal joint the longest of any, and pointed at the apex; the first six or seven joints ferruginous, the rest black, opaque. Thorax transverse, the anterior margin nearly straight, the posterior one evenly rounded and produced in the middle, the sides nearly parallel at the base, but narrowed towards the apex, all the angles acute; surface shining metallic green with a slight bluish tint, not very closely but rather deeply punctate. Scutellum smooth. Elytra slightly wider at the base than the thorax, very gradually and evenly rounded towards the apex; disk rather convex, without any basal depression; the humeral callus produced and smooth; surface finely punctured a little more strongly near the base, the punctures arranged in rather regular lines, partially running in pairs, and forming one stria near the suture towards the apex. Underside opaque blackish green. Legs and tarsi ferruginous.

Hab. Guatemala.

Collected by Mr. O. Salvin. In my collection.

8. *NODA BOUCARDI*, sp. nov.

Broadly ovate, above violaceous blue, shining, below greenish black. Tibiæ, tarsi, and base of the antennæ rufous. Elytra geminate-punctate-striate.

Length $1\frac{1}{2}$ line.

Head strongly punctured, especially towards the lower part, shining greenish blue; antennæ with the first six joints light rufous, the rest darker. Thorax of the same shape as *N. lefevrei* of this paper, also equally punctate throughout, the puncturing extending at the same time to all the margins. Elytra not differing in form from the above species, the punctuation on the disk, however, united in pairs, and only the extreme apex distinctly costate. Underside semiopaque, greenish black, all the tibiæ and tarsi bright rufous.

Hab. Valin, Guatemala.

Collected by Mr. Salvin.

Allied to *Noda rufipes*, Lefèv. (Mittheil. Münch. Ent. v. 1878), but differing in the equal punctuation of the thorax, the double rows of punctures of the elytra, and the costate apex of the latter.

9. *NODA VIOLACEIPENNIS*, sp. nov.

Oblong-ovate, blackish green below, violaceous blue above; thorax moderately punctured, elytra semi-punctate-striate, without costæ. Legs and antennæ greenish æneous.

Length 2 lines.

Head and clypeus with some widely dispersed deep punctures, the former besides with an obsolete fovea in the middle; antennæ more than half the length of the body, robust, uniformly greenish æneous, with the exception of the two basal joints, which are stained with piceous. Thorax of the same shape as the other species of this paper, but rather finely punctured, the punctures on the disk assuming an oblong shape here and there, while the punctuation near the lateral margins is very obsolete. Elytra more oblong than in the other species, shining violaceous blue, with the punctures stronger than those of the thorax, and rather confusedly placed, only towards the apex more distinctly geminate-punctate-striate; the intervals not raised, only an obtuse tubercle visible near the extreme apex; the suture on each side accompanied by an impressed line, commencing about the middle of the elytra, to the apex. Underside and legs greenish black. Tarsi and claws obscure piceous.

Hab. Guatemala.

My collection. Collected by Mr. Salvin.

10. *METAXYONYCHA RUFOLIMBATA*, sp. nov.

Oblong, broadly ovate. Head aureous, deeply and closely punctured. Thorax laterally obsoletely tridentate, greenish, coarsely punctured. Elytra punctate-striate, the interstices longitudinally costate, greenish; the sides and the apex broadly rufous-coloured, abdomen flavous.

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

Head deeply and closely punctured, with a deep longitudinal middle groove, bright aureous or copper-coloured; antennæ black, the first six joints shining. Thorax transverse, distinctly tridentate at the sides, the disk covered with rather deep punctures in the middle and along the anterior margin; the rest of the surface minutely punctate, of a greenish opaque colour. Scutellum elongate, smooth, purplish. Elytra not much wider at the base than the thorax, rather finely punctate-striate, the interstices broadly costate from the base to the apex, where their ends are joined, of the same green opaque colour as the thorax, the sides (narrowly at the base, gradually widened to the apex, the latter broadly) of a rufous colour. Breast and legs purplish green, abdomen light rufous or flavous.

Hab. Venezuela.

Collection Jacoby.

11. *PRIONODERA ELEGANS*, sp. nov.

Elongate, dark purplish. Head and thorax irregularly punctured and finely transversely wrinkled, the latter at the sides obsoletely bidenticulate. Elytra longitudinally costate, the intervals punctate-

striate, purplish blue, a large triangular sutural patch from the base to the middle reddish copper-coloured.

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

Head and clypeus deeply punctured, with a deep longitudinal groove in the middle, of a greenish semiopaque colour, here and there with a purplish tint; labrum and jaws nearly black; first joint of the antennæ very thick and subcylindrical, the second short and globose, the rest cylindrical, equal in length; the first six joints shining greenish aureous, the rest black, opaque. Thorax subquadrate, slightly broader than long, all the angles acute and produced externally, the sides with a distinct tooth behind and another very obsolete one before the middle; disk irregularly transversely wrinkled, visible only when viewed sideways, and covered with large and small punctures; of a greenish colour, sometimes with purplish patches. Scutellum elongate, finely punctate. Elytra much wider at the base than the thorax, a little widened posteriorly; each elytron with eight longitudinal costæ, the intervals subgeminata-punctate-striate; bluish purple, a large sutural triangular patch, extending from the base to below the middle, of a reddish copper, surrounded by light green colour. Underside and legs dark green, with a purplish hue.

Hab. Columbia.

Two specimens in my collection.

12. CHALCOPHANA SEMIRUFA, sp. nov.

Elongate, subparallel, piceous below. Head, thorax, first six joints of the antennæ, and the legs rufous. Elytra deeply and closely punctate-striate and partly costate, shining bronze-colour, extreme margin and the apex rufous.

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

Head deeply punctured, with a median groove, labrum yellowish, apex of mandibles black; antennæ with the first six joints rufous, the rest black. Thorax transverse, the posterior margin round and widened in the middle, the anterior one straight, all the angles produced into a short acute tooth, the surface rather coarsely punctate towards the sides, less so on the disk. Scutellum rufous. Elytra with a more or less distinct oblique depression below the base, closely punctate-striate, the punctures not united in pairs, and regularly placed only towards the suture, the rest confused and irregular; the apex as well as the sides of each elytron furnished with three or four more or less distinct costæ, those at the sides commencing below the humeral callus; the surface of a bronze or metallic green colour, the extreme lateral margins and the apex rufous. Underside dark piceous, as well as the tarsi.

Hab. Costa Rica.

Of the six or seven similarly-coloured described species, the present one will be easily recognized by the colour of the first six joints of the antennæ, which is constant in all the specimens before me, as well as by the strong punctuation of the thorax and the elytra.

13. *CHALCOPHANA UNIFORMIS*, sp. nov.

Entirely dark rufous, with the exception of the last five joints of the antennæ, the apex of the tibiæ, and the tarsi. Thorax finely, elytra deeply geminate-punctate-striate, and more or less costate.

Length $3-3\frac{1}{2}$ lines.

Head exactly punctured as in *semirufa*, the antennæ also coloured as in that species. Thorax a little more finely punctate. Elytra distinctly and closely punctured, the punctures running together in pairs, the interstices either raised over the whole disk in costæ, or only distinctly visible towards the apex. The underside rufous; extreme apex of tibiæ and the tarsi black.

Hab. Costa Rica.

This species may possibly be only a variety of *C. semirufa*; but the uniform coloration, the punctuation of the elytra approached in pairs distinguish it sufficiently from that species, while the colour of the first six joints of the antennæ will separate it from species in other respects similarly coloured.

14. *DORYPHORA BRUNNEIPENNIS*, sp. nov.

Broadly ovate, narrowed behind, below black; antennæ with the last two joints yellowish white. Head, thorax, and elytra rufous, opaque.

Length 6 lines.

Head strongly but not closely punctate, brown with a greenish tint; antennæ brownish æneous, last two joints whitish. Thorax with the sides parallel, the anterior angles acute; surface with the same-sized punctures as the head, but closely and uniformly distributed. Scutellum smooth, broadly triangular. Elytra broader at the base than the thorax, very convex at their first third, from there strongly declining to the apex, the latter pointed; surface finely and irregularly punctured and longitudinally aciculate, the intervals finely alutaceous, opaque, of a uniformly rufous colour. Beneath black; mesosternal process robust, long, slightly curved. Legs rufous.

Hab. Columbia.

Collection Jacoby.

15. *DORYPHORA FLAVIPENNIS*, sp. nov.

Greenish black, shining. Head and thorax strongly punctate. Elytra sparingly irregularly punctured, flavous, a sutural stripe narrowed towards the apex, greenish black.

Length $5\frac{1}{2}$ lines.

Head more strongly punctured near the apex than at the vertex; antennæ with the last five joints flattened and widened, the first five joints testaceous, stained with greenish æneous above, the rest fuscous. Thorax more strongly punctured than the head, very coarsely towards the sides, dispersedly on the disk. Scutellum smooth. Elytra rotundate towards the apex, parallel near the base, sparingly and rather finely punctate without order, the intervals finely aciculate; the extreme outer margin has a row of punctures, and is accompanied, at some distance, with another row of double

punctures; the suture has also at its posterior part a deeply impressed line running parallel with it at each side. The elytra are of a light flavous, shining, the entire suture greenish or bluish black, which colour is gradually narrowed towards the apex. Underside and legs black with a bluish tint.

Hab. Columbia.

In colour this species approaches close to *D. limbaticipennis*, Stål; but the want of the outer marginal vittæ, together with the roundish shape, will distinguish the species before us from the above insect.

16. *DORYPHORA VITTATIPENNIS*, sp. nov.

Black. Head and thorax opaque. Elytra strongly semipunctate-striate, black, shining; each elytron with five narrow longitudinal flavous stripes.

Length 6 lines.

Head finely punctate; antennæ black, shining. Thorax deeply and irregular punctured, the intervals partly convex; sides narrowed at the base, from there rounded to the apex. Scutellum smooth, triangular, black. Elytra parallel, convex, deeply punctate, striate near the suture, more irregularly towards the sides; black, shining, each elytron with five narrow flavous vittæ at equal distances from each other, of which the outer one is the broadest, all of which are confluent at the apex and extending to the base. Underside and legs black.

Var. Elytra with only the outer vittæ entire, the sutural one only visible at the posterior third, the other stripes entirely absent or only partially visible near the apex.

Hab. Columbia.

Collected by Mr. Salmon.

17. *DORYPHORA POROSA*, sp. nov.

Broadly ovate, very convex, piceous below. Head and disk of thorax black; sides of latter testaceous. Elytra deeply foveolate, the intervals irregular transversely reticulate, dark brown.

Length 7 lines.

Head opaque, with a few very minute punctures; antennæ long, scarcely thickened towards the apex, fuscous. Thorax with the anterior and posterior margin parallel in the middle, the anterior angles acute and much produced, the sides much flattened and slightly thickened; disk minutely punctate, of the same colour as the head, the sides light testaceous, impunctate. Scutellum broad, smooth, piceous. Elytra convex at their first third, thence suddenly declining and subdepressed towards the apex, uniformly dark brown; the suture shining, piceous, smooth; surface deeply punctate, striate near the suture, foveolate towards the sides, the intervals raised and connected partially by transverse short costæ, forming a kind of network towards the sides. Femora greenish æneous; tibiæ piceous.

Hab. West Columbia.

Collection Jacoby.

18. *DORYPHORA HYBRIDA*, sp. nov.

Ovate, black below. Head and thorax greenish black, distinctly punctured. Elytra geminate punctate-striate, testaceous; the suture, the outer margin, and two transversely placed large irregularly shaped spots, one placed before, the other behind the middle, as well as the base narrowly, greenish black.

Length 8 lines.

Antennæ rufous. Thorax not very strongly or closely punctured; the intervals also minutely punctate. Scutellum black. Elytra convex, geminate-punctate-striate, each puncture surrounded by a piceous spot; the extreme base, a spot on the shoulder, the outer margin, the suture (which is widened below the base into a square-shaped spot), and a transverse patch, consisting of two united spots before the middle as well as a similar shaped one (formed by three united spots) behind the middle, greenish black. Underside and legs black.

Hab. Peru.

Collection Jacoby.

The insect before me is so exactly similar in markings to the *Doryphora imperialis* of Stal, that it may be only a variety of that species. The colour, however, instead of being rufous, is greenish black. The elytra, besides having the sutural stripe broader, are also marked with regular rows of small piceous spots which surround the puncturing everywhere; and the underside is shining black.

19. *DORYPHORA MILITARIS*, sp. nov.

Greenish æneous, shining. Elytra closely punctate-striate, four roundish spots placed transversely at the base, two others behind the middle, with two submarginal longitudinal vittæ from the middle to the apex, light flavous, margined with rufous.

Length 6 lines.

Head closely punctured, dark brownish green, labrum fulvous; antennæ gradually thickened towards the apex, the basal joints shining fulvous, the rest greenish æneous. Thorax closely and deeply punctured towards the sides, much more sparingly punctate on the disk, the intervals also minutely punctured. Scutellum smooth. Elytra moderately convex, closely and rather regularly punctate-striate, the punctures diminishing towards the apex; of a greenish æneous colour; each elytron with two spots near the base, of which one is placed on the shoulder, another near the scutellum, an elongate spot behind the middle near the suture, and a longitudinal stripe near the outer margin, from immediately behind the middle to the apex, flavous, all the markings surrounded by a narrow rufous border. Underside shining greenish black; legs more brownish; mesosternal process slightly curved and pointed.

Hab. Columbia.

My collection.

20. *DORYPHORA OCELLATA*, sp. nov.

Ovate, very convex, testaceous. Thorax with four piceous spots.

Elytra geminate-punctate-striate, fuscous; two large round spots near the scutellum, four others placed transversely, and the apex broadly flavous, the latter with a small fuscous spot.

Length 5 lines.

Head minutely punctured, flat, with an indistinct piceous mark at the vertex; antennæ testaceous, slightly thickened towards their apex, terminal joint scarcely longer than broad. Thorax narrow, sides rounded in front, anterior angles scarcely produced; above much more strongly (but not closely) punctured than the head, of a rather indistinct testaceous colour; four spots placed transversely on the disk, the middle ones, which are in shape of two short longitudinal vittæ, of a greenish piceous colour. Scutellum testaceous. Elytra slightly broader at the base than the thorax, very convex on the disk, their apex regularly rounded; the surface rather finely punctate-striate, consisting of double rows of punctures, which are more deeply impressed on the disk than at the base or the apex; the flavous patches on the disk of each elytron arranged as follows, viz. one in the middle of the base, two transversely, of which the outer larger one is placed immediately below the shoulder, the inner one on the middle near the suture, the fourth occupying the apex to nearly a third of the length of the elytra, having its inner margin sinuate, and in its interior a small fuscous square spot. Underside and legs testaceous. Mesosternal spine rather short, slightly curved.

Hab. Costa Rica?

My collection.

Closely approaching in colouring to *D. æstuans*, Lin., the species described here is distinguished by its much larger size and by the four spots on the thorax.

21. DORYPHORA DECORATA, sp. nov.

Ovate, convex, testaceous. Head with the base, thorax with two vittæ black. Elytra geminate-punctate-striate, testaceous, with three transverse metallic green fasciæ and a longitudinal vitta between the second and third bands.

Length $5\frac{1}{2}$ lines.

Head minutely punctate, with a shallow transverse depression and an obscure longitudinal groove, testaceous, with an irregular transverse bifurcate patch on the vertex; antennæ longer than the thorax, gradually thickened towards the apex, as well as the palpi, testaceous; apex of mandibulæ black. Thorax with a longitudinal depression parallel with the lateral margins, the latter regularly rounded; surface very sparingly but rather deeply punctate, shining testaceous, with two longitudinal black vittæ from the apex to the base, slightly curved outwards, and connected at the base by a very narrow band. Scutellum impunctate, testaceous. Elytra regularly geminate-punctate-striate near the suture, more confusedly towards the sides; shining testaceous, the suture, an obliquely placed transverse band from the shoulder to the suture a little below the scutellum (with its posterior margin denticulate and connected by a narrow stripe at the lateral

margin anteriorly with another transverse band of a Δ -shaped form, and placed in the middle of the elytra), as well as a short rounded band near the apex (this latter band being also connected with the former one by a short vitta near the lateral margin), shining metallic green; the inflexed margin of the elytra, as well as the underside and the legs, testaceous.

Hab. Costa Rica?

Collection Jacoby.

Allied to *D. vittaticollis*, Stål, but differing in the colour of the head, antennæ, and palpi, and the longitudinal stripe between the second and third bands.

22. SCELIDA BALYI, sp. nov.

Elongate, parallel, testaceous; vertex of head, last six joints of antennæ, and the coxæ black. Elytra metallic green, closely rugose-punctate.

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

Head impunctate, with two distinct tubercles between the antennæ, limited behind by a transverse groove, lower part of face with a raised triangular ridge; last joint of maxillary palpi piceous; vertex of head black, shining; lower part and the basal five joints of the antennæ flavous, the latter about three fourths the length of the body, with the three terminal joints slightly curved. Eyes prominent, black. Thorax subquadrate, widened from the apex towards the middle, from there straight to the base, the anterior and posterior margins slightly sinuate in middle; surface entirely impunctate, the disk depressed, flavous, with indistinct irregular blotches of a piceous colour. Scutellum semiovate, dark piceous, with a light-coloured margin. Elytra much wider at the base than the thorax, sides entirely parallel, the surface covered throughout with crowded and rather deep punctures, the intervals of which are finely rugose, of a metallic, moderately shining green colour, which assumes towards the apex and near the suture a purplish hue. Under surface and legs flavous, the base of the coxæ and a spot at the base of the anterior femora piceous or black; the metathorax on each side raised in the shape of a triangular-pointed elevation.

This species is the second one belonging to this genus, the first of which was published in diagnosis by Mr. Chapuis in his eleventh volume of the 'Genera of Coleoptera.' From this species it is sufficiently distinguished by its smaller size, the black vertex of the head, together with the spots on the coxæ of the legs, and by the peculiar shape of the metathorax.

23. DIABROTICA WATERHOUSEI, sp. nov.

Elongate, convex, widened behind, flavous. Head, breast, and the extreme base of the elytra pitchy black, the apex of the latter brownish fuscous.

Length 3 lines.

Head shining black, with a distinct fovea between the eyes; antennæ ferruginous, the basal joint flavous. Thorax quadrate,

rather convex, smooth, narrowed towards the base, surface shining, flavous. Scutellum black. Elytra widened towards the apex, rather convex, light flavous, a narrow transverse band at the base undulated at its posterior edge, and extending to the humeral callus, dark fuscous or black; the posterior third of the elytra fuscous brown, surrounded by an indistinct crescent of a darker colour; the rest of the surface covered with minute piceous spots, visible only under a lens. Underside black; abdomen brownish; legs flavous, the hinder tibiæ on their outer side blackish.

Var. Thorax at the anterior margin with a triangular black spot; the apical markings of the elytra obsolete.

Hab. Cache, Costa Rica.

Collected by Mr. Rogers.

24. *DIABROTICA JANSONI*, sp. nov.

Elongate, convex, widened behind, fulvous. Thorax and elytra closely punctate, a large oval patch near the apex of the latter violaceous blue.

Length $4\frac{1}{2}$ –5 lines.

Head with a deep transverse groove, closely punctured, fulvous; antennæ robust, as long as half the length of the body, fuscous, the first joint below fulvous, the fourth joint nearly double the length of the third. Thorax transverse, sides nearly parallel, with three indistinct shallow depressions on the disk, of which two smaller ones are situated on each side and a large one near the posterior margin at its middle; surface distinctly but not very closely punctate, fulvous. Scutellum broad, triangular, its surface very finely alutaceous, and slightly excavated near the base. Elytra more than four times the length of the thorax, much widened towards the apex, and distinctly margined; the surface crowded everywhere with distinct punctures of the same colour as the head and thorax, the whole of the posterior third occupied by a large rounded spot of violaceous blue, which sometimes terminates at some distance from the apex. Underside and the femora testaceous; tibiæ and tarsi fuscous.

Hab. Chontales, Nicaragua. Collected by Mr. Janson.

In my collection.

25. *DIABROTICA FUSCOMACULATA*, sp. nov.

Testaceous below. Head, thorax, and elytra olive-green, the latter obsoletely costulate, with the base and two spots on each elytron dark fuscous, margined with pale yellow.

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

Head impunctate, with a fovea in the middle, shining green; labrum dark brown; antennæ nearly reaching to the end of the body, with the second and third joint very short, the fourth three times as long as the second joint, of an indistinct brownish colour, the first joint pale greenish. Thorax bifoveolate, impunctate, very shining olive-green. Scutellum flavous. Elytra subdepressed,

parallel, closely punctate, with two or three obsolete costæ on the disk, of which the outer one is more distinctly raised, of the same colour as the thorax; a transverse band at the base narrowed towards the suture and extending to the shoulders, a transverse spot in the middle and another at a little distance from the apex of each elytron, dark fuscous; all the spots, as well as the lateral margin at its anterior part, surrounded with yellowish white. Underside pale testaceous, the tibiæ darker, and the femora olive-green.

Var. The middle spot on the elytra absent, as well as the apical one, which is replaced by a yellowish patch.

Hab. Nicaragua, Bogotá. *Var.* Guatemala.

Collected by Mr. Salvin.

26. *DIABROTICA NIGROVITTATA*, sp. nov.

Elongate, parallel, black. Thorax bifoveolate. Elytra yellowish white, with the suture and a submarginal longitudinal stripe on each elytron not reaching the apex, black.

Length $2\frac{1}{2}$ lines.

Head very shining black, smooth, with a fovea above the antennæ; the latter of about half the length of the body, entirely black; second and third joints short, equal. Thorax quadrate, narrowed near the base, surface deeply bifoveolate, smooth, very shining black. Scutellum black. Elytra about three times the length of the thorax, with a longitudinal depression below the shoulders and extending a little below the middle; surface very minutely punctured and finely granulose, of a yellowish white, a longitudinal stripe from the base, extending to a little distance from the apex and narrowed at each end, black. Body and the legs shining black.

One specimen from Mexico and another from Guatemala, in my collection.

27. *DIABROTICA NOVENMACULATA*, sp. nov.

Elongate, widened behind, flavous. Head and breast black. Elytra finely punctate, flavous, five spots near the base and four near the apex black.

Length 4 lines.

Head black, impunctate, with a fovea and two flat tubercles in front of the antennæ; the latter more than half the length of the body, with the third joint a little longer than the second, and the fourth the longest, of a flavous or ferruginous colour, with the middle joints stained more or less with fuscous. Thorax impunctate, with two shallow depressions on its surface; sides much deflexed and margined, parallel near the base, widened above the middle. Scutellum fuscous. Elytra but little wider at the base than the thorax, gradually widened towards the apex, closely and irregularly punctured, flavous, a triangular spot extending a little below the base at the suture and surrounding the scutellum, an elongate short stripe on each shoulder, a roundish spot between the latter and the sutural one on each elytron, as well as four spots placed

transversely at a little distance from the apex, of which the outer one is elongate, black. Underside and legs flavous, breast black.

Hab. Costa Rica.

Var. The round spots on the elytra replaced by short longitudinal stripes.

28. *DIABROTICA COSTATIPENNIS*, sp. nov.

Elongate, uniform rufo-flavous. Thorax deeply bifoveolate, shining. Elytra closely rugose, punctate, with five or six elevated more or less distinct longitudinal costæ.

Length 3 lines.

Head perfectly smooth and shining, with a deep fovea above the antennæ; the latter of half the length of the body, the second and third joints very short, the fourth joint more than twice as long as the preceding one, ferruginous, the first three joints shining, the rest opaque. Thorax distinctly margined, narrowed at the base, the surface with two deep foveæ, very shining and impunctate, rufo-flavous. Elytra scarcely widened behind, with a distinct margin which is wider in the middle than on either end; surface closely punctate and finely rugose; each elytron with about six longitudinal raised costæ, which are a little more obsolete near the apex and the base, of a little lighter rufous colour than the thorax. Entire underside and legs flavous, the breast covered with whitish hairs.

Hab. Costa Rica.

29. *CEROTOMA NIGROFASCIATA*.

Oblong, widened behind, black. Thorax and legs flavous. Elytra dark red, with three broad transverse black bands.

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

Head black, vertex punctate; lower part of face coarsely and deeply punctate, with a few flavous hairs; antennæ closely approximate, of half the length of the body, with the first joint very long, the second short, the third longer than the fourth, of a flavous or ferruginous colour. Thorax transverse, the sides much deflexed, the lateral margins much widened before the middle, anterior angles obsolete, posterior ones produced but rounded; the surface rather convex, smooth, indistinctly depressed on the disk, of a light flavous colour. Scutellum black. Elytra much widened towards the apex, deeply and closely punctate, the intervals raised in irregular longitudinal costæ and transverse wrinkles, of a dark red colour; a transverse band common to both elytra at the base, another band slightly arched in the middle not reaching the suture, and a large triangular patch near the apex black; none of these bands reach quite to the lateral margins. Underside black, shining; legs uniformly flavous.

Hab. Costa Rica, Guatemala.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1878.

- Jan. 1. 1 Japanese Wild Dog (*Canis familiaris*, var.), ♂. Presented by Harry Pryer, Esq. See P. Z. S. 1878, p. 115.
1 Bristly Ground-Squirrel (*Xerus setosus*), ♂. Purchased.
1 Robben-Island Snake (*Coronella phocarum*). Presented by Messrs. Rice and A. Jamrach.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. F. Wood, Esq.
1 Striped Hyæna (*Hyaena striata*). Presented by Captain F. Cotton.
1 Red-and-Yellow Macaw (*Ara chloroptera*). Presented by Captain King. From Carthage.
1 Common Sole (*Solea vulgaris*). Presented by G. H. King, Esq.
5. 1 Mexican Deer (*Cervus mexicanus*). Presented by Cyril Graham, Esq. From Venezuela.
7. 1 White-handed Gibbon (*Hylobates lar*), ♀. Presented by W. H. Newman, Esq. From the forests of Laos, Northern Siam.
1 Brown Monkey (*Macacus arctoides*), ♂. Presented by W. H. Newman, Esq.
9. 2 Black Francolins (*Francolinus vulgaris*). Presented by Major Newton Pauli.
1 Chukar Partridge (*Caccabis chukar*). Presented by Major Newton Pauli.
1 Grooved Tortoise (*Testudo sulcata*). Purchased.
2 Rough Terrapins (*Clemmys punctularia*). Purchased.
1 Scorpion Mud-Tortoise (*Cinosternon scorpioides*). Purchased.
10. 4 Common Marmosets (*Hapale jacchus*). Deposited.
14. 1 Arabian Gazelle (*Gazella arabica*), ♂. Presented by Mark Whyley, Esq.
2 Violet Tanagers (*Euphonia violacea*). Purchased.
1 Superb Tanager (*Calliste fastuosa*). Purchased.
1 Tuberculated Lizard (*Iguana tuberculata*). Purchased.
3 Summer Ducks (*Aix sponsa*), 3 ♀. Presented by the Lord Braybrooke, F.Z.S.
15. 1 Stanleyan Chevrotain (*Tragulus stanleyanus*), ♂. Presented by Mrs. Leslie Walker.
1 Javan Chevrotain (*Tragulus javanicus*), ♂. Presented by Mrs. Leslie Walker.

- Jan. 16. 2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Purchased.
 2 White-bellied Storks (*Abdimia sphenorhyncha*). Purchased.
17. 1 Broad-banded Armadillo (*Xenurus unicinctus*). Purchased.
19. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♀. Presented by Madame Patey.
21. 2 Black Swans (*Cygnus atratus*). Presented by Captain W. H. Eccles.
22. 1 Common Fox (*Canis vulpes*). Presented by Mr. George Fredericks.
 2 West-India Rails (*Aramides cayennensis*). Purchased.
23. 1 Hog Deer (*Cervus porcinus*). Born in the Menagerie.
24. 1 Upland Goose (*Bernicla magellanica*), ♀. Purchased. From Chili.
 1 Humboldt's Penguin (*Spheniscus humboldti*). Purchased. See P. Z. S. 1878, p. 116.
25. 1 Wood-Owl (*Syrnium aluco*). Presented by J. E. Liardet, Esq.
 1 Common Magpie (*Pica caudata*). Presented by G. E. Ladbury, Esq.
 1 Jackdaw (*Corvus monedula*). Presented by G. E. Ladbury, Esq.
27. 1 Hoary Snake (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
 1 Derbian Opossum (*Didelphys derbiana*). Purchased.
28. 1 Common Puffin (*Fratercula arctica*). Received in exchange. From the Banks of Newfoundland.
29. 1 Brown Bear (*Ursus arctos*). Presented by J. Mason Allen, Esq.
 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by L. E. Lewis, Esq.
 1 White-cheeked Capuchin (*Cebus lunatus*). Presented by John Ikin, Esq.
30. 1 Yaguarundi Cat (*Felis yaguarundi*). Purchased.
 2 Yarrell's Curassows (*Crax carunculata*), ♂ and ♀. Purchased.
 1 Lesser Razor-billed Curassow (*Mitua tomentosa*). Purchased.
 2 White-bellied Guans (*Ortalida albiventris*). Purchased.
 1 White-fronted Guan (*Penelope jacucaca*). Purchased.
 1 Common Trumpeter (*Psophia crepitans*). Purchased.
 1 Guira Cuckoo (*Guira piririgua*). Purchased.
 1 Sun-Bittern (*Eurypyga helias*). Purchased.
 1 Cayenne Lapwing (*Vanellus cayennensis*). Purchased.
 1 Double-striped Thicknee (*Ædicnemus bistratus*). Purchased.
 1 Garden's Night-Heron (*Nycticorax gardeni*). Purchased.
 1 Maguari Stork (*Ciconia maguari*). Purchased.
 1 Black Vulture (*Cathartes atratus*). Purchased.
 2 Silky Cowbirds (*Molothrus bonariensis*). Purchased.
 1 American Kestrel (*Tinnunculus sparverius*). Purchased.
 3 Chilian Pintails (*Dafila spinicauda*). Purchased.
31. 1 Common Badger (*Meles taxus*). Presented by the Lord Saltoun, F.Z.S.
 2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by the Rev. S. R. Wilkinson, F.Z.S.
 7 Bankiva Jungle-fowls (*Gallus bankiva*). Presented by Mrs. Kendall.
- Feb. 4. 1 Azara's Fox (*Canis azarae*). Purchased.

- Feb. 5. 1 Brazilian Tortoise (*Testudo tabulata*). Presented by Captain King.
6. 4 Reeves's Terrapins (*Clemmys reevesi*). Presented by Mr. A. Thomson.
8. 1 Common Swan (*Cygnus olor*). Presented by John Colam, Esq., F.Z.S.
9. 2 Crested Guinea-fowls (*Numida cristata*). Presented by Mrs. Collingwood.
- 2 Canadian Geese (*Bernicla canadensis*). Presented by Edw. J. Philpot, Esq.
11. 1 Wood-Owl (*Syrnium aluco*). Presented by J. Torpey, Esq.
- 1 Hey's Partridge (*Caccabis heyi*). Purchased.
12. 2 Macaque Monkeys (*Macacus cynomolgus*). Presented by Lieut.-Colonel Feilden.
13. 2 Chimpanzees (*Troglodytes niger*), ♂ and ♀. Deposited.
- 1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
- 1 Garden's Night-Heron (*Nycticorax gardeni*). Presented by Henry Bottrell, Esq.
14. 1 Grivet Monkey (*Cercopithecus griseo-viridis*). Presented by E. H. Lockley, Esq.
15. 1 Collared Peccary (*Dicotyles tajaçu*). Purchased.
- 1 Black-faced Spider Monkey (*Ateles ater*), ♀. Purchased.
- 1 Globose Curassow (*Crax globicera*), ♂. Purchased.
17. 1 Chimpanzee (*Troglodytes niger*), ♂. Deposited.
18. 2 Leopards (*Felis pardus*). Purchased. From Persia. See P. Z. S. 1878, p. 289.
20. 2 Red-vented Bulbuls (*Pycnonotus hæmorrhous*). Presented by Colonel A. L. Annesley, F.Z.S.
21. 1 Black-billed Parrakeet (*Palæornis melanorhyncha*). Presented by Mrs. Barthorp. From Muttra, N.W. India.
- 2 Black-necked Swans (*Cygnus nigricollis*). Received in exchange.
22. 2 Tigers (*Felis tigris*). Born in the Menagerie.
- 2 Barbary Wild Sheep (*Ovis tragelaphus*), ♂ and ♀. Received in exchange.
23. 2 Black-winged Peafowls (*Pavo nigripennis*), ♀. Presented by the Hon. A. S. G. Canning, F.Z.S.
- 2 Pale-headed Parrakeets (*Platycercus pallidiceps*). Purchased.
- 4 Turquoise Parrakeets (*Euphema pulchella*). Purchased.
24. 1 Black-billed Sheathbill (*Chionis minor*). On approval.
25. 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
26. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.
- 1 Variegated Sheldrake (*Tadorna variegata*), ♂. Received in exchange.
27. 2 Rock-Sparrows (*Petronia stulta*). Presented by D'Arcy Thompson, Esq.
- 1 Indian Muntjac (*Cervulus muntjac*), ♂. Born in the Menagerie.
- 1 Common Snipe (*Gallinago media*). Presented by W. K. Stanley, Esq.
- 1 Common Adder (*Vipera berus*). Presented by Colonel Irby, F.Z.S.
- 1 Four-lined Snake (*Coluber quadrilineatus*). Deposited.
28. 2 Brown Coatis (*Nasua nasica*). Presented by the Hon. C. H. Wynn.
- Mar. 1. 1 Palm-Squirrel (*Sciurus palmarum*). Presented by Miss Barclay.

- Mar. 2. 1 Ocelot (*Felis pardalis*), ♀. Presented by H. B. Whitmarsh, Esq.
 1 Yellow Snake (*Chilobothrus inornatus*). Purchased.
 2 Black-capped Bitterns (*Butorides atricapilla*). Received in exchange.
 1 Red-backed Buzzard (*Buteo erythronotus*). Received in exchange.
 1 Yellow-cheeked Amazon (*Chrysotis autumnalis*). Purchased.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by H. Wright, Esq.
 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by G. H. Garrett, Esq.
 2 Common Chameleons (*Chamaeleon vulgaris*). Presented by G. H. Garrett, Esq.
5. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Captain Pole Carew.
 1 Herring-Gull (*Larus argentatus*). Presented by J. W. Capstick, Esq., F.Z.S.
6. 1 Green Lizard (*Lacerta viridis*). Deposited.
 2 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Presented by Mrs. Hylton Jolliffe.
7. 2 Sambur Deer (*Cervus aristotelis*), ♂ and ♀. Received in exchange.
 1 Isabelline Bear (*Ursus isabellinus*). Received in exchange. See P. Z. S. 1878, p. 378.
 1 Javan Adjutant (*Leptoptilus javanicus*). Received in exchange.
 1 Siren (*Siren lacertina*). From South Carolina. Received in exchange.
9. 2 Long-legged Buzzards (*Buteo ferox*). Presented by W. J. E. Cartwright, Esq. From India.
 1 White-cheeked Bulbul (*Pycnonotus leucogenys*). Purchased.
 1 Levaillant's Darter (*Plotus levaillanti*). Purchased. See P. Z. S. 1878, p. 378.
 2 Dace (*Leuciscus vulgaris*). Presented by Mr. Parsons.
 1 Eel (*Anguilla vulgaris*). Presented by Mr. Parsons.
10. 1 Blue-bonnet Parrakeet (*Psephotus hæmatogaster*). Purchased.
11. 1 Lion (*Felis leo*), ♂. Received in exchange.
 1 Three-striped Paradoxure (*Paradoxurus trivirgatus*) Presented by Captain Dalrymple.
 3 Black Swans (*Cygnus atratus*). Bred in the Gardens.
13. 1 Zebu (*Bos indicus*), ♀. Born in the Gardens.
14. 2 Common Marmosets (*Hapale jacchus*). Presented by Robert Donaldson, Esq.
 1 Green Glossy Starling (*Lamprocolius chalybeus*). Presented by Mrs. Arabin, F.Z.S.
 1 White-eared Bulbul (*Pycnonotus leucotis*). Presented by Mrs. Arabin, F.Z.S.
 1 Californian Quail (*Callipepla californica*). Presented by Mrs. Arabin, F.Z.S.
 1 Common Kestrel (*Timunculus alaudarius*). Presented by A. Blumenthal, Esq.
15. 2 Common Badgers (*Meles taxus*). Born in the Gardens.
16. 1 Secretary Vulture (*Serpentarius reptilivorus*). Presented by Messrs. W. Rigg and J. Curtiss.
 1 Variegated Sheldrake (*Tadorna variegata*). Purchased.
18. 1 Savigny's Eagle-Owl (*Bubo ascalaphus*). From Bushire, Persian Gulf. Presented by Dr. J. Huntly.

- Mar. 19. 2 Darwin's Pucras Pheasants (*Pucrasia darwini*), ♂ and ♀.
Purchased.
20. 2 Reindeer (*Rangifer tarandus*). Received in exchange.
1 Jay (*Garrulus glandarius*). Presented by J. Young, Esq.
21. 1 Malayan Bear (*Ursus malayanus*), ♀. Presented by S. Palmer,
Esq.
1 Spotted Eagle-Owl (*Bubo maculosus*). Received in exchange.
2 Plantain-Squirrels (*Sciurus plantani*). Received in exchange.
1 Beccari's Cassowary (*Casuarius beccarii*). Received in ex-
change.
4 Pied Grass-Finches (*Spermestes fringilloides*). Received in
exchange.
1 Anaconda (*Eunectes murinus*). Received in exchange.
2 Matamata Terrapins (*Chelys mutamata*). Received in ex-
change. See P. Z. S. 1878, p. 378.
1 One-streaked Hawk (*Melierax monogrammicus*). Received
in exchange.
2 Hog Deer (*Cervus porcinus*), 2 ♀. Received in exchange.
1 Egyptian Ichneumon (*Herpestes ichneumon*). Received in
exchange.
1 Short-toed Eagle (*Circæetus gallicus*). Presented by H. M.
Upcher, Esq., F.Z.S.
23. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by Mrs.
Baxter.
1 Green Monkey (*Cercopithecus cullitrichus*). Presented by
James Bennet, Esq.
1 Vervet Monkey (*Cercopithecus lalandii*). Presented by W. B.
Westwood, Esq.
25. 1 Black-faced Spider Monkey (*Ateles ater*). Deposited.
28. 1 Philippine Paradoxure (*Paradoxurus philippensis*). Received
in exchange.
30. 1 Arabian Gazelle (*Gazella arabica*), ♀. Presented by W.
Webb, Esq.
- Apr. 1. 2 Pudu Deer (*Cervus humilis*), ♂ and ♀. Purchased. From Chili.
1 Naked-eared Deer (*Cervus gymnotis*). Purchased. From
Ecuador.
1 Macaque Monkey (*Macacus cynomolgus*). Presented by Francis
Pym, Esq.
2 Persian Gazelles (*Gazella subgutturosa*). Presented by R. W.
Inglis, Esq.
1 Maned Goose (*Bernicla jubata*), ♂. Purchased.
5. 1 Egyptian Gazelle (*Gazella dorcas*), ♂. Deposited.
1 Vulpine Phalanger (*Phalangista vulpina*). Presented by Capt.
T. Ayling.
6. 1 Fraser's Squirrel (*Sciurus stramineus*). Received in exchange.
See P. Z. S. 1878, p. 441.
1 Black Sternotherere (*Sternothererus niger*). Received in ex-
change.
7. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Madame
Harte.
8. 1 Arabian Baboon (*Cynocephalus hamadryas*), ♀. Presented by
Dr. A. P. Woodforde.
10. 2 Chacma Baboons (*Cynocephalus porcarius*). Presented by
Capt. W. L. Coke.
1 Short-eared Owl (*Otus brachyotus*). Presented by W. K.
Stanley, Esq.

- Apr. 11. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂.
Born in the Menagerie.
12. 1 Great Kangaroo (*Macropus giganteus*). Presented by Crawford Caffin, Esq., Lt. R.N.
2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Crawford Caffin, Esq., Lt. R.N.
1 Golden-winged Parrakeet (*Brotogeris chrysoptera*). Received in exchange.
13. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by George Milward, Esq.
1 South-American Rat-Snake (*Spilotes variabilis*). On approval.
15. 1 Stanley Crane (*Tetrapteryx paradisea*). Deposited.
16. 1 Indian Leopard (*Felis pardus*), ♂. Presented by Robert Tubbs, Esq., F.Z.S.
1 Red Deer (*Cervus elaphus*), ♂. Presented by Carrol W. Ansdell, Esq.
1 Common Fox (*Canis vulpes*). Presented by Carrol W. Ansdell, Esq.
2 Spotted Ichneumons (*Herpestes auropunctatus*). Presented by J. McIntosh, Esq.
1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by W. Ruston, Esq.
18. 1 Suricate (*Suricata zenik*), ♀. Presented by Percy Howard, Esq.
19. 1 Azara's Fox (*Canis azaræ*). Presented by Dr. A. Stradling.
20. 4 Common Foxes (*Canis vulpes*). Born in the Menagerie.
21. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
23. 2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
24. 1 Bennett's Wallaby (*Halmaturus bennetti*). Born in the Menagerie.
1 Hybrid Duck (between *Marcca chiloensis* and *Dafila spinicauda*). Presented by I. Charlton Parr, Esq.
2 Common Carp (*Cyprinus carpio*). Presented by Richard Seyd, Esq., F.Z.S.
25. 1 Black Wallaby (*Halmaturus ualabatus*), ♂. Presented by D. W. Barker, jun., Esq.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by D. W. Barker, jun., Esq.
1 Saffron Finch (*Sycalis flaveola*). Presented by Mrs. Hylton Joliffe.
1 Cariama (*Cariama cristata*). Purchased.
1 Crested Curassow (*Crax alector*). Purchased.
1 Guira Cuckoo (*Guira piririgua*). Purchased.
1 White-faced Tree-Duck (*Dendrocygna autumnalis*). Purchased.
2 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Purchased.
26. 1 Common Seal (*Phoca vitulina*). Purchased.
4 Short-tailed Wallabies (*Halmaturus brachyurus*), 1 ♂ and 3 ♀. Purchased.
1 Long-tailed Cuckoo (*Eudynamis taitensis*). Purchased.
1 Dominican Gull (*Larus dominicanus*). Purchased.
1 Blue-bonnet Parrakeet (*Psephotus haematogaster*). Purchased.
1 Stanley Parrakeet (*Platycercus icterotis*). Purchased.
1 Bar-headed Goose (*Anser indicus*). Purchased.
27. 1 African Leopard (*Felis pardus*), ♂. Presented by Mrs. Kirk.

- Apr. 27. 1 Beisa Antelope (*Oryx beisa*), ♂. Presented by H.H. the Sultan of Zanzibar. See P. Z. S. 1878, p. 441.
 1 Black-crested Eagle (*Spizaetus occipitalis*). Purchased.
 1 Sand-Lizard (*Lacerta agilis*). Presented by Master W. L. Sclater.
 1 Smooth Newt (*Triton taniatus*). Presented by Master B. L. Sclater.
29. 1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.
 2 Black Storks (*Ciconia nigra*). Purchased.
 1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*). Purchased.
 1 Long-nosed Crocodile (*Crocodilus americanus*). Purchased.
30. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by J. M. Neil, Esq.
 1 Lion (*Felis leo*). Presented by J. D. Massey, Esq.
- May 1. 1 Black Ape (*Cynopithecus niger*). Deposited.
 1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
2. 2 Black-faced Spider Monkeys (*Ateles ater*), 2 ♀. Purchased.
 1 Common Cassowary (*Casuarius galeatus*). Purchased.
 1 Greek Partridge (*Caccabis savatilis*), white var., ♂. Presented by F. Papillon, Esq. From Beyrout.
 1 Golden-winged Woodpecker (*Colaptes auratus*). Purchased.
 2 Lesser Birds of Paradise (*Paradisea minor*). Purchased. See P. Z. S. 1878, p. 631.
3. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by G. W. Twining, Esq.
 1 Common Cormorant (*Phalacrocorax carbo*). Presented by Lord Braybrooke, F.Z.S.
 4 Green Lizards (*Lacerta viridis*). Presented by F. E. Lawder, Esq.
 1 Black-eared Marmoset (*Hapale penicillata*). Presented by Walter M. St. Aubyn, Esq.
6. 1 Bonelli's Eagle (*Nisaetus fasciatus*). Deposited.
 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by J. W. Cossback, Esq.
 1 Common Snake (*Tropidonotus natrix*). Presented by Henry Smith, Esq.
 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Mrs. Tennent.
7. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by W. Mackie, Esq.
8. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Master R. C. Heyworth.
 1 Black-backed Jackal (*Canis mesomelas*), ♀. Presented by Richard Seyd, Esq., F.Z.S.
 1 Common Badger (*Meles taxus*). Presented by Messrs. J. H. and B. H. Thompson.
 1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by John Ritchie, Esq.
9. 1 Slow Loris (*Nycticebus tardigradus*), ♀. Received in exchange.
 1 Bonnet-Monkey (*Macacus radiatus*). Presented by R. Bryant, Esq.
 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by Capt. E. J. Howes.
 1 Goffin's Cockatoo (*Cacatua goffini*). Presented by Mrs. Pitt.

- May 9. 1 Wonga-wonga Pigeon (*Leucosarcia picata*). Bred in the Gardens.
 1 Spotted Turtle Dove (*Turtur suratensis*). Bred in the Gardens.
10. 1 Jaguar (*Felis onca*). Presented by Major Wood.
 1 Blue-fronted Amazon (*Chrysotis aestiva*). Presented by Dr. Byron Whitehead.
 9 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.
11. 1 Darwin's Pucras Pheasant (*Purcraasia darwini*). Bred in the Gardens.
 3 Water-Ouzels (*Cinclus aquaticus*). Presented by R. J. L. Price, Esq., F.Z.S.
12. 1 Reindeer (*Rangifer tarandus*). Born in the Menagerie.
13. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
14. 1 Wood-Owl (*Syrnium aluco*). Presented by C. B. Wharton, Esq., F.Z.S.
 1 Rattlesnake (*Crotalus durissus*). Deposited.
15. 1 Reindeer (*Rangifer tarandus*), ♀. Born in the Menagerie.
 1 European Bearded Vulture (*Gypaëtus barbatus*). Deposited.
17. 1 Nilotic Fox (*Canis niloticus*), ♂. Presented by Commr. F. Cotton. From Djeddah, Arabia.
 1 Hog-nosed Snake (*Heterodon platyrhinos*). Presented by Dr. Painter, F.Z.S.
 1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
 4 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Gardens.
20. 1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.
22. 2 Bar-headed Geese (*Anser indicus*), ♂ and ♀. Purchased.
23. 2 Chimpanzees (*Troglodytes niger*), 2 ♂. Deposited.
 4 Water-Ouzels (*Cinclus aquaticus*). Presented by R. J. L. Price, Esq., F.Z.S.
 1 Variegated Sheldrake (*Tadorna variegata*), ♂. Received in exchange.
 2 Great-billed Rheas (*Rhea macrorhyncha*). Received in exchange.
 2 Sulphury Tyrants (*Pitangus sulphuratus*). Received in exchange.
 2 Geoffroy's Doves (*Peristera geoffroii*). Bred in the Gardens.
 7 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.
25. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Henry Willatt, Esq.
 1 White-fronted Capuchin (*Cebus albifrons*), ♀. Presented by Dayrell Davies, Esq., R.N.
 2 Wild Cats (*Felis catus*). Born in the Menagerie.
 3 Wild Boars (*Sus scrofa*). Born in the Menagerie.
 1 Yellow-legged Herring-Gull (*Larus leucophæus*). Bred in the Gardens.
 1 Hairy Tapir (*Tapirus roulini*), ♂. Received in exchange. See P. Z. S. 1878, p. 631, pl. xxxix.
 3 Common Rheas (*Rhea americana*). Presented by Frank Parish, Esq.
27. 4 Temminck's Tragopans (*Cerionis temmincki*). Bred in the Gardens.
 1 Brazilian Caracara (*Polyborus brasiliensis*). Presented by Miss Amslie.

- May 29. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. Farmer, Esq.
 1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.
30. 1 Geoffroy's Cat (*Felis geoffroyi*), ♂. Presented by Ronald Bridgett, Esq.
 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*). Born in the Menagerie.
31. 1 Tamandua Anteater (*Tamandua tetradactyla*). Purchased.
- June 3. 8 Common Sticklebacks (*Gasterosteus aculeatus*). Presented by Master G. L. Sclater.
 4. 2 Indranees Owls (*Syrnium indranees*). Deposited.
 5. 1 White-fronted Amazon (*Chrysotis leucocephala*). Purchased.
 6. 1 Mouflon (*Ovis musimon*). Born in the Menagerie.
 2 Greater Spotted Woodpeckers (*Picus major*). Presented by J. A. Cooper, Esq.
 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by N. Partocalis, Esq.
7. 2 Horned Tragopans (*Cerionis satyra*). Bred in the Gardens.
 1 Impeyan Pheasant (*Lophophorus impeyanus*). Bred in the Gardens.
 2 Oystercatchers (*Hæmatopus ostralegus*). Purchased.
 12 Green Tree-Frogs (*Hyla arborea*). Purchased.
8. 2 Mandrills (*Cynocephalus mormon*). Presented by G. H. Garrett, Esq.
 1 Ocellated Monitor (*Monitor ocellatus*). Presented by G. H. Garrett, Esq.
 2 Black Rats (*Mus rattus*). Presented by W. H. Hatcher, Esq.
 1 Common Chameleon (*Chamæleon vulgaris*). Presented by W. W. Spicer, Esq.
9. 1 Rhesus Monkey (*Macacus erythræus*). Born in the Menagerie.
 2 Common Seals (*Phoca vitulina*). Purchased.
10. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by J. C. Witte, Esq.
 1 White Ibis (*Ibis alba*). Purchased.
 1 Spotted Cavy (*Ceologenys paca*). Purchased.
 1 Ocelot (*Felis pardalis*). Presented by Capt. J. Moir.
 1 Black-faced Spider Monkey (*Ateles ater*). Presented by Capt. J. Moir.
 1 Common Boa (*Boa constrictor*). Presented by Capt. J. Moir.
 1 West-India Rail (*Aramides cayennensis*). Presented by Capt. J. Moir.
 1 Black Tortoise (*Testudo carbonaria*). Presented by Capt. J. Moir.
 2 Black-crested Cardinals (*Gubernatrix cristatella*). Presented by Mrs. Arabin, F.Z.S.
 1 American Thrush (*Turdus migratorius*). Presented by Mrs. Arabin, F.Z.S.
11. 1 Spotted Turtle Dove (*Turtur suratensis*). Bred in the Gardens.
 2 Brazilian Teal (*Querquedula brasiliensis*). Bred in the Gardens.
 1 Bay Antelope (*Cephalophus dorsalis*), ♀. Purchased.
 1 Black Saki (*Pithecia satanas*). Purchased.
12. 1 Chimpanzee (*Troglodytes niger*), ♀. Deposited.

- June 13. 1 Himalayan Bear (*Ursus tibetanus*), ♂. Presented by Commander J. S. Murray.
 1 Indian Crow (*Corvus splendens*). Presented by Commander J. S. Murray.
 6 Herring-Gulls (*Larus argentatus*). Presented by Arthur Clarke, Esq.
14. 1 Rufous Rat-Kangaroo (*Hypsiprymnus rufescens*). Presented by T. Wickenden, Esq.
 1 Reeves's Muntjac (*Cervulus reevesi*). Born in the Gardens.
15. 6 Upland Geese (*Bernicla magellanica*). Bred in the Gardens.
17. 1 Indian Gazelle (*Gazella bennetti*) ♂. Presented by Miss A. Statter.
 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by E. J. Beagle, Esq.
 1 Common Cormorant (*Phalacrocorax carbo*). Presented by W. Thompson, Esq.
18. 2 Cereopsis Geese (*Cereopsis novæ-hollandiæ*), ♂ and ♀. Purchased.
 2 Australian Sheldrakes (*Tadorna tadornoides*), ♂ and ♀. Purchased.
 4 Smooth Newts (*Triton tæniatus*). Presented by Master B. L. Sclater.
19. 2 Manchurian Crossoptilons (*Crossoptilon mantchuricum*), ♂ and ♀. Received in exchange.
 2 Black-billed Tree-Ducks (*Dendrocygna arcuata*). Received in exchange.
 2 Prairie Marmots (*Cynomys ludovicianus*). Presented by Mons. J. W. Cornély, C.M.Z.S.
 1 Yellow-billed Sheathbill (*Chionis alba*). Purchased.
 1 Barbel (*Lota vulgaris*). Presented by Earl Brownlow, F.Z.S.
20. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Samuel Curtis, Esq.
 1 Red-billed Tree-Duck (*Dendrocygna autumnalis*). Presented by R. M. Hyde, Esq.
 1 Scarlet Ibis (*Ibis rubra*). Presented by R. M. Hyde, Esq.
21. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by W. H. Gedge, Esq.
 1 Hybrid Ass (between *Equus onager* ♂ and *Equus hemippus*), ♀. Born in the Menagerie.
 1 Mueller's Parrot (*Tanygnathus muelleri*). Purchased.
 1 Talpacoti Ground-Dove (*Chalcopelia talpacoti*). Bred in the Gardens.
22. 2 Argus Pheasants (*Argus giganteus*). Bred in the Gardens.
 4 Summer Ducks (*Aix sponsa*). Bred in the Gardens.
 4 Chilian Widgeon (*Mareca chiloensis*). Bred in the Gardens.
 3 Australian Wild Ducks (*Anas superciliosa*). Bred in the Gardens.
 2 Common Cormorants (*Phalacrocorax carbo*). Presented by Edward Banks, Esq.
24. 1 Pine-Marten (*Martes abietum*). Presented by Robert Walters, Esq., F.Z.S.
 1 Green-necked Peafowl (*Pavo spicifer*). Bred in the Gardens.
25. 1 Rhesus Monkey (*Macacus erythraeus*), ♀. Presented by Mrs. Walcot.
 10 Herring-Gulls (*Larus argentatus*). Deposited.
 1 Brown Capuchin (*Cebus fatuellus*). Presented by A. Warming-ton, Esq.

- June 25. 1 Daubenton's Curassow (*Crax daubentoni*). Presented by A. Warmington, Esq.
 1 Common Boa (*Boa constrictor*). Purchased.
 1 Garden's Night-Heron (*Nycticorax gardeni*). Purchased.
26. 1 Japanese Wolf (*Canis hodophylax*), ♀. Presented by H. Heywood Jones, Esq., F.Z.S. See P.Z. S. 1878, p. 788.
 1 Common Seal (*Phoca vitulina*). Deposited.
 6 Goldfinches (*Carduelis elegans*). Presented by C. F. Johnson, Esq.
 1 Common Chameleon (*Chamæleon vulgaris*). Presented by C. F. Johnson, Esq.
 4 Geoffroy's Doves (*Peristera geoffroyi*). Bred in the Gardens.
 4 Cunningham's Skinks (*Egernia cunninghami*). Presented by J. G. Pearson, Esq.
27. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Alex. C. Forbes, Esq.
28. 1 Short-tailed Capromys (*Capromys brachyurus*). Presented by the Hon. H. J. Burford Hancock.
 1 Indian Antelope (*Antilope cervicapra*), ♀. Received in exchange.
 1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Presented by Philip Saville, Esq.
29. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♂. Presented by Capt. C. F. Filliter.
 1 Common Marmoset (*Hapale jacchus*), ♀. Presented by Edward Clayton, Esq.
 1 Pinche Monkey (*Midas ædipus*), ♂. Presented by Edward Clayton, Esq.
30. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Mrs. George Yeomans.
- July 1. 1 Reeves's Muntjac (*Cervulus reevesi*), ♀. Born in the Menagerie.
 2. 2 Black Wallabies (*Halmaturus ualabatus*), ♂ and ♀. Received in exchange.
 1 Australian Monitor (*Monitor gouldi*). Purchased.
 3. 6 Amberst Pheasants (*Thaumalea amherstiae*). Bred in the Gardens.
 1 Fork-tailed Jungle-fowl (*Gallus furcatus*). Bred in the Gardens.
 1 Demeraran Cock of the Rock (*Rupicola crocea*). Purchased.
 1 Prince Albert's Curassow (*Crax alberti*), ♂. Purchased.
 2 Black-faced Spider Monkeys (*Ateles ater*), ♂ and ♀. Purchased.
 4. 1 Persian Gazelle (*Gazella subgutturosa*), ♂. Presented by Col. Nixon.
 1 Goliath Heron (*Ardea goliath*). Presented by Col. Nixon.
 1 Spotted Ichneumon (*Herpestes auropunctatus*). Presented by Mrs. Payne.
 5. 1 King Parrakeet (*Aprosmictus scapulatus*). Presented by Ebenezer Carr, Esq.
 6. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Edward Wright, Esq.
 2 Red-faced Weaver-birds (*Foudia erythroptis*). Presented by Miss M. Jackson.
 1 Chestnut-bellied Finch (*Munia rubro-nigra*). Presented by Miss M. Jackson.

- July 6. 2 Common Redpoles (*Linota rufescens*). Presented by Miss M. Jackson.
- 2 Canary Finches (*Serinus canarius*). Presented by Miss M. Jackson.
- 2 Æsculapian Snakes (*Coluber æsculapii*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
- 2 Lacertine Snakes (*Cœlopeltis lacertina*). Presented by Lord Lilford, F.Z.S. From Tunis.
- 1 Horse-shoe Snake (*Zamenis hippocrepis*). Presented by Lord Lilford, F.Z.S. From Tripoli.
- 1 Leopardine Snake (*Coluber leopardinus*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
- 1 Vivacious Snake (*Tachymenis vivax*). Presented by Lord Lilford, F.Z.S. From Montenegro.
- 1 Dark-green Snake (*Zamenis atrovirens*, var. *carbonarius*). Presented by Lord Lilford F.Z.S. From Italy.
- 1 Four-rayed Snake (*Elaphis quateradiatus*). Presented by Lord Lilford, F.Z.S. From Dalmatia.
8. 4 Vulturine Guinea-fowls (*Numida vulturina*). Deposited.
9. 1 Hybrid Fallow Deer between *Dama mesopotamica* ♂ and *Dama vulgaris* ♀. Born in the Menagerie.
- 1 Hairy Tree-Porcupine (*Sphingurus prehensilis*). Born in the Menagerie.
- 2 Water-Vipers (*Cenchris piscivorus*). Purchased.
- 5 Seven-banded Snakes (*Tropidonotus leberis*). Purchased.
- 4 Red-headed Buntings (*Euspiza luteola*). Purchased.
- 4 Green-winged Doves (*Chalcophaps indica*). Purchased.
- 1 Plantain-Squirrel (*Sciurus plantani*). Purchased.
- 1 Water-Chevrotain (*Hyomoschus aquaticus*). Purchased.
- 1 Electric Silurus (*Malapterurus beninensis*). Purchased.
10. 1 Beatrix Antelope (*Oryx beatrix*), ♂. Presented by Commander Burke, S.S. 'Arcot.' From Arabia. See P.Z. S. 1878, p. 789.
- 1 Barn-Owl (*Strix flammea*). Presented by Commander Wyatt, S.S. 'Deccan.' From Mesopotamia.
- 3 Bullfinches (*Pyrrhula rubicilla*). Presented by Miss A. Sargeant.
11. 4 Paradise Whydah-birds (*Vidua paradisea*). Presented by Archibald Brown, Esq.
- 1 Pin-tailed Whydah-bird (*Vidua principalis*). Presented by Archibald Brown, Esq.
- 3 Grenadier Weaver-birds (*Euplectes oryx*). Presented by Archibald Brown, Esq.
- 2 Hooded Finches (*Spermestes cucullatus*). Presented by Archibald Brown, Esq.
- 2 Crested Porcupines (*Hystrix cristata*). Presented by Dr. G. S. Badger.
- 1 Banded Ichneumon (*Herpestes fuscatus*). Presented by Dr. G. S. Badger.
- 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by Capt. Henderson.
- 1 Green Tree-Frog (*Hyla arborea*). Presented by J. Greenwood, Esq.
14. 1 Green Tree-Frog (*Hyla arborea*). Presented by Lord Arthur Russell, F.Z.S.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Enoch.

- July 15. 1 Golden-headed Marmoset (*Midas chrysomelas*), ♂. Purchased. From Para.
- 1 Horrid Rattlesnake (*Crotalus horridus*). Purchased. From Bahia.
- 1 Thick-billed Tanager (*Euphonia crassirostris*), ♀. Purchased. From Para.
- 3 Alligator Terrapins (*Chelydra serpentina*). Presented by J. H. Thompson, Esq., C.M.Z.S.
- 1 Eland (*Oreas canna*), ♂. Born in the Menagerie.
16. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by Miss Davis.
- 2 Cape Zorillas (*Ictonyx zorilla*). Presented by Mrs. J. J. Monteiro.
- 1 Argus Pheasant (*Argus giganteus*). Bred in the Gardens.
- 5 Amherst Pheasants (*Thaumalea amherstie*). Bred in the Gardens.
19. 1 Common Cuckoo (*Cuculus canorus*). Presented by G. D. Careless, Esq.
- 2 Smooth Snakes (*Coronella lævis*). Purchased. From Hampshire.
20. 1 Black-necked Swan (*Cygnus nigricollis*). Bred in the Gardens.
22. 1 Nightingale (*Daulias lusciniæ*). Presented by — Gee, Esq.
23. 1 Wood-Owl (*Syrnium aluco*). Presented by H. T. Wharton, Esq., F.Z.S.
- 1 Red-and-blue Macaw (*Ara macao*). Presented by H. T. Wharton, Esq., F.Z.S.
- 1 Blue-and-yellow Macaw (*Ara ararauna*). Presented by H. T. Wharton, Esq., F.Z.S.
- 1 Common Gull (*Larus canus*). Presented by F. Lancelott, Esq.
25. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Presented by Dr. Adcock.
- 2 American Flying Squirrels (*Sciuropterus volucella*), ♂ and ♀. Received in exchange.
- 1 Coati (*Nasua nasica*). Received in exchange.
27. 1 Orang-outang (*Simia satyrus*), ♀. Received in exchange. See P. Z. S. 1878, p. 789.
- 1 Green-winged Dove (*Chalcophaps indica*). Presented by Capt. W. Otho N. Shaw.
- 1 Burrowing Owl (*Speotyto cunicularia*). Presented by Geo. E. P. Nixon, Esq., M.D.
- 6 Common Guillemots (*Uria troile*). Presented by Sir Hew Dalrymple, Bart.
29. 1 Greater Sulphur-Crested Cockatoo (*Cacatua galerita*). Presented by Mrs. A. A. Hole.
- 1 Ocelot (*Felis pardalis*). Purchased.
- 1 Black Vulture (*Cathartes atratus*). Purchased.
- 2 Chilian Sea-Eagles (*Geranoæetus melanoleucus*). Purchased.
- 1 Brazilian Caracara (*Polyborus brasiliensis*). Purchased.
- 2 Rufous Tinamous (*Rhynchotus rufescens*). Purchased.
- 9 Spotted Tinamous (*Nothura maculosa*). Purchased.
- 1 Razor-billed Curassow (*Mitua tuberosa*). Purchased.
31. 1 Mexican Deer (*Cervus mexicanus*), ♀. Presented by A. Scrutton, Esq.
- 1 Common Fox (*Canis vulpes*). Presented by Athelston Riley, Esq.

- July 31. 1 Brown Coati (*Nasua nasica*), ♂. Deposited.
 4 Indian Rat-Snakes (*Ptyas mucosa*). Received in exchange.
 3 Long-snouted Snakes (*Passerita nycterizans*). Received in exchange.
 4 Long-banded Snakes (*Tropidonotus vittatus*). Received in exchange.
- Aug. 1. 1 Slow Loris (*Nycticebus tardigradus*) ♂. Presented by Theodore Hance, Esq.
 3 Common Cranes (*Grus cinerea*). Presented by Theodore Hance, Esq. From Chinkiang China.
 1 Copper-head Snake (*Cenchrus contortrix*). Presented by Dr. F. Painter, F.Z.S.
 2. 3 Great Bustards (*Otis tarda*), 1 ♂ and 2 ♀. Presented by Lord Lilford, F.Z.S.
 1 Tiger Bittern (*Tigrisoma brasiliense*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
 1 Passerine Owl (*Glaucidium passerinum*). Presented by W. E. Tait, Esq., C.M.Z.S.
 1 Spanish Blue Magpie (*Cyanopolius cooki*). Presented by Lord Lilford, F.Z.S. See P. Z. S. 1878, p. 789.
 1 Caspian Terrapin (*Clemmys caspica*). Presented by T. Wilson, Esq.
 2 Argus Pheasants (*Argus giganteus*). Bred in the Gardens.
 3. 2 Beisa Antelopes (*Oryx beisa*), ♂ and ♀. Presented by Capt. F. M. Hunter, B.C.S.
 1 Bacha Eagle (*Spilornis bacha*). Presented by J. S. Jameson, Esq. From Labuan, N.W. Borneo.
 4. 1 Axis Deer (*Cervus axis*), ♀. Born in the Menagerie.
 5. 2 European Lynxes (*Felis lynx*), ♂ and ♀. Presented by Major Chadwick. From Norway.
 1 Hobby (*Hypotriorchis subbuteo*). Presented by W. H. Scratton, Esq.
 2 Common Kingfishers (*Alcedo ispida*). Purchased.
 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Gardens.
 6. 1 Common Boa (*Boa constrictor*). Presented by Arthur Stradling, Esq.
 1 Coati (*Nasua nasica*). Received in exchange.
 3 Bluish Finches (*Spermophila cerulescens*). Deposited.
 1 Thick-billed Seed-Finch (*Oryzoborus crassirostris*). Deposited.
 1 Red-and-blue Macaw (*Ara macao*). Deposited.
 1 Yellow Snake (*Chilobothrus inornatus*). On approval.
 7. 1 Weeper Capuchin (*Cebus capucinus*). Deposited.
 1 Black-crested Cardinal (*Gubernatrix cristatella*). Bred in the Gardens.
 2 Talpacoti Ground-Doves (*Chamæpelia talpacoti*). Bred in the Gardens.
 1 Solitary Thrush (*Monticola cyanus*). Presented by W. Verner, Esq.
 8. 1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
 9. 1 Black Rat (*Mus rattus*). Presented by R. Morton Middleton, Esq.
 7 Greek Land-Tortoises (*Testudo græca*). Deposited.
 12. 3 Guinea-Pigs (*Cavia caprera*). Presented by Mr. J. Gould.
 13. 1 Lion (*Felis leo*), ♂. Presented by W. H. Wylde, Esq.
 1 Patas Monkey (*Cercopithecus ruber*). Presented by W. H. Wylde, Esq.

- Aug. 13. 2 Common Buzzards (*Buteo vulgaris*). Presented by Valentine Marks, Esq.
 2 Herring-Gulls (*Larus argentatus*). Presented by Thomas Landseer, Esq.
 1 Crested Ground-Parakeet (*Calopsitta novæ-hollandiæ*). Presented by Mrs. Parker.
 2 Barbary Apes (*Macacus inuus*). Deposited.
 1 Bladder-nosed Seal (*Cystophora cristata*). Purchased.
14. 1 Common Paradoxure (*Paradoxurus typus*). Presented by Edwin ETTY Sass, Esq.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
 2 Beautiful Parrakeets (*Psephotus pulcherrimus*). Deposited.
17. 1 Many-zoned Hawk (*Melierax polyzonus*). Presented by C. H. Fisher, Esq. From Mogador.
 6 Common Kingfishers (*Alcedo ispida*). Purchased.
 13 Greek Land-Tortoises (*Testudo græca*). Deposited.
19. 2 Saffron Finches (*Sycalis flaveola*). Bred in the Gardens.
21. 1 Prairie-Wolf (*Canis latrans*). Presented by Prof. C. M. Vincent, F.G.S., F.R.G.S. From the Rocky Mountains. See P. Z. S. 1878, p. 789.
22. 1 Common Jackal (*Canis aureus*), ♂. Presented by Mr. James Smith.
 1 Spotted Ichneumon (*Herpestes auropunctatus*), ♀. Presented by Mr. W. Pyne.
23. 1 Bronze Fruit-Pigeon (*Carpophaga ænea*). Presented by Mr. A. H. Jamrach.
24. 1 White-eared Bulbul (*Pycnonotus leucotis*). Presented by J. W. Wooler, Esq.
26. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Capt. Clarke.
 11 Spinose Lizards (*Agama colonorum*). Received in exchange.
 1 Cape Bucephalus (*Bucephalus capensis*). Received in exchange.
 1 Smooth-bellied Snake (*Homalosoma lutrix*). Received in exchange.
 1 Crossed Snake (*Psammophis crucifer*). Received in exchange.
27. 1 Common Marmoset (*Hapale jacchus*). Deposited.
28. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
30. 1 Common Crow (*Corvus cornix*). Presented by F. Sydney B. Brough, Esq.
 3 Hybrid Snakes (between *Chilobothrus inornatus* ♂ and *Epicrates angulifer* ♀). Born in the Menagerie. See P. Z. S. 1878, p. 789.
31. 1 White-lipped Peccary (*Dicotyles labiatus*). Purchased.
 1 Golden Agouti (*Dasyprocta aguti*). Presented by Geo. Hammond Hawtayne, Esq., C.M.Z.S.
 1 Bahama Duck (*Dafila bahamensis*). Bred in the Gardens.
- Sept. 1. 1 Red Deer (*Cervus elaphus*). Born in the Menagerie.
 2. 1 Caspian Ouaran (*Psammosaurus caspicus*). Presented by F. A. Floyer, Esq., F.Z.S. From Khan Yunis, Egypto-Syrian frontier.
4. 1 Turquoise Parrakeet (*Euphema pulchella*). Bred in the Gardens.

- Sept. 4. 1 Goffin's Cockatoo (*Cacatua goffini*). Deposited by F. A. Rogers, Esq.
 1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. Presented by Capt. Benson.
5. 1 Hybrid Kaleege, ♂. Presented by A. F. Wiener, Esq.
 2 Tayras (*Galictis barbara*). Born in the Menagerie.
6. 1 Banded Ichneumon (*Herpestes fasciatus*), ♂. Presented by the Rev. H. F. B. Lawrence.
 1 Japanese Warbler (*Cettia cantans*). Deposited by E. L. Hyde, Esq.
9. 1 Banded Ichneumon (*Herpestes fasciatus*), ♀. Presented by F. T. Blackley, Esq.
10. 2 Vinaceous Turtle Doves (*Turtur vinaceus*). Presented by Miss Harris.
 1 Greek Land-Tortoise (*Testudo græca*). Presented by Miss Harris.
12. 1 Common Adder (*Vipera berus*). Presented by the Viscount Mandeville.
14. 1 Spotted Turtle Dove (*Turtur aurita*). Bred in the Gardens.
16. 1 Oriental Eagle-Owl (*Bubo orientalis*). Presented by Charles Fowler, Esq. From Karennee, Siam. See P. Z. S. 1878, p. 790.
 1 Passerine Owl (*Glaucidium passerinum*). Presented by Albert Momber, Esq.
17. 1 Common Adder (*Vipera berus*). Presented by F. Buckland, Esq.
18. 2 Prairie-Marmots (*Cynomys ludovicianus*). Presented by Wilfred G. Marshall, Esq.
 2 Leconte's Rattlesnakes (*Crotalus leontii*). Presented by Wilfred G. Marshall, Esq. From Colorado.
19. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Emily Palmer.
 2 Ostriches (*Struthio camelus*), ♂ and ♀. Presented by the Hon. H. C. Vivian, H.B.M. Consul General, Cairo. See P. Z. S. 1878, p. 790.
 2 Secretary Vultures (*Serpentarius reptilivorus*). Presented by C. Rivers Wilson, Esq., C.B.
20. 2 Egyptian Gazelles (*Gazella dorcas*), ♂ and ♀. Presented by Thos. Moss, Esq.
 3 Reddish Finches (*Spermophila macrourantia*). Presented by R. C. Batterbee, Esq.
 1 Lineated Finch (*Spermophila lineata*). Presented by R. C. Batterbee, Esq.
 1 Guttural Finch (*Spermophila gutturalis*). Presented by R. C. Batterbee, Esq.
 1 Tropical Seed-Finch (*Oryzoborus torridus*). Presented by R. C. Batterbee, Esq.
 1 Plumbeous Finch (*Spermophila plumbea*). Presented by R. C. Batterbee, Esq.
 3 Rufous Tinamous (*Rhynchotus rufescens*). Presented by J. A. Iliffe, Esq.
 1 Leonine Monkey (*Macacus leoninus*), ♂. Deposited.
 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*). Purchased.
 1 Molucca Deer (*Cervus moluccensis*), ♂. Born in the Menagerie.
21. 1 Mocking Bird (*Mimus polyglottus*). Deposited.
 1 Common Hangnest (*Icterus vulgaris*). Deposited.

- Sept. 22. 2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by A. H. Cocks, Esq., F.Z.S.
23. 2 White-crested Touracous (*Corythaix albocristata*). Presented by W. Wormald, Esq.
25. 1 Bonnet-Monkey (*Macacus radiatus*). Presented by Frederick Carter, Esq.
- 1 Chestnut-backed Weaver-bird (*Hyphantornis castaneofusca*). Deposited.
- 4 Rufous-necked Weaver-birds (*Hyphantornis textor*). Deposited.
- 2 Grenadier Weaver-birds (*Euplectes oryx*). Deposited.
- 1 Barbary Turtledove (*Turtur risorius*). Deposited.
- 1 Vinaceous Turtledove (*Turtur vinaceus*). Deposited.
- 1 Turquoise Parrakeet (*Euphema pulchella*). Deposited.
- 2 Undulated Grass-Parrakeets (*Melopsittacus undulata*). Deposited.
- 7 Crested Ground-Parrakeets (*Calopsitta novæ-hollandiæ*). Deposited.
26. 1 Tabuan Parrakeet (*Pyrrhulopsis tabuensis*). Purchased.
- 1 Masked Parrakeet (*Pyrrhulopsis personata*). Purchased.
- 2 Barbel (*Barbus vulgaris*). Presented by G. H. Jones, Esq., F.Z.S.
- 8 Mocassin Snakes (*Tropidonotus fasciatus*). Born in the Menagerie.
27. 1 Green Turtle (*Chelone viridis*). Presented by Capt. J. Smith.
28. 1 Yellow Wagtail (*Motacilla flava*). Purchased.
29. 1 Black-faced Spider Monkey (*Ateles ater*). Presented by W. C. Kenny, Esq.
30. 1 Variable Squirrel (*Sciurus variabilis*). Purchased.
- Oct. 1. 1 Common Fox (*Canis vulpes*), ♂. Presented by F. B. Toogood, Esq.
2. 1 Mona Monkey (*Cercopithecus mona*), ♂. Presented by the Rev. W. N. Ripley.
- 1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Rev. E. L. Marrett.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.
- 1 Anubis Baboon (*Cynocephalus anubis*). Deposited.
- 1 Kinkajou (*Cercoptes caudivolvulus*). Deposited.
- 1 Sumatran Rhinoceros (*Rhinoceros sumatrensis*), ♀. Deposited. See P. Z. S. 1878, p. 790.
- 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by D. L. Broughton, Esq.
5. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Deposited.
- 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Received in exchange.
- 1 Red-beaked Weaver-bird (*Quelea sanguinirostris*). Presented by W. H. Simmonds, Esq.
- 1 Passerine Owl (*Glaucidium passerinum*). Presented by Miss Turner.
6. 1 Red-crested Touracou (*Corythaix erythrolophus*). Presented by J. Colman, Esq., C.M.Z.S.
- 1 Cape Zorilla (*Ictonyx zorilla*). Presented by J. Colman, Esq.
7. 1 Red-sided Eclectus (*Eclectus polychlorus*), ♀. Purchased.
- 1 Brown Mynah (*Acridotheres fuscus*). Presented by Capt. J. Murray.

- Oct. 7. 1 Pied Mynah (*Sturnopastor contra*). Presented by Capt. J. Murray.
- 1 Indranee Owl (*Syrnium indranee*). Presented by Capt. J. Murray.
- 1 Black-footed Penguin (*Spheniscus demersus*). Purchased.
9. 4 Egyptian Geese (*Chenalopex aegyptiaca*). Presented by Mr. Justice Denyssen, of the Cape colony.
- 2 Leopard Tortoises (*Testudo pardalis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1878, p. 790.
- 1 Collared Peccary (*Dicotylestajacu*). Presented by J. Lloyd, Esq.
10. 1 Common Otter (*Lutra vulgaris*). Presented by W. H. Baylis, Esq.
- 4 Chinese Turtledoves (*Turtur chinensis*). Purchased.
11. 1 Cross Fox (*Canis fulvus*). Presented by Wilfred G. Marshall, Esq. From Colorado.
13. 1 Hybrid Mandrill Monkey (between *Cynocephalus mormon* ♀, and *Macacus cynomolgus* ♂, large variety). Born in the Menagerie. See P. Z. S. 1878, p. 791.
- 1 Indian Muntjac (*Cervulus muntjac*), ♀. Born in the Menagerie.
- 1 Philantomba Antelope (*Cephalophus maxwelli*), ♀. Received in exchange.
- 1 Cinereous Opossum (*Didelphys cinerea*). Received in exchange.
15. 1 Squirrel Monkey (*Saimaris sciurea*), ♂. Presented by Ed. Calthrop, Esq.
- 1 Michie's Tufted Deer (*Elaphodus cephalophus*), ♂. Purchased. See P. Z. S. 1878, p. 790.
- 2 Ruddy Sheldrakes (*Tadorna rutila*). Purchased.
- 1 Naked-throated Bell-bird (*Chasmorhynchus nudicollis*), ♂. Purchased.
- 3 Blue-bearded Jays (*Cyanocorax cyanopogon*). Purchased. From Bahia.
- 1 Saturnine Mocking-bird (*Mimus saturninus*). Purchased. From Pernambuco.
- 2 Lined Finches (*Spermophila lineola*). Purchased. From Pernambuco.
- 2 Guttural Finches (*Spermophila gutturalis*). Purchased. From Pernambuco.
- 1 Pileated Song-Sparrow (*Zonotrichia pileata*). Purchased. From Rio de Janeiro.
- 1 Palm-Tanager (*Tanagra palmarum*), ♀. Purchased. From Monte Video.
- 1 Dark-winged Buzzard (*Leucopternis scotoptera*). Purchased. From Bahia.
16. 1 Patas Monkey (*Cercopithecus ruber*). Purchased.
17. 1 Emu (*Dromæus novæ-hollandiæ*). Presented by C. Hampden Wigram, Esq.
- 2 Radiated Tortoises (*Testudo radiata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
19. 1 Water-Rail (*Rallus aquaticus*). Presented by Capt. H. F. Salvin.
21. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Capt. E. Waterhouse.
- 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Samuel Thompson.
22. 1 Common Seal (*Phoca vitulina*). Presented by Messrs. Thompson and Gough.

- Oct. 22. 1 Bornean Fireback (*Euplocamus nobilis*), ♀. Presented by A. Dent, Esq. From Northern Borneo.
 2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Presented by Edward Trelawny, Esq.
 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
23. 1 Common Jackal (*Canis aureus*). Presented by Capt. Easson.
 1 Common Roe (*Capreolus caprea*), ♂. Presented by Edward Jones, Esq.
 1 Mandarin Duck (*Aix galericulata*), ♀. Purchased.
24. 1 Merrem's Snake (*Liophis merremi*). Purchased.
 1 Plumbeous Snake (*Oxyrrhopus plumbeus*). Purchased.
 1 Black-headed Snake (*Homalocranon melanocephalum*). Purchased.
 1 D'Orbigny's Snake (*Heterodon d'orbignyi*). Purchased.
 1 Anaconda (*Eunectes murinus*). Purchased.
 1 Tuberculated Lizard (*Iguana tuberculata*). Purchased.
 1 Teguxin Lizard (*Teius teguexin*). Purchased.
 1 Common Marmoset (*Hapale jacchus*). Purchased.
25. 2 Ruddy Sheldrakes (*Tadorna rutila*). Received in exchange.
27. 1 Wood-Owl (*Syrnium aluco*). Presented by F. W. Jaedecke.
28. 1 Grison (*Galictis vittata*), ♀. Presented by H. Potier, Esq.
29. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Mrs. Tranchell.
 1 Rhesus Monkey (*Macacus erythræus*). Deposited.
 1 Horse-shoe Snake (*Zamenis hippocrepis*). Presented by W. C. Verner, Esq. From Gibraltar.
30. 2 South-American Rat-Snakes (*Spilotes variabilis*). Presented by G. H. Hawtayne, Esq., C.M.Z.S. From Demerara.
 1 Chequered Elaps (*Elaps lemniscatus*). Presented by G. H. Hawtayne, Esq., C.M.Z.S. From Demerara.
31. 1 Mesopotamian Fallow Deer (*Dama mesopotamica*), ♀. Purchased. See P. Z. S. 1878, p. 790.
 2 Small-scaled Mastigures (*Uromastix microlepis*). Presented by Capt. Phillips.
 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by Henry Hands, Esq.
 1 Common Boa (*Boa constrictor*). Presented by W. D. Bell, Esq.
- Nov. 1. 2 Japanese Pheasants (*Phasianus versicolor*), ♂ and ♀. Purchased.
 1 Gold Pheasant (*Thaumalea picta*), ♂. Purchased.
 1 Lineated Pheasant (*Euplocamus lineatus*), ♂. Purchased.
 2 Barred-tailed Pheasants (*Euplocamus reevesi*), ♂ and ♀. Purchased.
 1 Siamese Pheasant (*Euplocamus prælatus*), ♂. Purchased.
 1 White-crested Kaleege (*Euplocamus alboeristatus*), ♀. Purchased.
 2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ and ♀. Purchased.
 1 Bewick's Swan (*Cygnus bewicki*), ♀. Purchased.
 2 Macaque Monkeys (*Macacus cynomolgus*), ♀. Presented by Mr. C. Loveless.
 1 Weasel (*Mustela vulgaris*). Purchased.
2. 1 Three-quarter-bred Zebu (between *Bos indicus* ♂, and hybrid *B. frontalis* ♀). Born in the Menagerie.

- Nov. 2. 1 Green Tree-Frog (*Hyla arborea*). Presented by Lord Arthur Russell, M.P., F.Z.S.
 1 Spotted Salamander (*Salamandra maculosa*). Presented by Lord Arthur Russell, M.P., F.Z.S.
 1 Common Hedgehog (*Erinaceus europæus*). Presented by Mr. E. Sass.
 3 Green Tree-Frogs (*Hyla arborea*). Presented by Mr. E. L. Boyd.
 5. 1 Sykes's Oriole (*Oriolus kundoo*). Received in exchange.
 6. 2 Squirrel-like Phalangers (*Belideus sciureus*). Presented by E. S. Waller, Esq.
 7. 1 Blue-and-yellow Macaw (*Ara macao*). Deposited.
 1 Yellow-shouldered Amazon (*Chrysotis ochroptera*). Deposited.
 8. 2 Arabian Baboons (*Cynocephalus hamadryas*), ♂ and ♀. Presented by C. Wood, Esq.
 1 Burchell's Zebra (*Equus burchelli*), ♀. Received in exchange.
 1 Sulphury Seed-eater (*Crithagra sulphurata*). Purchased.
 2 Hooded Crows (*Corvus cornix*). Presented by Capt. F. H. Salvin.
 9. 1 Nisnas Monkey (*Cercopithecus pyrrhonotus*). Purchased.
 1 Red-fronted Lemur (*Lemur rufifrons*). Purchased.
 1 Manchurian Deer (*Cervus manchuricus*), ♀. Purchased.
 1 American Tantalus (*Tantalus loculator*). Purchased.
 2 Hudson-Bay Squirrels (*Sciurus hudsonius*). Purchased.
 11. 1 Woodcock (*Scolopax rusticola*). Purchased.
 1 Sun-Bittern (*Eurypyga helias*). Deposited.
 12. 2 Egyptian Jerboas (*Dipus ægyptius*). Purchased.
 1 Cananina Snake (*Spilotes pæcillostoma*). Purchased.
 1 Bonnet-Monkey (*Mucacus radiatus*), ♂. Presented by Mr. F. Hinde.
 13. 2 Horsfield's Tortoises (*Testudo horsfieldi*). Presented by Dr. A. Strauch, C.M.Z.S. From Turkestan. See P. Z. S. 1878, p. 975.
 14. 1 Wanderoo Monkey (*Macacus silenus*), ♀. Deposited.
 15. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Miss G. E. Marryat.
 1 Spix's Macaw (*Ara spixi*). Purchased. See P. Z. S. 1878, p. 976.
 18. 1 Macaque Monkey (*Macacus cynomolgus*). Deposited.
 19. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by T. Beck, Esq.
 22. 2 Yellow-billed Grosbeaks (*Pheucticus chrysogaster*), ♂ and ♀. Purchased. From Cuzco.
 1 Black-crested Cardinal (*Gubernatrix cristatella*). Purchased.
 2 Red-crested Cardinals (*Paroaria cucullata*). Purchased.
 24. 1 Equine Antelope (*Hippotragus equinus*), ♂. Received in exchange.
 25. 1 Brazilian Tree-Porcupine (*Sphingurus prehensilis*), ♂. Presented by Dr. J. F. Chittenden, C.M.Z.S. From Trinidad.
 1 Hybrid Vulturine Guinea-fowl (between *Numida vulturina* and *N. meleagris*). Presented by Mons. J. M. Cornély, C.M.Z.S.
 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
 1 Black Lemur (*Lemur macaco*), ♂. Purchased.
 26. 1 Water-Rail (*Rallus aquaticus*). Presented by W. Thompson, Esq.

- Nov. 26. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Dr. Whately, R.N.
28. 2 Common Cormorants (*Phalacrocorax carbo*). Presented by F. Buckland, Esq., F.Z.S.
29. 1 Common Peafowl (white variety) (*Pavo cristatus*), ♂. Presented by Mrs. Russ.
30. 1 Rufous-vented Guan (*Penelope cristata*). Purchased.
- Dec. 2. 3 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
- 1 Kinkajou (*Cercoleptes caudivolvulus*). Purchased.
3. 2 Black-faced Spider Monkeys (*Ateles ater*), ♂ and ♀. Presented by Mr. A. Gonzalez Carazo.
- 2 Rufous-vented Guans (*Penelope cristata*). Presented by Mr. A. Gonzalez Carazo.
- 2 Horsfield's Tortoises (*Testudo horsfieldi*). Presented by Dr. A. Strauch, C.M.Z.S. From Turkestan.
4. 1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mr. A. G. Lytton Squires.
- 2 Black-eared Marmosets (*Hapale penicillata*). Presented by the Countess of Cottenham.
- 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Mr. Edwin A. B. Crockett.
- 1 Rhomb-marked Snake (*Psammophylax rhombeatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 3 Rufescent Snakes (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 1 Aurora Snake (*Lamprophis aurora*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
8. 1 Ceylon Jungle-Fowl (*Gallus stanleyi*), ♀. Presented by Mr. G. Lyon Bennett.
- 2 Ring-necked Pheasants (*Phasianus torquatus*), ♀. Presented by Mr. G. Lyon Bennett.
- 1 Grey Francolin (*Francolinus ponticerianus*). Presented by Mr. G. Lyon Bennett.
9. 1 Mayotte Lemur (*Lemur mayottensis*), ♂. Purchased.
- 1 Ocelot (*Felis pardalis*). Purchased.
- 1 Globose Curassow (*Crax globicera*). Purchased.
- 3 Yellow-winged Blue Creepers (*Cæreba cyanea*). Purchased.
11. 1 Common Swan (*Cygnus olor*). Presented by Capt. Marx.
- 1 Yellow Baboon (*Cynocephalus babouin*), ♂. Presented by Mr. G. A. Shaw.
- 2 Ring-tailed Lemurs (*Lemur catta*), ♂ and ♀. Presented by Mr. G. A. Shaw. From Betsileo, Madagascar.
- 1 Ring-tailed Lemur (*Lemur catta*), ♂. Deposited.
- 1 Broad-nosed Lemur (*Hapalolemur simus*). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
- 1 Brown Mouse Lemur (*Cheirogaleus milii*?). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
- 9 Smith's Dwarf Lemurs (*Microcebus smithii*). From Betsileo, Madagascar. See P. Z. S. 1879, p. 2.
- 1 Common Fox (*Canis vulpes*), ♂. Presented by Sutton Sharpe, Esq.
- 1 Woodcock (*Scolopax rusticula*). Presented by Messrs. E. and W. H. Davis.
14. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by J. Williams, Esq.
- 1 Ceropsis Goose (*Ceropsis nova-hollandiæ*). Purchased.

- Dec. 16. 1 Pine-Martin (*Martes abietum*), ♀. Presented by Robert Walters, Esq., F.Z.S.
17. 1 Ring-hals Snake (*Sepedon hæmachates*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 1 Hissing Sand-Snake (*Psammophis sibilans*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
18. 2 Green-cheeked Amazons! (*Chrysotis viridigenalis*). Purchased.
- 2 Guatemalan Amazons (*Chrysotis guatemalæ*). Purchased.
- 1 Golden-naped Amazon (*Chrysotis auripalliata*). Purchased.
- 1 Crowned Eagle (*Spizaetus coronatus*). Presented by J. da Costa Andrade, Esq.
19. 1 Grey Ichneumon (*Herpestes griseus*). Presented by J. B. Jameson, Esq.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
24. 1 Common Barn-Owl (*Strix flammea*). Presented by W. Davies, Esq.
26. 2 Philantomba Antelopes (*Cephalophus maxwelli*), ♂ and ♀. Purchased.
- 2 Egyptian Jerboas (*Dipus ægyptius*). Purchased.
27. 1 White-whiskered Paradoxure (*Paradoxurus leucomystax*). Presented by G. Wilson, Esq.
- 1 Common Coot (*Fulica atra*). Presented by T. H. O'Donoghue, Esq.
29. 3 River-Jack Vipers (*Vipera rhinoceros*). Received in exchange.
30. 6 Brown Tritons (*Geotriton fuscus*). Presented by Prof. Giglioli, C.M.Z.S. From Italy.
31. 1 Feline Douroucouli (*Nyctipithecus felinus*), ♂. Purchased.
- 1 Punjaub Wild Sheep (*Ovis cycloceros*), ♀. Presented by Col. W. R. Alexander. From Upper Sind. See P. Z. S. 1879, p. 2.

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