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PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON.

FOR THE YEAR

1876.

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PART I.

CONTAINING PAPERS READ IN

JANUARY AND FEBRUARY.

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1876.

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

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January 4, 1876.

Prof. Newton, 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 December 1875 :—

The registered additions to the Society's Menagerie during the month of December were 86 in number. Of these, 17 were acquired by presentation, 54 by purchase, 1 by exchange, 1 by birth, and 13 were received on deposit. The total number of departures during the same period, by death and removals, was 113.

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

A Haast's Apteryx (*Apteryx haasti*) from New Zealand, presented by Baron F. von Mueller, C.M.Z.S., 18th December, 1875. Two examples of this Apteryx were despatched by our esteemed correspondent from Melbourne; but only one reached us alive—the first living individual of this recently determined species (assuming that its distinctness from *A. oweni* is fairly established) that has arrived in this country.

A Night-Parrot (*Stringops habroptilus*) from New Zealand, presented by Mr. T. E. Featherston, 23rd December, 1875.

Three male Moose (*Alces machlis*) from North America, deposited 28th December, 1875.

A letter was read, addressed to the Secretary by Mr. George Brown, Corresponding Member, dated Port Hunter, Duke-of-York Island (lat.  $4^{\circ} 7' S.$ , long.  $152^{\circ} 22' E.$ ), Sept. 5, 1875, stating that he had shipped by the 'John Wesley,' for the Society, to the care of Dr. George Bennett at Sydney two Cassowaries, and a Cockatoo from the adjoining island of New Britain, and two Pigeons and two Parrots from Duke-of-York Island, and some other birds, which he trusted would arrive safely. Mr. Brown stated that he had a collector at work along with him, and hoped shortly to have made a good series of specimens of the hitherto almost unknown fauna of this and the neighbouring islands.

The Secretary had received intelligence from Dr. Bennett of the safe arrival of the two Cassowaries (*Casuarius bennetti*) and of four of the other birds at Sydney, and that they would be forwarded to the Society by the 'Paramatta' on her next return voyage.

The following extract was read from a letter addressed to the Secretary by Mr. R. Trimen, Curator of the South-African Museum, Cape-town, dated 24th Nov. 1875.

"Your note (P. Z. S. 1875, pp. 81, 82) on *Canis chama*, Smith, leads me to think that you may be interested in hearing that there are two specimens of that species in this Museum.

"They have hitherto been labelled *C. variegatoides*, Smith (South Afr. Qu. Journ. ii. p. 87), the example first received having been so determined by the late Curator; but on comparison of them with the characteristic plate (xviii.) in the 'Proceedings,' and with Dr. Smith's descriptions of the two species, it is clear that they are *C. chama* and not *C. variegatoides*.

"I should be glad to hear if you know any thing about the latter species.

"The late Dr. J. E. Gray referred it (List Mamm. Brit. Mus. 1843, p. 58) to *C. mesomelas*, Schreb.; but as Dr. Smith was well acquainted with *C. mesomelas*, it seems improbable that he would have founded a new species on any thing less than a well-marked variety.

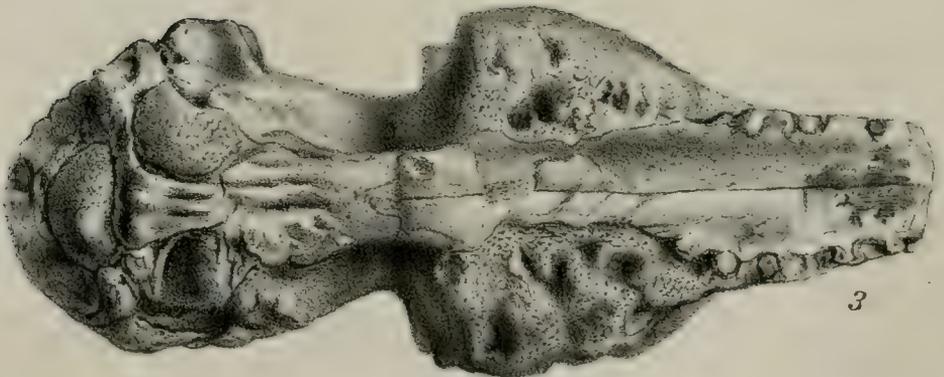
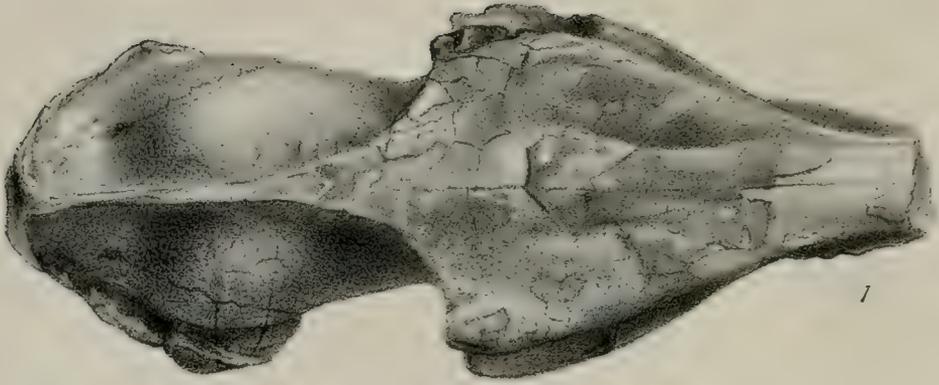
"*C. chama* is more widely spread than Dr. Smith's account would lead one to suppose, one of our two examples being from the neighbourhood of Beaufort (about the centre of this colony) and the other from near Caledon, a town about 70 miles east (and a little to the south) of Cape-town."

Dr. Hector, F.R.S., sent for exhibition three feather mats, made by the Maoris of New Zealand:—

No. 1. An ancient mat, obtained by Dr. Buller from a chief belonging to the Upper Wanganui river. Centre of pigeon's feathers (*Carpophaga novæ-zealandiæ*) trimmed with feathers from the Kaka (*Nestor meridionalis*) and North-Island Kiwi (*Apteryx mantelli*), and also tufts of hair of the ancient Maori dog, now extinct.

No. 2. A mat of Kiwi feathers (*Apteryx mantelli*) from Tampo Lake, North Island. The harsh feel, from the prolonged shafts





J. Smit, lith.

Hanhart imp.

characteristic of this species, is obvious. Each feather is worked into the flax of the mat.

No. 3. A mat of wing-feathers of the Kaka (*Nestor meridionalis*), made by the natives near Wellington.

The following papers were read :—

1. Description of the Skull of a Species of *Xiphodon*, Cuvier.

By WILLIAM HENRY FLOWER, F.R.S., F.Z.S., F.G.S., &c.

[Received November 16, 1875.]

(Plate I.)

The Hon. Auberon Herbert has lately presented to the Museum of the Royal College of Surgeons a fossil cranium which merits description, as in some measure assisting to fill up one of the still innumerable vacant spaces in the vast and complex history of living beings, a history gradually, slowly, but no less surely, being reconstructed by the united labours of explorers and palæontographers in all parts of the world.

In some respects, the specimen is provokingly unsatisfactory for the purpose, partly from its own incompleteness, but especially in the absence of certain knowledge as to its locality and geological antiquity. As it had passed through several hands before it came into Mr. Herbert's possession, there is no external history belonging to it, except a traditional statement that it was found in the neighbourhood of Woodbridge, in Suffolk.

At first little more was to be seen in it than an ovoid mass, nearly nine inches long, of dark grey, very compact, micaceous sandstone, with the surface smoothly rounded, and almost polished, evidently by the action of water. To a superficial observer it might have passed for a large rolled pebble; but closer examination showed that, besides having the general form of the head of an animal, the surface here and there presented darker patches, having a distinctly bony structure, which, from their situation and form, plainly revealed the general outline of the cranium within.

After a considerable amount of trouble, the closely adhering enveloping matrix was completely cleared away. The specimen was then shown to consist of the almost entire cranium (skull without lower jaw) of an animal of the size of a small sheep, with all its cavities and external depressions filled up with a matrix of the above-described sandstone, and then so rolled as to wear down some of the most prominent parts, as the zygomatic arch and, unfortunately the whole of the crowns of the teeth; for the palatal surface was exposed, smooth and polished, and the dental characters are only indicated by the alveoli or by roots worn down to the level of the surrounding bone. This is a very great loss, more especially as it is mainly by the form of the enamelled crowns of the teeth, generally

better preserved than any other part of the body, that extinct forms of the group to which this one is allied have been characterized. The anterior portion of the skull has also been broken off close to the premaxillary suture, and consequently is wanting in the specimen.

Before proceeding to the description of the skull, the question naturally arises—What inference can be drawn from the condition of the fossil and its matrix as to its probable origin? Several experienced palæontologists to whom it was shown while still partially imbedded, declared that they knew of no fossil remains in a corresponding condition; and on comparing it with all the Mammalian specimens from every part of the world, contained in the British Museum, not one was found agreeing with it.

It certainly approximates very nearly in most of its characters to the curious "box stones" of the Suffolk Crag, to which Mr. Ray Lankester directed attention in the 'Quarterly Journal of the Geological Society' for 1870 (p. 499), though less ferruginous in colour than they generally are. If this suggestion should prove to be correct, it will confirm the indication as to locality mentioned above. The "box stones" are evidently waterworn aggregations of sandstone, generally, though by no means invariably, surrounding some organic body, and are remnants of a broken-up formation of an earlier age than the Red Crag in which they are now found. They are considered by Mr. Lankester, from a comparison of the moluscous fossils found in them, to be of "Diestien" age, or approximately equivalent to the so-called "Black Crag" of Antwerp; but, as will be mentioned hereafter, the zoological characters of the present specimen indicate a much greater geological antiquity.

The skull is that of a rather young animal, as shown by the still open suture between the basioccipital and the basisphenoid bones; but (at least in the case of existing Ruminants) this sign of immaturity remains some time after all the permanent teeth are in place, as appears to have been the case in the present specimen.

The cranium differs most notably from that of all existing species of Ruminants in the breadth and flatness of the frontal region between the orbits, the sudden contraction behind the orbits, and the large extent of the temporal fossæ, which is increased by well-marked sagittal and occipital crests. *Hyomoschus* is that to which it comes nearest; indeed, if we could imagine a larger animal of the Traguline type (*i. e.* an animal with a more lengthened head, and greater surface for the implantation of teeth and for the attachment of muscles, without corresponding increase of size of the brain-cavity and orbits—the modifications, in fact, which always occur in larger, as compared with smaller, members of a natural group), we should obtain a form closely resembling the present skull. Its special peculiarity would still be the flatness and width of the interorbital region above, in consequence of which the cavities of the orbits look directly outwards, instead of upwards and outwards as in *Hyomoschus*.

The sides of the face in front of the orbits are flat, as in the Tragulidæ and in many true Ruminants, without any sign of depression for a suborbital gland; but further forward, commencing just be-

hind the large infraorbital foramen, is a wide and deep oval depression, extending over the whole of the region above the premolar teeth. Indications only of such a depression are seen in the Tragulidæ. There is no vacuity at the point of junction between the nasals, maxillæ, lachrymals and frontals, as in so many Cervidæ and Antelopes, and as is slightly indicated in *Hyomoschus*, though not in *Tragulus*. The sutures bounding the lachrymal bone, and between the maxilla and malar, are beautifully marked by deeply indented and wavy lines; but the premaxillary suture cannot be distinguished, being probably situated anteriorly to the point of fracture of the skull. The supraorbital foramina are not very large, and are placed in depressions rather nearer the middle line than the margin of the orbit, on a level with the anterior angle of that cavity; and, as in many existing Artiodactyles, a groove is continued forwards from them.

The posterior margin of the orbits, if, as is probable, they were originally complete, have been broken away, as has the entire zygomatic arch.

Turning to the base of the skull, the occipital condyles are lost; but the greater part of the basioccipital, with its pair of prominent tubercles, remains. On each side of this the oval form of the bases of the large auditory bullæ can be distinctly made out, though they have been worn level to the rest of the surface of the skull. Their interior, however, can be seen to be filled with a fine network of cancellar tissue—a character common to the Suidæ, Tragulidæ, and Camelidæ, and absent in nearly all the true Ruminants. On the lower surface of the skull, as well as above, the elongation of the middle region is a conspicuous feature.

The hinder margin of the palate is produced backwards to the extent of fully three quarters of an inch beyond the notches on each side; but as its edge has been broken off, it is impossible to describe its true form.

Between the teeth the surface is long, narrow, and depressed along the middle line. There is no sign, even at the anterior fractured edge, of the incisive foramina, which must consequently have been small; but there is a conspicuous foramen opening forwards near the outer edge of the palate opposite the second premolar tooth, and placed rather more posteriorly on the left than on the right side.

The alveoli, in most of which broken roots of teeth remain, form a continuous series along each side of the palate, as far forward as the line of fracture. Posteriorly they have been so much injured that their form and number cannot be made out with perfect certainty; but they appear to indicate teeth of the following character.

Beginning at the hinder end of the series, there are three molars, with four roots, wider transversely than from before backwards. The most anterior of the three must have been considerably smaller than the other two, which appear to have been nearly equal in size. In front of the molars there are seven roots, rounded or transversely elongated, placed in a single line, and nearly equidistant, indicating a series of compressed teeth, each with an anterior and a

posterior root. Unfortunately the region in which the posterior of these teeth is situated is most damaged, and its form cannot be clearly made out; but, judging from the analogy of *Cænotherium*, *Xiphodon*, and allied forms, we have here the whole premolar series, the last having two external, and one internal root, obliterated in the specimen, and each of the others two roots only. The canines would thus be the teeth next beyond the line of fracture; but they evidently could not have been large, or deeply implanted, as in *Tragulidæ*. Of the incisors, nothing can be said from actual knowledge; but all analogies of allied forms lead to the supposition that the complete number (three on each side) were present.

It is evident that the animal to which this cranium belonged was a member of that group of Artiodactyles in which the general form of the modern Ruminants was shadowed out, but in which the typical number of teeth (eleven on each side, above and below, in continuous series) was still maintained, a group largely represented in the North-American Miocene strata by *Oreodon* and its allies, and of which the elegant little *Cænotherium* is one of the best-known European forms.

It differs, however, considerably in general form and proportions from any of the former as figured by Leidy, especially in the absence of a suborbital fossa, and is readily distinguished from the latter by the want of the deep median notch in the hinder edge of the palate, and by the more compressed form of the premolars, as estimated by the size of the roots. I am unable, however, to point out any character by which to separate it from Cuvier's *Xiphodon*, constituted in the 'Ossemens fossiles' as a subgenus of *Anoplotherium*. From the type of that form, *X. gracilis* of the Paris Upper Eocene, it differs, as far as can be inferred from descriptions and figures, chiefly in superior size, being about one third larger.

Another form to which it is closely allied is known as a British fossil from the Upper Eocene of Hordwell Cliff, having been described by Professor Owen under the name of *Dichodon cuspidatus*\*.

This animal is known by the teeth alone; and it is singular that, as far as the comparison of the size and shape of the roots or alveolar walls will allow, there is no reason why the teeth of *Dichodon cuspidatus* should not have belonged to our present specimen. Although there is not yet evidence enough to be assured of their identity, and more perfect specimens of either may show that the idea is fallacious, I yet think it necessary to point out the possibility. But then there are grave doubts, as already expressed by Gervais †, whether *Dichodon* is really separable generically from *Xiphodon*. The main character on which the genus was founded, the peculiarity of the last lower premolar tooth, was, as the original describer himself subsequently pointed out, simply the result of a milk-tooth having been mistaken for a permanent one ‡. The British species attributed to the

\* Quarterly Journal of the Geological Society, vol. iv. 1848, p. 36.

† Zoologie et Paléontologie Française, 2<sup>m</sup>e edit. (1859), p. 159.

‡ Quarterly Journ. Geol. Soc. vol. xiii. (1857), p. 190.

genus *Dichobune* are also considered by Gervais to be more properly *Xiphodons*; so it is perfectly clear that a more careful comparison than has yet been made will be necessary to determine the claims of either to generic distinction.

Being always strongly opposed to the multiplication of generic designations without very adequate grounds, I shall be content in the present instance, to retain the Cuvierian name *Xiphodon*\*, and, in the absence of any certain evidence that it belongs to any of the previously described species, to distinguish it as *X. platyceps*.

It may be added that all the species with which it is most nearly related, found both in England and France, belong to the Upper Eocene epoch, or "proëcene" of Gervais.

The principal dimensions of the cranium are as follows:—

	inches.	centim.
Length, in its mutilated state . . . . .	8·2	20·8
(About 9 inches if perfect.)		
From anterior margin of orbit to occipital crest . . . . .	5·3	13·5
From anterior margin of orbit to infraorbital foramen . . . . .	1·5	3·8
Breadth of upper surface of skull between orbits . . . . .	2·8	7·2
Greatest parietal breadth . . . . .	2·4	6·1
Breadth at anterior part of temporal fossa . . . . .	1·8	4·6
Height of skull (between frontal region and hinder part of palate) . . . . .	2·6	6·6
Height of orbit . . . . .	1·3	3·3
Length of molar and premolar series . . . . .	3·7	9·5
Breadth of palate between posterior molars	9	2·3
„ „ between middle premolars	1·1	2·8

2. On a New Ziphioid Whale. By JULIUS VON HAAST, Ph.D., F.R.S., Director of the Canterbury Museum, Christchurch, New Zealand. Communicated by Prof. W. H. FLOWER, F.R.S.

[Received November 16, 1875.]

In the month of May of this year the Canterbury Museum received from W. Hood, Esq., of the Chatham Islands, three skulls of Ziphioid Whales taken from specimens stranded with about 25 others during the summer of last year on the Waitangi beach of the main island of that group.

They were described as "blackfish," all belonging to the same school, by my informant, who moreover believes that the whole series belonged to the same species.

\* Not, however, as a subgenus of *Anoplotherium*, from which it is perfectly distinct.

Unfortunately the skulls were so badly separated from the body that the occipital portion has been cut off, so as to lay the brain-cavity open; but as they were brought over with the greater portion of the skin still attached, some hitherto unknown and, as I think, peculiar characteristic features in the dentition of a Ziphioid genus have fortunately been preserved.

These three skulls accord in many respects with the genus *Mesoplodon* of Gervais, of which I will point out only one, viz. that they possess one tooth in each ramus of the lower jaw opposite the posterior edge of the symphysis, and of varying size and shape, either hidden below the gum or rising conspicuously above, according to age and sex. They differ, however, from all known species of the genus by possessing in the upper jaw, starting in a vertical line above the posterior border of the mandibular tooth, a series of small conical teeth slightly incurved, which extends to near the gape of the mouth.

I may here at once observe that these teeth are neither rudimentary nor are they confined to young animals, because, as I shall show in the sequel, these three skulls are derived from individuals of different ages, of which one is an aged (male?) animal, in which the row of teeth is best developed. It is thus evident that this series of teeth is a functional portion of the animal, and is constant and necessary for its proper nourishment, some of them being broken off, others evidently worn down from use. That these small teeth, of which the largest stands scarcely half an inch above the gums, are only rooted in the gums, does not lessen their value as a specific character of some importance.

Of the species of Ziphioid Whales inhabiting the New-Zealand seas I have obtained three, namely *Berardius arnouwii* (3 specimens), *Ziphius novæ zealandiæ*, and *Mesoplodon floweri* (Haast, MS.), none of which shows the least sign or rudiments of teeth in the upper jaw. Moreover several others have been secured in New Zealand and Australia; but nowhere can I find that, except the teeth in the lower jaw, they possessed any; and I have looked carefully over all the different papers on the Ziphioid Whales of the northern hemisphere to which I had access, without finding the slightest mention made of the occurrence of such a peculiar feature in their dentition.

On the contrary, Professor Flower in his excellent paper on the recent Ziphioid Whales (Trans. Zool. Soc. vol. viii. part 3), when enumerating their principal structural characters, begins by stating that they have "no functional teeth in the upper jaw." I believe that this term functional is rather ambiguous and can scarcely be applied to the genus under consideration, as we are totally unacquainted with the food on which it subsists, or the manner in which the same is obtained.

It is true, these teeth do not grow from alveolar grooves in the maxillaries, but only from a groove in the gums, and have their roots implanted therein; nevertheless I have no doubt that they are always present and do perform as distinct and important functions as those of *Kogia* or any of the Dolphins which possess teeth of similar form.

The first of the accompanying photographs shows the three skulls in comparison with each other; the second the middle portion of the second skull, belonging to an aged (male?) individual; whilst the following list gives the principal dimensions of these three skulls with the soft parts attached, as far as they could be ascertained; but as soon as they are macerated I shall offer some further observations on their anatomical structure.

*Table of Measurements of three Skulls of Mesoplodon Grayi, with the greater portion of soft parts adhering.*

	Skull I., probably female (full- grown).	Skull II., probably male (aged).	Skull III., probably male (young).
	ft. in.	ft. in.	ft. in.
Height of Skull from top of nasals (skin preserved) to lower border of pterygoids, the latter lying exposed...	0 11·13	0 11·38	0 9·12
Greatest breadth of skull across post-orbital processes of frontals.....	1 0·48	1 0·88	9·51
Length of skull from crest of nasal bones to anterior border of rostrum, in a straight line .....	2 5·46	2 3·47	1 5·07
Length of ramus of lower jaw, soft parts preserved on anterior border .....	2 7·52	2 6·03	1 7·75
From gape* of mouth to anterior border of lower jaw .....	1 6·50	1 4·87	10·05
From anterior border of lower jaw to centre of tooth .....	10·75	10·12	5·00
From centre of tooth to gape of mouth.	7·75	6·75	5·05
Breadth of lower jaw at centre of tooth .....	2·31	2·69	1·75
Distance from extremity of rostrum to first anterior tooth .....	11·06	10·75	5·62
Distance from gape to end of teeth ...	1·02	1·37	1·40
Eye, perpendicular diameter, about ...	2·25	2·27	
Opening of blower, the two extremities slightly directed backwards, about...	4·50	4·50	3·25
Number of teeth in upper jaw .....	19	17	17

I should have liked to give also in this list the breadth of the rostrum at the anteorbital notches, as it would have supplied another important point for comparison; but the coverings prevented this; also I was not able to give the total length of each skull, owing to the occipital portion being cut off; but the length of the skulls from crest of nasals to anterior border of the rostrum, as well as the length of the ramus of each mandible, will supply this deficiency and offer us sufficient material for comparison.

\* The drying of the skin has been so unequal in the different specimens, and even on the two sides of the same skull, that the position of the gape cannot be fixed with precision.

Examining the skulls separately, we find that the one marked No. 1 is longer but narrower than No. 2. This is still more striking when we compare the two rostrums with each other, that of skull No. 1 being considerably narrower than that of skull No. 2. The same observation applies to the mandibles, which in No. 1 only widen very gradually and are much narrower all along than those of skull No. 2. In fact, if both skulls had been obtained separately I believe that they would probably have been assigned to two distinct species.



- a.* Side view of upper and lower jaws, covered with the dried skin, of No. 2 (aged male?), showing the row of small teeth above and the single large mandibular tooth. From a photograph.
- b.* Four of the upper teeth, with the whole of their roots exposed; natural size.

When the skull No. 1 was first examined by me, the sharp point of a tooth in each ramus of the lower jaw, when passing the finger over the gums, was discernible; but I doubt if this was to be felt before the gums were dried up.

In cutting a portion of the gums away, the apex of a very flat tooth, rather acutely triangular as far as visible, was exposed, which stands about one eighth of an inch above the upper surface of the ramus. This tooth is imbedded in a very narrow alveolar cavity situated near the posterior edge of the symphysis, the ramus here scarcely bulging out; this is still more obvious if we compare that portion of the ramus with that of skulls Nos. 2 & 3.

Above the posterior edge of the small tooth in the lower jaw, and which without doubt has to perform some function, notwithstanding that it is covered by the gum, a row of small conical teeth, the apices slightly incurved, begins on each side of the upper jaw, reaching within an inch of the gape of the mouth, which, however, may have somewhat retreated by the drying of the skin.

These small teeth are situated in a well-defined dental groove in the gums. There were 19 teeth on each side, of which, however, several are broken off. They are from 0·20 to 0·40 inch long, and occupied a line 6·12 inches in length, standing nearly the eighth of an inch apart. Of the whole series, the first or anterior tooth is the smallest, the succeeding ones gradually getting larger till the eighth, and then maintaining the same size to nearly their termination.

The crowns of the teeth stand at about the same level with the central line of the palate. The opening along the upper surface of the rostrum is still unclosed, thus showing that the animal is not so aged as the next specimen, No. 2.

I may here add that the rostrum in all three skulls is half an inch shorter than the mandible, and that it lies in a well-defined groove in the latter.

*Skull No. 2.*—The measurements of this skull, as far as I was able to obtain them, show that, as previously stated, it was not so elongate as the former, but somewhat broader and more massive in all its proportions. The rami of the mandible widen much sooner than those of the former; about 7 inches from their anterior extremity they expand considerably in order to form the alveolar cavity for a large tooth which here rises conspicuously on both sides, having a vertical position. This tooth has a compressed triangular shape, is  $2\frac{1}{5}$  inches broad at its base on the line of the gums, and rises  $1\frac{3}{4}$  inch above them.

On the inner side near the top it is slightly abraded, and on the outside broken considerably, so as to suggest that the animal used it for the purpose of defence or attack. This injury has taken place on both teeth, so that they have lost their point and show a ragged horizontal apex with a width of nearly a quarter of an inch.

From behind the tooth the rami expand very little as far as the gape.

A similar row of small teeth, described as occurring in the first specimen, exists also in this second skull; but there are apparently only 17 of them. Their position is exactly the same as in the foregoing, the first standing exactly above the posterior edge of the base of the large tooth in the lower jaw.

The teeth have the same form as those previously described, except that they are generally thicker; this becomes conspicuous with the 7th tooth, after which they gradually increase to the 13th, which is  $\frac{1}{3}$  of an inch thick at its base and stands 0.45 inch above the gums. They then keep nearly the same size to the posterior end of the series.

As the space on which these 17 teeth stand is only 4.25 inches long, besides their greater stoutness they are far more crowded than in the first-described skull.

Owing to the fact that the gums have dried more thoroughly in this than in the two other skulls, in both of which the teeth stand erect with the curve of the apex directed inwards, the teeth in this skull are no longer in their normal position, but lie somewhat forwards on the palate.

The groove in the upper surface of the rostrum, between the pre-maxillaries, is filled by a convex ridge of dense bone with a small channel on each side. That this is only caused by age, and that it is neither a sexual nor a specific character, is proved by the fact that the next skull, No. 3, which is doubtless a young half-grown specimen of the same sex as the one under review, has this groove on the top of the rostrum still open, and thus resembles the skull No. 1, although in the latter that groove is narrower and more shallow.

*Skull No. 3.*—Assuming that the last-described skull belongs to

an aged male, the measurements of the third skull under consideration must lead us to the conclusion that it is that of a young half-grown male. Beginning with the lower jaw, the same form as in the foregoing is observable, the rami expanding considerably as soon as we reach the neighbourhood of the alveolar cavity; and although the tooth in the same is only small, and stands only 0·25 inch above the edge of the ramus, that alveolar cavity is much more bulged out and has a different form from the first (or female?) skull described. The apex of the tooth was distinctly visible, and seemed to have already pierced the gums when the animal was alive.

The row of teeth in the upper jaw, however, which have the same form as in the skull No. 2, are smaller and somewhat more slender. They begin likewise above the posterior end of the alveolar cavity.

There are, as in the preceding skull, 17 teeth on each side, occupying a length of 2·48 inches. They stand more closely together than in the supposed female skull No. 1, thus also agreeing with the second skull in that respect.

In volume vi. of the Transactions of the New-Zealand Institute, Dr. Hector describes the lower jaw of a Ziphioid Whale under the title "Notice of a variation in the dentition of *Mesoplodon hectori*, Gray."

It is difficult for me to conceive by what process the tooth in the lower jaw which, in *Mesoplodon hectori*, stands at the anterior end of the ramus, could have travelled as far backwards as to stand now opposite the posterior edge of the symphysis. Hitherto I have believed that the position of the mandibular teeth was constant and a valuable specific character—an opinion which, as far as I am aware, is held by the most eminent cetologists, and which the observations I was able to make on the three skulls under review amply confirms. Moreover I wish to add that a comparison of these three skulls with the skull of *Mesoplodon hectori*, Gray, in the Canterbury Museum, and which is derived from an aged specimen, shows at a glance the distinct specific characters.

We are only at the beginning of the study of our Ziphioid Whales; and I have no doubt that year by year new material will come to hand; so that by the lumping of two distinct species into one, as attempted by Dr. Hector, and for which no tangible reason can be assigned, only confusion will be created.

The occurrence of hidden teeth in the gums of *Ziphius australis*, Burmeister, of which he gives a careful description in his exhaustive paper, "Descripcion detallada del *Epidodon australe*" in the 'Anales del Museo publico de Buenos Ayres,' part v. page 328, is a point of great interest. On first thought, one might assume that that specimen was so young that the teeth had not yet pierced the gums, and that animals belonging to that species when full-grown would be possessed of a row of teeth in each jaw resembling those of *Mesoplodon grayi*. However, two (and what I think fatal) objections have to be urged against such a theory.

The skull of No. 3 belongs doubtless to a younger specimen than



PLATE 1876. 111



J. Smal, del et hila

LEUCOPHEA NEMPHES

1876. 111

*Ziphius australis*; nevertheless the row of teeth standing above the gums was perfectly formed; and, secondly, the specimen of *Ziphius novæ zealandiæ*, of which the Canterbury Museum possesses a complete skeleton, was an aged female and obtained in the flesh, but did not show the least trace of any row of small teeth above the gums.

I have examined carefully the gums of the new species in both jaws, where no teeth were visible, but without the least success, no hidden teeth being in existence anywhere.

Finally I propose to designate this new Cetacean by the specific name of *grayi* in memory of the late Dr. J. E. Gray, to whom New Zealand is so much indebted for his contributions towards the better knowledge of its natural history.

#### Conclusion.

In summing up the evidence which the three skulls under review present to us, the following points may be accepted as fully established:—

1st. That there exists a Ziphioid Whale in the New-Zealand seas which possesses a mandibular tooth at the posterior edge of the symphysis, either hidden below the gum or standing conspicuously above it, according to age or sex.

2nd. That the skull of one of the sexes (probably the female) is longer but narrower and lower than that of the opposite (probably the male) sex—the latter possessing also a large triangular compressed tooth rising above the gum, which in the other (probably female) sex is much smaller and almost hidden below the gum.

3rd. That both sexes possess permanently in the upper jaw a row of small conical teeth with the apex slightly incurved, which, although only rooted in the gums, have to perform important functions in the nourishing-process of the animal.

### 3. On some additional Species of Birds from St. Lucia, West Indies. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received November 30, 1875.]

#### (Plate II.)

The Rev. J. E. Semper, of St. Lucia, who has already done so much to make us acquainted with the ornithology of that island, has lately forwarded to me a third collection of birds, which I have now the pleasure of exhibiting. It contains examples of eight species not included in my two former articles on this subject\*, and among them two specimens of a very remarkable form, which

\* P. Z. S. 1871, p. 263, and 1872, p. 647.

appears to be referable to a new genus of Mniotiltidæ. The following is a list of the species, with the local names as given by Mr. Semper :—

1. *Thryothorus mesoleucus*, sp. nov. Local name "Rossignol."
2. *Leucopeza semperi*, sp. et gen. nov. Local name, "Pied-blanc."
3. *Setophaga ruticilla* (Linn.). Local name, "Carrougette."
4. *Progne dominicensis* (Gm.). Local name, "White-breasted Swallow."
5. *Euphonia flavifrons* (Sparrm.). Local name, "Moisson à couleurs."
6. *Phonipara bicolor* (Linn.). Local name, "Grass-sparrow."
7. *Ægialitis semipalmata* (Bp.) Local name, "Bécasse à collier."
8. *Tringa fuscicollis* (Vieill.). Local name, "Bécasse."

I append descriptions of the two new species.

**THRYOTHORUS MESOLEUCUS, sp. nov.**

*Supra terreno-brunneus, alis caudaque nigro transfasciatis, uropygii plumis laxis, albo sub apicem punctatis: subtus pure albus hypochondriis et crisso fulvis, hoc indistincte nigro maculato: rostro superiore corneo, inferiore albicante, pedibus fuscis: long. tota 4·0, alæ 2·0, caudæ 1·5, rostri a rictu '8.*

*Hab.* ins. St. Lucia Antillarum (*Semper*).

*Mus.* P. L. S.

*Obs.* Minor statura quam *T. martinicensis*, et rostro longiore tenuiore et magis incurvo: quoad colores abdomine albo satis diversus.

**LEUCOPEZA SEMPERI, gen. et sp. nov. (Plate II.)**

*Leucopeza\**, gen. nov. ex familia Mniotiltidarum, ad Helmintherum, Helminthophagam et hujusmodi genera spectans, rostro fere simili, sed alis rotundatis, remige tertio et quarto longissimis, secundo quintum æquante, primo quam sextus paulo brevior distinguendum. Ptilosis fere unicolor, cineracea, immaculata. Pedes fortes. Tarsi elongati. Cauda paulum rotundata.

**LEUCOPEZA SEMPERI, sp. nov. (Plate II.)**

*Cineraceus unicolor, dorso postico in olivaceum trahente, subtus pallidior, medialiter albescens, ventre medio fere pure albo: rostro corneo, pedibus albis: long. tota 5·7, alæ 2·7, caudæ 2·2, tarsi 0·9, rostri a rictu 0·8.*

*Hab.* ins. St. Lucia Antillarum (*Semper*).

*Mus.* P. L. S.

\* Λευκός, albus, et πῆζα, pes—ex nomine vulgari "Pied-blanc."





J. Smit del. et lith

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THAMNOPHILUS MELANCHROUS.

4. Note on the Spoonbill of the Argentine Republic. By  
W. H. HUDSON, C.M.Z.S.

[Received November 17, 1875.]

It has been said that Spoonbills "obtain their food by shovelling in the mud with their beaks." This is perhaps true of the European bird; the Spoonbills which I have observed feeding certainly obtained their food exclusively from the water, as Flamingoes do.

In reference to the Rose-coloured Spoonbills of America, I believe ornithologists have been mistaken in referring them all to one species.

Whether two or only one species existed was a moot question a century ago: it has been decided that there is but one, the *Platalea ajaja*, and that the paler-plumaged birds, with feathered heads and black eyes, and without the bright wing-spots, the tuft on the breast, horny excrescences on the beak, and other marks, are only immature birds. Now it is quite possible the young of *P. ajaja* resembles the common Rose-coloured Spoonbill of Buenos Ayres; but in that country, for one bird with all the characteristic marks of an adult *P. ajaja*, we meet with not less, I am sure, than two or three hundred examples of the paler bird without any trace of such marks.

This fact of itself might incline one to believe that there two distinct species, and that the common *Platalea* of Buenos Ayres inhabits the temperate regions south of the range of the true *P. ajaja*.

Other facts confirm me in that opinion. A common Spoonbill was kept tame by a friend of mine seven years, at the end of which time it died without having acquired any of the distinguishing marks of *P. ajaja*.

I have dissected three examples of the latter species, and observed in them the curiously formed trachea recently described by Mr. Garrod\*. I have shot perhaps a hundred specimens of the common bird; for they are extremely abundant with us. Of these I have opened about thirty, but in none of them did I find this form of trachea. I am therefore convinced that we have two distinct species of rose-coloured Spoonbill, inhabiting different portions of the continent.

5. On Peruvian Birds collected by Mr. Whitely. By P. L.  
SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN,  
M.A., F.R.S.—Part IX.†

[Received December 8, 1875.]

(Plate III.)

The ninth collection of Mr. Whitely's Peruvian birds, now before us, has been formed in the same district of High Peru as the last was. It contains examples of sixty-five species.

\* P. Z. S. 1875, p. 297.

† For Part VIII. see P. Z. S. 1874, p. 677.

Maramora, Potrero, and Huiro are villages in the valley of Santa Anna, north of Cuzco, at elevations of 4000, 4500, and 4800 feet respectively. The other localities have been mentioned in our previous papers on this subject.

The following is a complete list of the species:—

	Nom. Av. Neotr.	Localities.
	page	
1. <i>Parula pitiayumi</i> (Vieill.) .....	8	Huiro.
2. <i>Geothlypis velata</i> (Vieill.) .....	10	Huiro, Maranura.
3. <i>Setophaga verticalis</i> , Lafr. et d'Orb. ....	10	Huiro, Potrero.
4. <i>Vireosylvia olivacea</i> (Linn.) .....	11	Maranura, Huiro.
5. <i>Atticora cyanoleuca</i> (Vieill.) .....	14	Maranura.
*6. <i>Conirostrum</i> , sp. inc. ....	...	Maranura.
*7. <i>Euphonia</i> , sp. inc. ♀ .....	...	Maranura.
8. <i>Tanagra caelestis</i> , Spix.....	21	Huiro, Potrero.
9. — <i>olivina</i> , Scl. ....	21	Maranura.
10. — <i>darwini</i> , Bp. ....	21	Paucartambo.
11. <i>Ramphocelus atrosericeus</i> , Lafr. et d'Orb.	21	Maranura, Potrero.
12. <i>Tachyphonus melaleucus</i> (Sparrm.).....	23	Maranura, Huiro, Potrero.
13. <i>Saltator magnus</i> (Gm.).....	26	Huiro.
14. <i>Orchesticus ater</i> (Gm.).....	26	Potrero, Huiro.
15. <i>Spermophila gutturalis</i> (Licht.) .....	28	Maranura.
16. <i>Coryphospingus cristatus</i> (Gm.) .....	30	Potrero.
17. <i>Phrygilus atriceps</i> (Lafr. et d'Orb.).....	31	Paucartambo.
18. — <i>fruticeti</i> (Kittl.) .....	31	Paucartambo.
19. <i>Poospiza cesar</i> , Scl. and Salv.....	30	Paucartambo.
20. <i>Ostinops atrovirens</i> (Lafr. et d'Orb.) .....	35	Huiro.
21. <i>Dolichonyx orizivora</i> (Linn.) .....	37	Paucartambo.
22. <i>Cyanocorax incas</i> (Bodd.) .....	39	Huiro.
23. <i>Muscisaxicola rubricapilla</i> (Ph. et Landb.)	44	Tinta.
24. — <i>fluvialis</i> , Scl. et Salv. ....	44	Potrero.
25. <i>Todirostrum cinereum</i> (Linn.).....	45	Maranura, Potrero.
26. <i>Euscarthmus wuchereri</i> , Scl. et Salv. ....	45	Maranura.
27. <i>Elainea pagana</i> (Licht.) .....	48	Maranura.
28. — <i>gigas</i> , Scl.....	48	
29. — <i>albiceps</i> (Lafr. et d'Orb.) .....	48	Huiro, Maranura, Potrero.
*30. — <i>placens</i> , Scl.....	48	Maranura.
31. — <i>obscura</i> (Lafr. et d'Orb.).....	49	Huiro.
*32. <i>Sublegatus griseocularis</i> .....	...	Maranura.
33. <i>Myiozetetes cayennensis</i> (Linn.) .....	49	Huiro.
34. <i>Myiodynastes chrysocephalus</i> (Tsch.) .....	50	Huiro.
35. <i>Myiobius naevius</i> (Bodd.).....	51	Potrero.
36. <i>Myiarchus erythrocerus</i> , Scl. ....	52	Maranura.
37. <i>Tyrannus melancholicus</i> , Vieill. ....	53	Huiro.
38. <i>Placellodomus striaticeps</i> (Lafr. et d'Orb.)	65	Paucartambo.
*39. <i>Thamnophilus melanchrous</i> , sp. nov. ....	...	Huiro, 4800 feet.
40. — <i>radiatus</i> , Vieill. ....	70	Huiro, Maranura.
41. <i>Formicivora rufatra</i> (Lafr. et d'Orb.) ...	72	Maranura.
42. <i>Phaethornis guyi</i> (Less.) .....	78	Huiro.
43. <i>Panoplitus matthewsi</i> (Bourc.).....	83	Huiro.
44. <i>Acestrura mulsanti</i> (Bourc.) .....	85	Huiro.
45. <i>Steganura adde</i> (Bourc.).....	86	Huiro.
*46. <i>Eupetomena hirundo</i> , Gould. ....	...	Huiro.

	Nom. Av. Neotr.	Localities.
	page	
47. <i>Leucippus chionogaster</i> (Tsch.) .....	91	Huiro.
48. <i>Chlorostilbon prasinus</i> (Less.) .....	94	Huiro.
49. <i>Crotophaga ani</i> , Linn. ....	107	Maranura, Potrero.
50. <i>Diplopterus nævius</i> (Gm.) .....	107	Maranura.
51. <i>Piaya cayana</i> (Linn.) .....	108	Huiro.
*52. <i>Bolborhynchus andicola</i> (Finsch) .....	...	Paucartambo.
53. <i>Tinnunculus sparverius</i> (Linn.) .....	121	Maranura, Potrero.
54. <i>Phalacrocorax brasilianus</i> (Gm.) .....	124	Laguna de Tungasuca.
55. <i>Querquedula cyanoptera</i> (Vieill.) .....	129	Laguna de Tungasuca.
56. <i>Dafila spinicauda</i> (Vieill.) .....	130	Laguna de Tungasuca.
57. <i>Spatula platalea</i> (Vieill.) .....	130	Laguna de Tungasuca.
*58. <i>Columba albipennis</i> , sp. nov. ....	...	Paucartambo.
59. — <i>rufina</i> (Temm.) .....	132	Maranura.
60. <i>Metriopelia melanoptera</i> (Mol.) .....	132	Tinta.
61. <i>Chamæpelia griscola</i> (Spix) .....	133	Maranura.
62. <i>Leptoptila ochroptera</i> , Pelz. ....	133	Potrero, Huiro.
*63. <i>Gallinago andina</i> , Tacz. ....	...	Tinta.
64. <i>Podiceps caliparæus</i> , Lesson. ....	150	Laguna de Tungasuca.
65. — <i>rollandi</i> , Q. et G. ....	150	Laguna de Tungasuca.

6. CONIROSTRUM, sp. inc.

A single skin of what is probably the female of a new *Conirostrum*, allied to *C. albifrons* or possibly of a new *Dacnis*.

7. EUPHONIA, sp. inc.

Two skins of the female of a thick-billed *Euphonia* of the group allied to *E. violacea*, probably of *E. lanirostris* (Lafr. et d'Orb.).

30. ELAINEA PLACENS, Sclater.

This brings the range of this species down to Peru. We have compared skins from Mexico, Guatemala, Veragua, Panama, Bogota, and Ecuador. The last-named (*E. implacens*, Sclater, olim) agree with the Peruvian in being rather darker on the back; but a Bogota skin is barely different in this respect from Sclater's Mexican type.

32. SUBLEGATUS GRISEOCULARIS.

This Tyrant bird, of which Mr. Whitely sends a pair from Maranura, is very closely allied to the Venezuelan *S. glaber*, but is recognizable by its shorter smaller bill, shorter crest, and the paler colour of the back. Sclater's collection contains a single immature example of the same form from Mendoza (*Weisshaupt*), labelled "*Elainea griseocularis*, Landbeck;" and there is a second skin from the same source in Salvin and Godman's collection. Whether this name has ever been published or not we are not sure; but we adopt it as a designation of this allied species, which is generally of the same form as its northern congener.

## 39. THAMNOPHILUS MELANCHROUS, sp. nov. (Plate III.)

*Ater; interscapulii macula magna, campterio et tectricum marginibus albis: ventre lineis quibusdam et marginibus angustis albis variegato: cauda nigra, rectricum trium lateralium apicibus et macula in rectricis utrinque extimæ pogonio externo medio albis: rostro et pedibus nigris: long. tota 6·0, alæ 2·8, caudæ rectr. med. 2·4, ext. 2·1.*

*Hab.* Peruvia alta propè Huiro (*Whitely*).

*Ob.* Species quoad formam et colores *Thamnophilo aspersiventri* maximè affinis, sed ventre nigro diversa.

46. EUPETOMENA HIRUNDO, Gould, Ann. N. H. ser. 4, vol. xvi. p. 370 (1875).

Mr. Whitely sends the following notes on this interesting new discovery:—

“I found these birds at Huiro in the valley of Santa Ana, at an elevation of 4800 feet; they rarely approach a flower, but appear to take their food hawking about in the air, in the manner of Swallows—in fact, at first sight might be easily mistaken for such birds. Length  $6\frac{7}{8}$  inches, bill 1 inch, wing 3 inches; eyes and bill black; legs, toes, and claws black.”

## 52. BOLBORHYNCHUS ANDICOLA (Finsch).

*Psittacula andicola*, Finsch, P. Z. S. 1874, p. 90; Scl. et Salv. P. Z. S. 1874, p. 679.

A third example of this little Parrot from Paucartambo. On the whole we think this species better referred to the genus *Bolborhynchus*, being unquestionably allied to *B. orbignesi*.

## 58. COLUMBA ALBIPENNIS, sp. nov.

*Columba maculosa*, Scl. et Salv. P. Z. S. 1869, p. 600.

*Supra fuscescens, capite et collo postico vinaceo lavatis: dorso postico et tectricibus supracaudalibus columbino-griseis: tectricibus alarum minoribus albido terminatis, tectricibus majoribus albo late terminatis, fusciam alarem distincta formantibus: alis fusco-nigris: cauda fusco-grisea, fascia lata terminali nigra: subtus griseo-cærulea, collo antico (nisi in gula) et pectore vinaceo indutis: alis subtus pallide columbino-griseis: rostro nigro, basi flavido, pedibus rubris: long. tot. 14·5, alæ 9·0, caudæ 5·0, rostri a rictu 1·1, tarsi 1·2.*

*Hab.* Peruvia alta, Pitumarca (*Whitely*); Bolivia (*D. Forbes*).

*Obs.* Sp. *C. maculosæ* affinis, sed fascia alari alba, corpore subtus grisescentiore et pagina alarum inferiore pallidiore grisea distinguenda.

This species, though closely allied to *Columba maculosa*, appears to take its place in Bolivia and Peru, from both of which countries we possess specimens. The true *C. maculosa* is found further south; we have specimens of it from Mendoza (*Weisshaupt*), and from the Rio Negro, where Mr. Hudson obtained it. [Cf. P. Z. S. 1872, p. 545.]

## 63. GALLINAGO ANDINA, Tacz.

*Gallinago frenata*, ScL and Salv. P. Z. S. 1869, p. 156.

*G. andina*, Tacz. P. Z. S. 1874, p. 561.

Having compared one of Mr. Whitely's skins with M. Taczanowski's typical specimens, we find them to be identical, and, moreover, that the bird we attributed in a former paper to the common *G. frenata* of Eastern South America really belongs to a distinct species, as shown by M. Taczanowski. Without placing much stress upon differences of coloration (a variable and unsatisfactory character in the Snipes), the shortness of the tarsi in *G. andina* at once shows its distinctness from *G. frenata*. The other dimensions are nearly the same in the two species: the bills appear to be shorter in *G. andina*; but upon this character no value can be placed. Mr. Whitely (P. Z. S. 1869, p. 156) says that "the legs and toes are brownish flesh-colour," *i. e.* in life. In the skin they are much paler than those of *G. frenata*; so that possibly a distinction here exists between the two birds.

6. Notes on some Fijian Birds, including Description of a new Genus and Species. By OTTO FINSCH, Ph.D., C.M.Z.S., &c.

[Received December 8, 1875.]

The Museum Godeffroy at Hamburg has received a small collection of birds from Mr. Theodor Kleinschmidt, of Ovalau, upon which I beg leave to make a few remarks. I have also the pleasure of describing a curious new Malurine form, which offers a very interesting addition to the avifauna of the Fijis and Central Polynesia.

## HALCYON SACRA, Gm.

One specimen with the blue of the head surrounded by a band of bright buff; the nuchal collar, sides of vent and flanks, the under wing- and tail-coverts also strongly tinged with buff. Apparently a young bird, agreeing with our descriptions (Finsch & Hartl. 'Orn. Centr.-Polyn.' p. 34, "jüngerer Vögel von Viti") and that of the "young" by Sharpe (Kingf. pl. 85).

## COLLOCALIA SPODIOPYGIA, Peale.

Two specimens, agreeing in every respect with specimens from the Navigators' (Upolu).

## MYZOMELA JUGULARIS, Peale.

An old male in full plumage; rump and upper tail-coverts scarlet; throat and crop pale orange, remainder of underparts yellowish.

## DRYMOCHÆRA, gen. nov.

(δρυμὸς, *sylva*; χαίρω, *gaudeo*.)

The systematic position of this new and curious Malurine form is between *Camaroptera* and *Orthotomus*. The former has a much

shorter, rounded tail; *Orthotomus*, on the contrary, has a cuneate tail, whereas in this genus the tail is only graduated. The wings are a little longer and less rounded than in *Orthotomus*, the fifth and sixth quills being the longest, the fourth and seventh scarcely shorter, the first considerably shortened, half of the fifth; the bill is straight, attenuated and subulate, a little more robust than in *Orthotomus*, as are likewise the legs and feet.

*DRYMOCHÆRA BADICEPS*, sp. nov.

Upper parts olive-brown, tinged with reddish brown on the rump and upper tail-coverts; head above to the nape chestnut-reddish; a narrow greyish superciliary stripe, extending to the temporal region, and bordered below by a narrow dark line, which runs from the lores through the eyes; quills and tail dark olive-brown; under parts, from chin to the middle of vent white; sides of head, neck, and breast washed with brownish-grey, remainder of underparts pale earthy brown; bill dark brown; feet pale brown.

al.	caud.	rect. ext.	culm.	rict.	tars.	dig. med.
23'''	22'''	17'''	5½'''	8'''	9½'''	6'''

Mr. Kleinschmidt discovered this remarkable little bird during an expedition into the interior of Viti-Levu, but could obtain only a single specimen.

*MYIOLESTES NIGROGULARIS*, Layard.

*Lalage! nigrogularis*, Layard, P. Z. S. 1875, p. 149.

Mr. Layard has described this interesting bird wrongly as a *Lalage*: it is a typical *Myiolestes*, agreeing in its generic characters with our *M. heinei* (H. & F., P. Z. S. 1869, p. 546) from Tongatabu. Mr. Layard, strangely enough, does not mention this characteristic bird in his last paper on Fijian birds (P. Z. S. 1875, p. 423).

Mr. Kleinschmidt obtained but one specimen of this species at Ovalau.

*RHIPIDURA ALBOGULARIS*, Layard (*nec* Less.).

One specimen, agreeing very well with Mr. Layard's description (P. Z. S. 1875, pp. 29, 434). This is a very excellent and peculiar species, not to be confounded with any of its allies.

*MYIAGRA CASTANEIVENTRIS*, Verr.

One old male as figured (F. & H. Orn. Centr.-Pol. t. ix. f. 2), and corresponding in every respect with specimens from the Navigators' Islands.

7. On the *Cæcum Coli* of the Capybara (*Hydrochærus capybara*). By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

[Received December 9, 1875.]

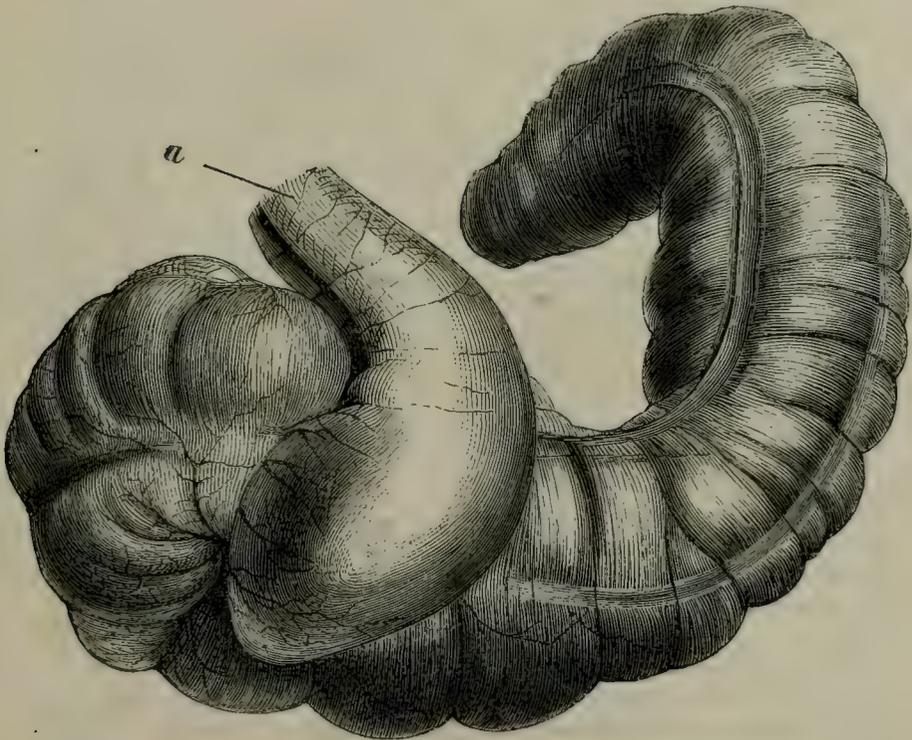
In no work on anatomy with which I am acquainted can I find any reference to the peculiarities of the *cæcum coli* of the Capybara,

which are but an extreme exaggeration of those observed in many of the allied forms.

In most of those mammals in which a cæcum is present, that organ is simply a direct continuation backwards of the colon beyond the place of junction of the small and large intestines. In some Rodents, however, this is not the case, the sacculated cæcum in them not being a direct continuation of the larger gut, but a lateral diverticulum from a true but simple cæcum.

In his account of the anatomy of *Capromys furnieri*\*, Prof. Owen remarks that the arrangement at the ilio-colic junction is such that "the two orifices of the blind intestine [that into the ileum and that into the colon] are analogous to the cardia and pylorus of the stomach;" and in his 'Anatomy of Vertebrates'† the same illustrious

Fig. 1.



Sacculated and simple cæca of the Capybara. The continuation of the colon is seen at *a*. The small intestine at its termination cannot be seen, being hidden in the proximal angular bend of the sacculated cæcum.

author tells us, with reference to the same animal, that "the cæcum is marked off from the colon by a valvular structure, similar to that at the end of the ileum." This is an approximation to the condition which obtains in the animal under consideration.

In the Capybara the small intestine enters the enormous saccu-

\* P. Z. S. 1832, p. 70.

† Vol. iii. p. 425.

lated cæcum at about an inch from its open extremity, and its relations to it are not in any way peculiar. The sacculated cæcum is nearly two feet long, and is traversed by four longitudinal bands. At its open end, which is an inch beyond (that is, further from the cæcal extremity than) the ileo-cæcal valve, it is constricted by a circular sphincter muscle, which forms the orifice of communication with the rest of the cylindrical large intestine. The colic surface of this sphincter is situated *in the side of the colon*, three inches from the blind extremity of a true, simple, thick-walled, slightly pyriform

Fig. 2.

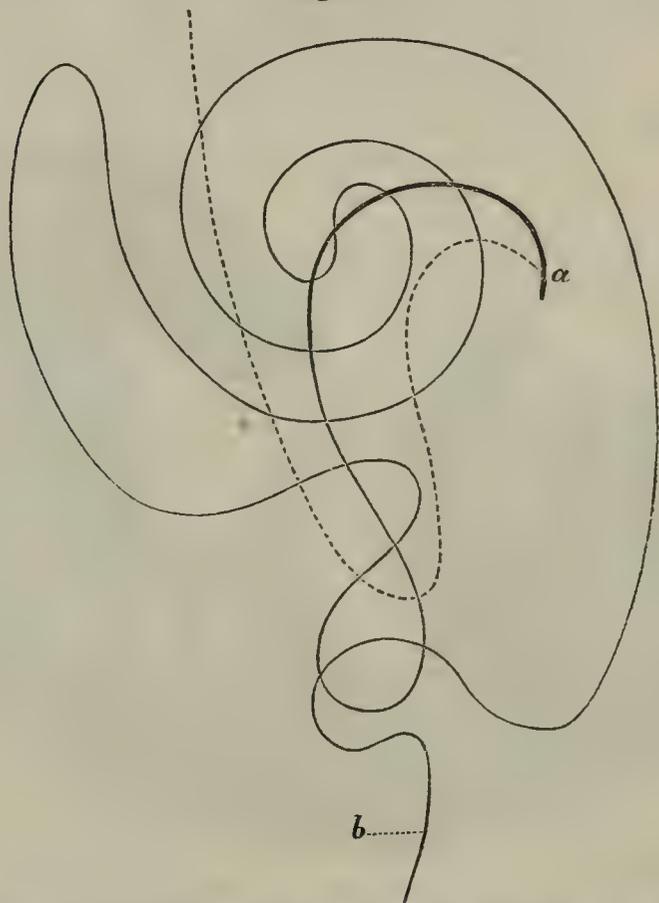


Diagram of the convolutions of the colon in the Capybara. The dotted line represents the cæcum springing from the side of the dilated end of the large intestine, and running forward to the diaphragm. *a*, ileo-cæcal valve; *b*, rectum.

cæcum, which is directly continuous with the colon, and is indistinguishable from it in structure. This second cæcum is, as indicated above, three inches from the extreme end to the centre of the orifice by which it communicates with the sacculated one. Superficially its

longitudinal muscular coat is strongly marked, covering it perfectly uniformly.

The ileo-cæcal valve is linear and longitudinal; it projects a short distance into the sacculated cæcum from above as a tube with slightly turned lips, of which the inferior is a little the longer and larger. There are some thickened gland-patches in the sacculated cæcum, and a large one in the colon, at the margin of the sphincter which is towards the continuation of the large intestine; three or four others are situated irregularly in the walls of the true cæcum.

The disposition of the colon is peculiar and interesting. The accompanying sketch (fig. 2, p. 22) will explain it best. It was taken from the view obtained of them as the animal lay on its back. As is well known, the large intestine commences in the left hypochondriac region, the true cæcum capping the end of the sacculated one anteriorly. The gut then, with a curve to the right, runs back to the hypogastric region, where, with a reversed figure-of-eight twist, it gets into the normal position of the ascending colon. It so reaches the right hypochondriac region, and then commences to form, in the transverse colon, coils very similar to, though on a smaller scale than those in *Indris* among the Lemurs and in the Artiodactylate Ungulata, the much-developed loop being twisted on itself to the left side. After reaching the left hypochondrium the descending colon continues straight to the sigmoid flexure, which is strongly developed, and thence to the rectum.

The sacculated cæcum being bound to the first part of the colon by bands of equal length (about  $2\frac{1}{2}$  inches), follows the course of that canal, and is therefore doubled on itself, not, as Prof. Owen remarks, occupying the posterior half of the abdomen, but running forwards towards the diaphragm, above the colon, till its caput arrives in the right hypochondriac and epigastric regions, where the ruminant-like coil above referred to is strongly bound to it on its under or ventral surface.

Neither in *Cavia*, *Dolichotis*, *Capromys*, nor in any of the allied forms with which I am acquainted, does the strong sigmoid curve of the large intestine, at the commencement of the sacculated cæcum, develop into a true secondary cæcum in the manner that it does in the Capybara.

Whilst on the subject of the viscera of the Capybara, the following measurements of those of an adult male will not be out of place—small intestine 21 feet, large intestine 6 feet 7 inches, cæcum 1 foot 10 inches.

The liver is comparatively simple. The gall-bladder is pyriform, situated in a cystic fossa, not reaching the free margin of the gland. The right central lobe is slightly more bulky than the left lateral, which is more than twice the size of the left central, which, again, is somewhat larger than the caudate. The spigelian lobe is minute, and bifid as in so many Rodents.

8. Contributions to Morphology. ICHTHYOPSIDA.—No. 1.  
On *Ceratodus forsteri*, with Observations on the Classification of Fishes. By Prof. T. H. HUXLEY, Sec. R.S.

[Received January 4, 1876.]

Two specimens of *Ceratodus forsteri* have come into my possession within the last two years. The first was kindly placed at my disposal by the Secretary of this Society some time ago; but I was unwilling to dissect it until I had a second. This desideratum was supplied by my friend Sir George MacLeay, who, on a recent visit to Australia, was kind enough to undertake to obtain a *Ceratodus* for me, and fulfilled his promise by sending me a very fine and well-preserved fish, rather larger than the first. The first was 32 inches long, the second only 30 inches, though a considerably stouter fish.

I need hardly say that I have little to add or qualify in the general description of the exterior structure given by so accomplished and experienced an ichthyologist as Dr. Günther\*. Only in one point do I find my interpretation of the facts widely discrepant from his; and that is in regard to the position of the external nostrils.

Dr. Günther says, "As in *Lepidosiren*, there are two nasal apertures on each side, both being situated within the cavity of the mouth."

That anterior nasal apertures should be situated, in any sense, "within the cavity of the mouth" would be so singular a deviation from the otherwise universal rule, that the anterior nares of vertebrated animals are situated outside the mouth, on the surface of the head, that conclusive evidence must be producible before the anomaly can be admitted to exist; and, so far as my observations go, that conclusive evidence is not only wanting, but the contrary is demonstrable.

In *Ceratodus*, it is easily seen that the anterior nares are not occluded when the mouth is shut by the apposition of the edges of the mandible to the palate. The anterior nares, in fact, lie altogether outside and in front of the contour of the mandibles, on the under concave surface of the anterior part of the head. The median portion of the margin of this region of the head must not be confounded with the upper lip, with which it has nothing to do. The maxillary portion of the upper lip is, in fact, represented only by a fold of the integument, which begins on the outer side of the anterior nostril, and extends back to the angle of the gape, where it passes into the lower lip. The præmaxillary, or internasal, portion of the upper lip is represented by a delicate fold of the integument, disposed in a transverse arch in front of the vomerine teeth, which it separates from the inner boundary of the anterior nares. The outer and posterior portion of the lower lip is produced into a free process, which is folded back against the jaw, and extends for about two thirds of the distance from the angle of the mouth to the symphysis, ending by a rounded free edge.

\* "Description of *Ceratodus*," Phil. Trans. pt. ii, 1871.

Thus the anterior nares can in no sense be said to open into the cavity of the mouth, inasmuch as they lie outside the præmaxillary portion of the upper lip, and are not enclosed by the maxillary portion of that lip. They are not even placed between the upper and the lower lips, inasmuch as the vaulted flap, on the underside of which they lie, is not the upper lip, but the anterior part of the head.

In *Lepidosiren*, the anterior nares are closer to the anterior margin of the head than in *Ceratodus*, and the præmaxillary lip is represented only by a papillose ridge, in which the integument of the underside of the head, between the anterior nares, terminates posteriorly. Otherwise the disposition of the nostrils is quite as in *Ceratodus*; and when the mouth is shut, the nostrils open on the underside of the head, in front of it and of the rudimentary præmaxillary portion of the upper lip.

The disposition of the nasal apertures in the Dipnoi is essentially Selachian\*. In the common Dogfish (*Scyllium*), for example, the anterior contour of the head answers to the anterior contour of the head of *Ceratodus*. The mandibular and maxillary lips are similarly disposed; and the external nares are placed on the sides of the head in a similar position. But the præmaxillary part of the upper lip is much larger and more prominent; and its outer edges (septal alæ), instead of being continued into the maxillary lip, to form the floor of the nasal passage, are separated from it by a fissure, which communicates with the nasal cavity. This fissure is overlapped by the septal alæ; and thus an incomplete nasal passage, which opens posteriorly into the cavity of the mouth, is constituted.

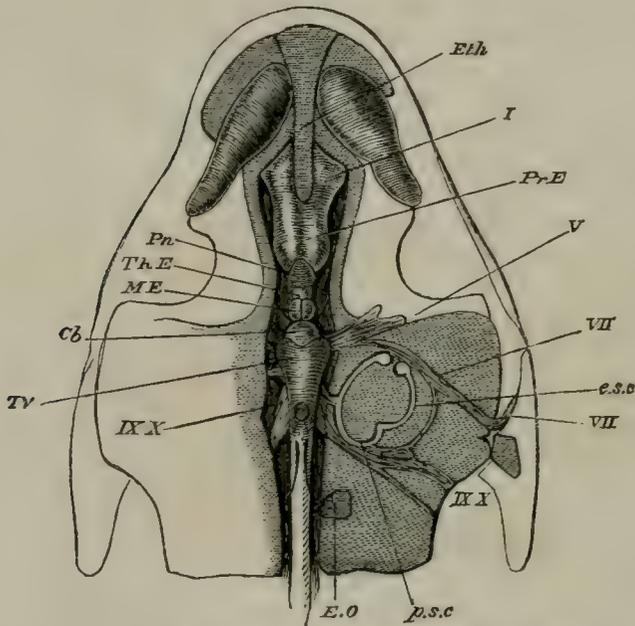
Still more instructive is the comparison of the nasal passages of *Ceratodus* with those of *Cestracion* and *Chimæra*. In *Cestracion*, the external nostrils lie just outside the mouth, the lower lip coming into contact with the maxillary and præmaxillary portions of the upper when the mouth is shut. The anterior end of the maxillary lip is folded in, and passes into the external part of the *ala nasi*, which has a thickened edge, and ends in a continuation of the free fold of the lip. The inner *ala nasi* is the outer part of the internasal or præmaxillary part of the upper lip. It also ends in a free edge, which is rolled inwards. The septal ala and the maxillary ala do not unite; but a groove is left between their convex edges, which answers to part of the groove which leads from the nose into the mouth in Dogfish and other Plagiostomes. But the greater part of this groove is represented by a canal formed by the convoluted septal ala, which is open on its dorsal aspect, and communicates, in front, with the cavity of the olfactory sac. Behind, the free edge of the septal ala has a curious fringe; and when the mouth is shut, this fringe overlaps the edge of the mandible. The free edge of the septal ala bounds a large opening, the posterior nostril, which is situated, as in *Ceratodus*, at the point of junction between the vomerine and the palatine teeth. Consequently, when the mouth is shut, there is a free passage for water through this incompletely closed nasal canal.

\* See the excellent observations of Gegenbaur, 'Kopfskelet der Selachier,' p. 224 *et seq.*

An arrangement of a very similar character exists in *Chimæra*. Here the nasal septum is very narrow, but widens out below, where, as the præmaxillary lip, it overlaps the vomerine teeth. The free edge of the septal ala is curved in, as in *Cestracion*. Meeting it is an inward process of the maxillary lip, which abuts against the septal ala in the same way as the maxillary ala does in *Cestracion*. Outside this, again, is another flap-like process of the maxillary lip, which overhangs the foregoing when the maxillary lip is in place. Between the præmaxillary lip and the maxillary lip is the nasal passage, open ventrally as in *Cestracion*; and an interval between the vomerine and palatine teeth above and the mandibular tooth below (the posterior nostril) places this passage in free communication with the oral cavity.

It is obvious that if the septal and the maxillary alæ in *Scyllium*,

Fig. 1.



*Ceratodus forsteri*. Dorsal view of the brain *in situ*.

*Pr.E*, lobus communis of the prosencephalon; *Th.E*, Thalamencephalon; *Pn*, pineal gland; *ME*, mesencephalon (the median groove is somewhat too strongly marked); *Cb*, cerebellum; *Tv*, tela vasculosa over the fourth ventricle; *e.s.c.*, *p.s.c.*, external and posterior semicircular canals; *I*, *V*, *VII*, *IX*, *X*, cerebral nerves; *E.O*, exoccipital ossification. The general contour of the chondrocranium is given; on the right side the cartilage has been sufficiently removed to show the anastomosis of the seventh and ninth nerves, the auditory organ, and other deep-seated parts. With respect to this and the other figures, I may remark that my object has been to make accurate diagrams drawn to scale, and not pictures.

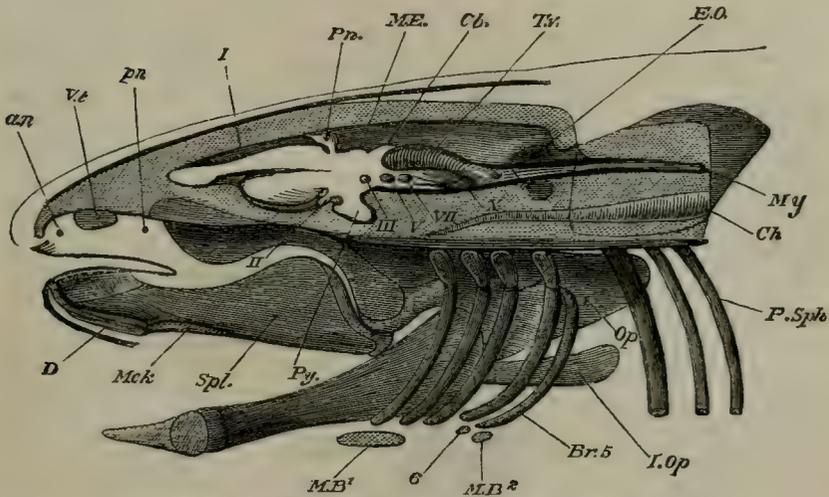
*Cestracion*, and *Chimæra* united along the middle line, such a nasal passage as exists in *Ceratodus* would be the result. Compared with

*Ceratodus*, the Elasmobranchs mentioned are hare-lipped; and as regards the position of the external nostrils, *Cestracion* and *Scyllium* are intermediate between *Chimæra* and *Ceratodus*.

It may be asked, what is the use of a nasal passage and of internal nares in a purely branchiate animal? Without actual experiment it is hard to give a definite answer to this question; but I will venture upon two suggestions. In the first place, these communications between the cavity of the mouth and the exterior must permit slow respiration to take place when the jaws are shut; and it is easy to imagine that this, under many circumstances, may be an advantage.

In the second place, the large olfactory sacs of these animals suggest that the sense of smell is of value to them; and the communication of the nasal passages with the mouth must enable them to do what they could not do otherwise—namely, accelerate the rapidity of the contact of odoriferous particles with the Schneiderian membrane at will. The fish with posterior nasal apertures, in fact, can “sniff” effectually, while that operation could only be very imperfectly performed by compression and dilatation of the walls of the olfactory

Fig. 2.



*Ceratodus forsteri*. Left lateral view of the brain *in situ*.

The details of the structure of the dorsal region of the spinal column are omitted. *Ch*, notochord; *E.O*, exoccipital ossification; *P.Sph*, parasphenoid; *V.t*, vomarine teeth; *an*, *pr*, positions of the anterior and posterior nares; *Op*, operculum; *I.Op*, interoperculum; *Spl*, splenial, and *D*, dentary bones of the mandible; *Mck*, Meckel's cartilage; *M.B*<sup>1</sup>, *M.B*<sup>2</sup>, anterior and posterior mesobranchials; *Br. 5*, fifth branchial arch; *6*, nodule of cartilage, which possibly represents a rudimentary sixth arch; *Py*, pituitary body. The other letters have the same signification as in the preceding figure. The suprascapular bone is shown in place; and its contour is given as if the anterior part of the vertebral column were transparent.

sacs in the absence of any second opening. Probably the second opening so generally present in the olfactory sacs of the Teleostei, and the naso-palatine canal of the Marsipobranchs, have a similar

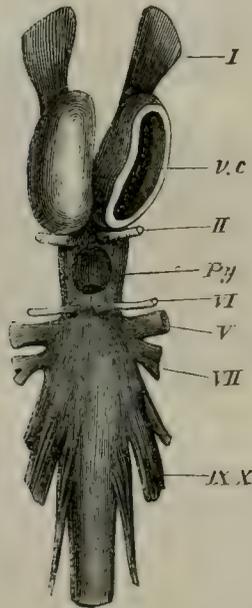
physiological significance. In *Ceratodus* there is the further physiological relation to aerial respiration; and in all the higher Vertebrata the nasal passages are concerned in sniffing and breathing.

With respect to the internal structure of *Ceratodus*, I shall confine my remarks, in the present communication, to the brain, the skull, and the pectoral limbs. *Ceratodus* is, in fact, the most surprisingly suggestive animal I have ever had occasion to study; and the attempt to comprehend the morphological significance of the organs I have mentioned has led me so far, that I must defer the consideration of other parts of its organization to another occasion.

### I. The Brain.

I had no great hope of finding the brain in a state fit for examination in my specimen of *Ceratodus*; and in fact the cerebral substance and that of the nerves are in a very friable condition. But, by great good fortune, the *pia mater* is so very dense and tough, that it has held the cerebral substance in place; and thus not only the external form, but somewhat of the internal structure of the brain could be satisfactorily determined.

Fig. 3.



*Ceratodus forsteri*. Underview of the brain (nat. size).

I, olfactory, II, optic, VI, third nerve (?); V, VII, IX, X, roots of the trigeminal, portio dura, auditory, glossopharyngeal, and pneumogastric nerves; v.c., one of the lateral ventricles of the *lobus communis*, laid open from below.

The brain is represented from above in fig. 1, from the left side in fig. 2, and from below in fig. 3.

The brain of *Ceratodus* nearly fills the cranial cavity, the interspace left between it and the walls of the latter being, to a great extent, occupied by a peculiar reticulated tissue. The *medulla oblongata* is long and slender, but widens, anteriorly, in the region of the fourth ventricle. This cavity is arched over by a *tela vasculosa* (Tv, figs. 1 and 2), separated into two lateral convexities by a slight median depression. In front, each convexity is continued into a blind rounded cornu, which lies over the origin of the fifth and seventh auditory nerves. The two cornua diverge, and the cerebellum is continued backwards as a triangular lamella between them. The cerebellum is relatively very small, being represented merely by the thin arched roof of the anterior part of the fourth ventricle. In front of it is a rounded elevation, obscurely divided by a longitudinal depression into two. These are the only indications of the optic lobes of the mid brain, or mesencephalon. In front of this is the fore brain. The hinder division (or thalamencephalon) is narrower than the mesencephalon, and passes below into the infundibulum, which terminates in the large, oval, flattened, pituitary body (*hypophysis*). This is lodged in an excavation of the cartilaginous floor of the skull representing the *sella turcica*.

Dorsally, the thalamencephalon is continued upwards and forwards into the subcylindrical peduncle of the pineal gland (*epiphysis* or *conarium*). This is a large heart-shaped body, the base of which is turned downwards and backwards. The apex is connected by fibrous and vascular tissue with a depression in the cartilaginous roof of the skull.

Next follows the largest division of the brain, answering to the cerebral hemispheres and the olfactory lobes. The former are represented by a single oval *lobus communis*, the middle area of the roof of which is occupied by a broad thick *tela vasculosa*. From the anterior dorsal aspect of the prosencephalon proceeds, on each side, the large olfactory lobe, which, flattening in front, and becoming obliquely truncated, terminates against the posterior walls of the olfactory sacs. A backward prolongation of the mesethmoid cartilage separates the two lobes. In the lateral view of the brain (fig. 2) the manner in which the olfactory lobes take their origin from the dorsal aspect of the prosencephalon is well seen. The short and thick infundibulum, terminating in the flattened oval pituitary body, and the origins of the second, third, fifth, eighth, ninth, and tenth nerves are shown.

The ventral view (fig. 3) displays the origins of the small optic nerves (II) which arise close together from the floor of the thalamencephalon. Whether any *chiasma* exists could not be ascertained.

In the middle line of its ventral aspect the prosencephalon presents a deep longitudinal fissure, lodging anterior cerebral arteries. The walls of the fissure have been separated by turning the left division of the prosencephalon to one side; and the floor of the ventricle (*v.c*), which is contained in the prosencephalon, has been removed.

When the dorsal wall of the brain was cautiously laid open by a median section, it was found to contain one large ventricular cavity

the separation of which into fourth and third ventricles was indicated only by slight constrictions of the roof and side walls. The large ventricle of the prosencephalon is partially separated into two chambers by a median septum, formed by the infolding of its ventral wall; and the spacious ventricle of each olfactory lobe opens into the dorso-lateral part of each of these chambers.

The place and mode of origin of the olfactory and of the optic nerves have already been mentioned.

The third nerve is indicated in the figure; but I am somewhat doubtful as to the nature of the cord thus marked.

No fourth or sixth nerve was observed.

The fifth arises by a single large cylindrical root just below the anterior end of the cornu of the tela vasculosa of the fourth ventricle. The seventh and eighth leave the medulla by a common root just behind this; and the roots of the ninth and tenth nerves, divided into three bundles, arise from a tract at the sides of the medulla which extends from the last to the hinder limit of the *tela vasculosa*, and incline obliquely backwards to their exit.

The brain of *Ceratodus* is very singular and interesting, inasmuch as it presents resemblances to that of the Marsipobranchii on one side, to that of the Ganooids and Amphibia on another, and to that of the Chinæroids and Plagiostomi on a third.

As in the brain of the Marsipobranchii, the pineal gland is relatively very large, with its pointed dorsal end inclined upwards and forwards, and the roof of the fourth ventricle is almost entirely formed by the *tela vasculosa*; but, as in the Ganoidei and Amphibia, the cerebellum is larger than in the Lampreys. In *Ceratodus* it is similar to, though proportionally less than, that of *Lepidosteus*, and still more like that of *Polypterus*. In the proportions of the thalamencephalon the brain of *Ceratodus* resembles that of the Sturgeon and that of the Ray; while in the representation of the cerebral hemispheres, or prosencephalon, by a large imperfectly divided *lobus communis*, from the dorso-lateral regions of which the olfactory lobes take their rise, the brain of *Ceratodus* presents a feature hitherto known, so far as I am aware, only in the Plagiostomi\*. Thus, in its cerebral characters, *Ceratodus* occupies a central place in the class Pisces.

The development of the cerebral hemispheres in Plagiostome fishes differs from the process by which they arise in the higher Vertebrata. In a very early stage, when the first and second visceral clefts of the embryo of *Scyllium* are provided with only a few short branchial

\* So far as I can judge from the examination of a small but well-preserved specimen of *Lepidosiren annectens*, for which I am indebted to Mr. Selater, the brain of this fish is similar, in all essential respects, to that of *Ceratodus*. The figure of the brain of *Lepidosiren* given by Prof. Owen in his 'Anatomy of Vertebrates' is susceptible of interpretation in this sense. Hyrtl's description and figure of the brain of *Lepidosiren paradoxa* (Abhandlungen der königlichen böhmischen Gesellschaft, Bd. iii. 1845), on the other hand, leave me in doubt whether, apart from its curious asymmetry, the brain of this fish does or does not present important differences from that of *Ceratodus* and that of *Lepidosiren annectens*.

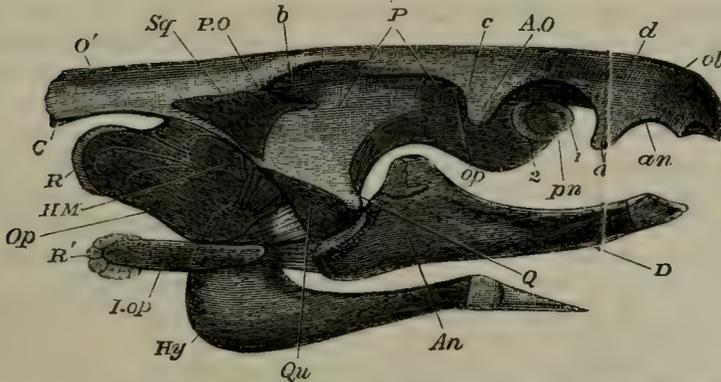
filaments, the anterior cerebral vesicle is already distinctly divided into the thalamencephalon (from which the large infundibulum proceeds below, and the small tubular peduncle of the pineal gland above, while the optic nerves leave its sides) and a large single oval "vesicle of the hemispheres." On the ventral face of the integument covering these are two oval depressions, the rudimentary olfactory sacs.

As development proceeds, the vesicle of the hemispheres becomes divided by the ingrowth of a median longitudinal septum, and the olfactory lobes grow out from the posterior lateral regions of each "ventricle" thus formed, and eventually rise onto the dorsal faces of the hemispheres, instead of, as in most Vertebrata, remaining on their ventral sides. I may remark that I cannot accept the views of Miklucho-Maclay, whose proposal to alter the nomenclature of the parts of the Elasmobranch's brain appears to me to be based upon a misinterpretation of the facts of development.

## II. The Skull.

Dr. Günther\* distinguishes in the skull an "inner cartilaginous capsule and an outer incomplete osseous case, to which again some outer cartilaginous elements are appended. In the former the con-

Fig. 4.



*Ceratodus forsteri.* Lateral view of the chondrocranium, with most of the bones and fibrous tissues removed.

*ol*, position of the olfactory sac; *an*, *pn*, position of the anterior and posterior nares; *a*, process of the cranial cartilage, *d*, between the two; 1, 2, upper labial cartilages; *op*, optic foramen; *A.O.*, antorbital process; *P.O.*, post-orbital process; *P.Q.*, palato-quadrate process; *Sq*, *Qu*, remains of the bony plate which lies on the outer side of this process; *O.C.*, occipital prolongation of the chondrocranium roofing over the branchial cavity; *D*, dentary; *An*, angular; *Hy*, hyoid; *I.op*, interoperculum; *Op*, operculum; *R*, *R'*, cartilages representing hyoidean rays; *HM*, hyo-mandibular.

fluence of cartilage is so complete, that no distinct divisions are traceable by sutures; its parts can be designated only by reference to the locally corresponding bones of the teleosteous skull."

\* *L. c.* p. 521.

This would seem to imply that the chondrocranium of vertebrated animals is formed by the coalescence of parts analogous to those which compose the bony skull of osseous fishes. As a matter of fact, however, the chondrocranium is never formed of such elements, but is built up, at a very early stage of embryonic development, by the union of primitively distinct parachordal, otic, and pleural elements\*, which in no way correspond with the bones of the teleostean skull. And when Dr. Günther subsequently (*l. c.* p. 522) speaks of "three groups of superficial labial cartilages," "the upper labial," the "supraorbital," and the "lower labial," the discrimination of such cartilages must, I think, be regarded merely as regional anatomy; and it must not be supposed that they have any thing to do with the cartilages to which the same names are applied in other fishes, several of which exist in *Ceratodus*, and will presently be described.

When the osseous and merely fibrous structures are carefully removed, I find that the chondrocranium (figs. 4, 2, and 7) consists of a continuous cartilaginous mass, the interorbital region of which is much narrower than any other part, produced inferiorly and laterally into two stout suspensorial or palato-quadrato-processes, with the pulley-shaped ventral ends of which the strong Meckelian cartilages are articulated. Anteriorly the orbits are bounded by the *antorbital processes* (*A.O.*), which curve downwards in front of the eye. From these antorbital processes the cartilage is continued forwards to form the evenly curved roof of the ethmoidal region and its contained nasal chambers, and, bending down on all sides, ends in a free edge, which is slightly concave opposite each anterior nasal opening (*an*, fig. 4), and much more deeply excavated opposite the posterior nares (*pn*, fig. 4). The small process (*a*) which lies between the two excavations in question is connected by a strong fibrous band with the antorbital process (*A.O.*), and this, by the ossified bar described by Dr. Günther, with the *postorbital process* (*P.O.*); but these structures have nothing to do with the chondrocranium. Behind the orbits, the skull suddenly widens out into two broad periotic masses, which lodge the auditory labyrinth. Anteriorly and ventrally these processes are continued into the suspensorial pillars (*Qu*); while behind they pass into thin but wide cartilaginous plates (*O, C*, fig. 4), which roof over the chambers in which the branchiæ are lodged.

I thought at first that *Ceratodus* had no labial cartilages; but at length I discovered two small upper labial cartilages in their right places, namely in the region of the nostrils.

One of them (1, figs. 4 and 5) lies in the roof of the mouth, just in front, and on the inner side of, the posterior nasal aperture. It is fixed to the mesethmoidal cartilage (*M.E.*) by fibrous bands, and is broader behind than in front. The inner edge of this cartilage is concave, the outer convex, and it has a nearly horizontal direction.

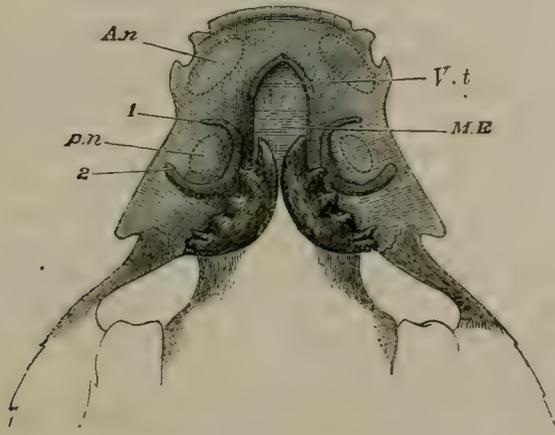
The second cartilage (2, figs. 4, 5, 7) is stouter, and lies behind, and on the outer side of, the posterior nasal aperture. Its dorsal end is attached to the base of the skull and anterior part of the

\* "On the Structure of the Skull &c. of *Menobranchnus lateralis*," P. Z. S. 1874.

palato-quadrate cartilage just above the middle of the palatine tooth. It thence descends with an outward convexity and inward concavity, and terminates in the upper lip near the angle of the mouth.

Dr. Günther states (*l. c.* p. 524) that "the body of the mandible is persistent cartilage; but its entire outer and inner surfaces are covered by bone, forming an articular and a dentary piece. . . . The articular and dentary bones meet near the top of a low but strong coronoid process, and again at the symphysis, which is formed by fibrous tissue, and may easily be separated by the knife . . . . In front of the jaw the cartilage is expanded into a slightly concave lamella (lower labial cartilage)."

Fig. 5.



*Ceratodus forsteri.* Underview of the skull, showing the vomerine teeth (*V.t*), the palatine teeth, the mesethmoid cartilage (*M.E*), and the upper labial cartilages (1, 2) in place. The dotted lines *An*, *pn* indicate the form and position of the anterior and the posterior nares.

I find a persistent Meckelian cartilage, such as that here described; but as, after careful removal of the ensheathing bones, I have been unable to discover any separation between this lamellar expansion and the rest of the cartilage, I am in doubt whether the lamella represents the lower labial cartilage or not. The analogy of the Frog, however, leads one to suspect that distinct lower labial cartilages may exist in the young *Ceratodus*.

Dr. Günther does not mention a third ensheathing bone (figs. 2 and 4, *D*) which is united by suture with the other two, and lies on each side of the symphysis on the ventral face of the mandible. It is a flat plate, of a triangular form, with a thick rugose inner edge for the attachment of the symphyssial ligament. Its posterior edge is thin and concave; its external edge is also thin and overlaps the bone termed "articular" by Dr. Günther, uniting with it by a squamous suture. The outer half of its dorsal aspect is smooth, and helps to support the ventral face of Meckel's cartilage; the inner or symphyssial half presents a broad rough triangular surface, which extends on the inner

side of the symphyseal end of Meckel's cartilage, and unites with a corresponding surface furnished by the expanded symphyseal end of the bone, termed "dentary" by Dr. Günther. I cannot doubt that this bone is the representative of the true "dentary" element; nor is there any question in my mind that Dr. Günther's "dentary" is the true "splenial" element, while his articular answers to the "angular" piece of the vertebrate mandible. In the attachment of the tooth to the splenial, and not to the dentary, element, *Ceratodus* presents an interesting and important feature of resemblance to *Siren* and to larval Salamanders on the one hand, and, on the other, to *Polypterus*.

The splenial element in this Ganoid resembles that of *Ceratodus*, not only in bearing teeth, but in form, position, and relative size. In a young specimen of *Polypterus* I find that the splenial does not extend continuously to the symphysis, but that, between its anterior termination and the latter, there are two short and broad bony plates developed in the fibrous tissue which overlies Meckel's cartilage; these bear teeth, and correspond with the expanded symphyseal end of the splenial in *Ceratodus*. *Polypterus* has a true *articulare*, from which Meckel's cartilage is continued. The *angulare* is much shorter, and the *dentale* much longer than in *Ceratodus*.

The hyoidean and opercular apparatus present characters of singular interest. Dr. Günther says that "on the hinder side of the tympanic pedicle\*, near its base, there is a small round tubercle, for the suspension and articulation of the hyoid arch (pl. xxxiv. fig. 3, v)."

I presume that this "small round tubercle" of the suspensorial expansion of the cranium is the small cartilage marked *H.M* in figs. 4 and 6. But this is neither a process of the suspensorium, nor does it articulate with, nor take the principal share in, suspending *Hy*, which is Dr. Günther's "hyoid arch."

In fact it is, as fig. 6 shows, a distinct, though small, four-sided, flattened cartilage, the anterior and ventral angle of which is produced into a short conical process (*Sy*). Its anterior edge is firmly united with the skull, just where the cranium proper passes into the suspensorium. At this point there is a triangular vacuity filled with fibrous tissue, through which the posterior division of the seventh nerve passes (figs. 1 and 6, VII). The outer face of the cartilage is loosely connected with the operculum (*Op*); and the conical process (*Sy*) is imbedded in the dorsal and posterior part of the powerful ligament (*h.s*) (corresponding with the hyosuspensorial ligament in *Menobranchus*†) by which *Hy* is mainly kept in place.

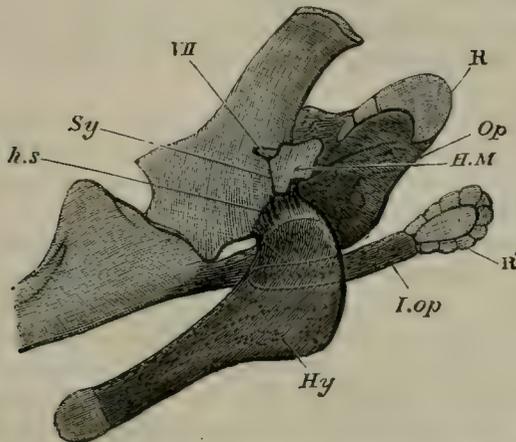
It is obvious that this little cartilage is the homologue of the hyo-mandibular element of the hyoidean arch of other fishes, the small conical process being the rudimentary *symplectic*, and, therefore, that

\* It is surely to be regretted that any writer of authority should retain the misleading name of "tympanic pedicle" for a part the total distinctness of which from the "tympanic bone" of the higher Vertebrata has now been so copiously demonstrated.

† P. Z. S. 1874, pl. xxix. figs. 1 and 2.

it is itself the dorsal element of the hyoidean arch, attached in its normal position, as its relations to the seventh nerve show. The hyoidean cornua are very strong, and consist of a cartilaginous axis almost completely ensheathed by bone. The dorsal end of each is

Fig. 6.



*Ceratodus forsteri*. Inner view of the right hyoidean arch (*Hy*), with the opercular apparatus and part of the suspensorium and of the mandible.

*H.M.*, hyomandibular cartilage; *Sy*, its symplectic process; *Op*, operculum; *I.op*, interoperculum; *R, R'*, cartilaginous rays attached to the inner face of the operculum and interoperculum; *VII*, exit of the posterior division of the seventh nerve; *h.s.*, hyosuspensorial ligament (immediately beneath it is the mandibulo-hyoid ligament).

attached by the strong hyo-suspensorial ligament aforesaid to the suspensorium; but another very strong round ligament (answering to the *mandibulo-hyoid ligament* of *Menobranchus*\*) connects the dorsal end of the hyoidean cornu with the angle of the mandible (figs. 4 and 6).

Thus the hyoidean arch of *Ceratodus* strikingly resembles that of a Plagiostome on the one hand, and that of an Amphibian on the other. And the small hyomandibular presents a form and connexions which are strikingly similar to those of the *suprastapedial* cartilage in the Sauropsida†, which, on a former occasion, I showed to be the summit of the hyoidean arch and the homologue of the mammalian incus.

In describing the operculum Dr. Günther says (*l. c.* p. 525), "A small movable piece of cartilage is found inside of the articular groove of the opercle (pl. xxxiv. figs. 2 and 3, *k*): it is a rudiment of the præoperculum."

Neither the figures referred to nor the account given enable me to be certain that they apply to the cartilaginous structures I am about

\* P. Z. S. 1874, *ibid.*

† "On the representatives of the Malleus and Incus of the Mammalia in other Vertebrata," P. Z. S. 1869.

to describe, and which are to be found not only on the inner face of the operculum, but on that of the interoperculum\*.

On the inner side of the former and projecting beyond its free edge is a curved band of cartilage divided into several portions †. One of these, that nearest the hyomandibular, is conical and bent at an angle to that which follows it. The terminal plate is broad and crescentic, and, on one side, was subdivided towards its free edge. On the inner face of the posterior end of the interoperculum (*I.op.*) there is an oval cartilage surrounded by eight or nine smaller nodules.

These cartilages represent the cartilaginous branchiostegal rays of Plagiostomes, which are often subdivided into two groups—a dorsal group attached to the hyomandibular, and a ventral group to the cornual division of the hyoid arch.

The *præoperculum* of Fishes and the *squamosal* of the higher Vertebrata are represented by the bone *Sq*, termed “tympanic lamina” by Dr. Günther. I have marked the lower piece, which was distinct on the specimen represented in fig. 4, *Qu*; but in another specimen I can find no subdivision, and I am disposed to think that the division arose from an accidental dismemberment of a squamosal (or *præoperculum*) corresponding with that of *Menobranchus* (P. Z. S. 1874, pl. xxix. fig. 1, *Sq*), and that there is no true quadrate in *Ceratodus*. I can discover no ossification of the substance of the articular extremity of the suspensorium, such as occurs in the Amphibia. The pterygopalatines and the vomers, which last are represented only by the bases of the two vomerine teeth, are similar in their form and relations to the corresponding bones of Urodele Amphibia.

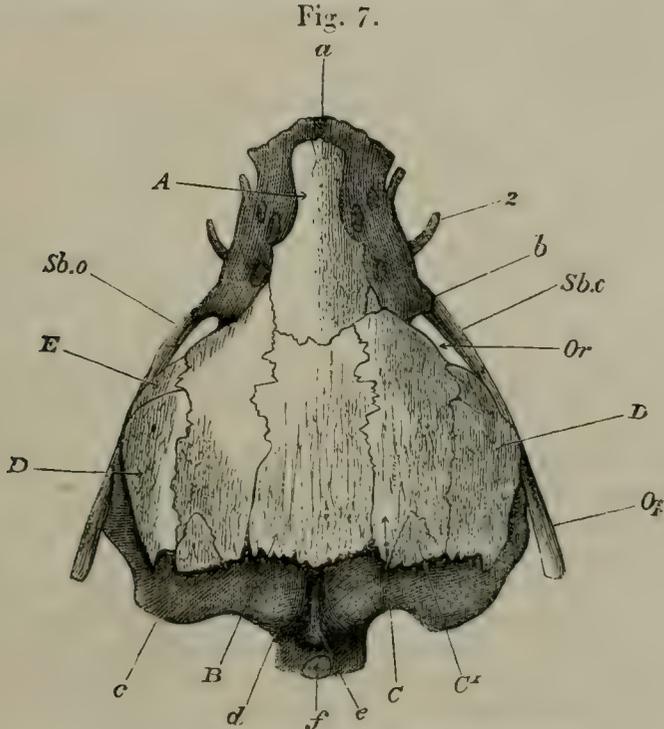
With respect to the branchial apparatus, Dr. Günther (*l. c.* p. 526) says that it “does not differ from that of Teleostean fish, but is entirely cartilaginous. There are five branchial arches, the last rudimentary and attached to the base of the fourth. There is no peculiar modification of any part of this apparatus; and the middle pieces have the usual groove for the reception of the vessels and nerves.”

I find that each of the anterior four branchial arches consists of a long ventral and a short dorsal piece of cartilage: the former pieces are united by ligament at their ventral ends, the third and fourth curving forwards in this part; they are connected by joints surrounded by ligaments with the dorsal pieces (fig. 2). In the median

\* Dr. Günther terms the bone here named interoperculum, “suboperculum.” He says (*l. c.* p. 525) that to the lower edge of the operculum “is attached by fibrous tissue the long styliform *suboperculum*, terminating at a considerable distance from the mandibular joint.” It is quite true that the bone in question is thus attached to the operculum; but a much more important connexion takes place between its ventral end and the angle of the jaw, by means of strong ligamentous fibres which run into the hyomandibular ligament. It thus more closely resembles the interoperculum of Teleosteans than it does the suboperculum.

† In a specimen of the skull of *Ceratodus*, for which I am indebted to my friend Mr. F. M. Balfour, the curved band of cartilage of the operculum is not subdivided, and the interopercular cartilages are divided less regularly and differently on the two sides.

ventral line, between the ends of the ventral pieces, lie two cartilages—an anterior elongated and spindle-shaped (*M.B*<sup>1</sup>), which is connected by a strong ligament with the median piece of the hyoid arch, and a posterior rounded nodule (*M.B*<sup>2</sup>) at some distance from the foregoing. The fifth arch consists of a single piece of cartilage curved forwards and united with the principal branchial of the fourth arch, both above and below; in front of it, close to the ventral end of the fifth arch, was a small nodule of cartilage, which is probably a rudimentary sixth arch (6).



*Ceratodus forsteri*. Dorsal aspect of the skull.

*a*, the anterior end of the chondrocranium; *b*, the antorbital process of the chondrocranium; *c*, its suprabranchial expansion; *d*, lateral elevations of the occiput; and *e*, median ridge, with the surface for the attachment of the anterior fin-ray; *f*, articular surface for the second fin-ray; *A*, anterior median bone; *B*, posterior median bone; *C*, inner lateral bone; *C'*, distinct ossification on the posterior extremity of this bone; *D*, outer lateral bone (squamosal); *E*, a separate ossification on the left side; *Op*, operculum; *Or*, orbit; *Sb.o*, suborbital bones; *2*, the posterior upper labial cartilage.

As Dr. Günther has pointed out, the osseous shield which covers the dorsal aspect of the skull consists of two median bones (fig. 7, *A*, *B*), one anterior and one posterior, which he terms "ethmoid" and "scleroparietal," and of two pairs of lateral bones, the "frontals" internally (fig. 7, *C*) and the "tympanic laminæ" externally (fig. 7, *D*). In my specimens the anterior half of the anterior median bone (*A*) has a different shape from that given in Dr. Günther's plate xxxiv. fig. 1, and its margins are very well defined. Moreover, in

one specimen, the hinder end of each inner lateral bone is completed by a distinct ossification (*C'*). There is also a separate ossification (*E*) on the left side, on what corresponds with the front part of the outer lateral bone on the right side. Doubtless these bones are subject to much individual variation.

The fibrous band which extends, below the eye, between the ant-orbital process and the ventral end of the suspensorium contains three suborbital bones. The anterior of these, trihedral, is connected by its broad base with the antorbital process; the middle bone is slender and elongated; the posterior is broad, flattened from side to side, and its hinder edge is fixed by ligamentous fibres to the outer face of the suspensorium and of the squamosal.

The *basal bone* of Dr. Günther is the parasphenoid. It extends backwards, beyond the limits of the proper cranium, into the region of the vertebral column, to a point just beyond the attachment of the third pair of ribs. But there is at least one vertebra in front of that which bears the first pair of ribs. In *Ceratodus*, as in the Sturgeon and other Ganoids, several anterior vertebræ have coalesced with one another and with the skull; or, probably, it would be more accurate to say that the investing mass of the notochord has not become differentiated into vertebræ for this extent. Nevertheless the posterior boundary of the skull can be strictly defined by the interspace between the exit of the pneumogastric and that of the next following, or first spinal, nerve.

It is to the outer surface of this interspace that the anterior edge of the "suprascapular" element of the pectoral arch is fixed by strong ligamentous fibres (fig. 2). Just in front of the boundary between the skull and the vertebral column, and therefore in the side walls of the former, there lies, deep in the substance of the cartilage, a hollow cone of bone (*E.O*). It is wider above and externally than below and internally, where its end lies above the notochord. This appears to be an exoccipital ossification, such as is to be found in greater state of development in *Lepidosiren*, *Polypterus*, and *Menobranchus*.

The skull of *Ceratodus* is, as might be expected (and as Dr. Günther has pointed out), extremely similar to that of *Lepidosiren*. In fact, beyond differences in the proportions of its various parts, the more extensive fenestration of the roof of the olfactory capsules in *Lepidosiren*, and the absence, so far as my investigations have yet gone, of the hyomandibular cartilage in the latter genus, the cartilaginous elements of the skull are the same in the two cases.

As to the superadded bones, the parasphenoid, the rudimentary vomers, and the pterygopalatine plates correspond in the two genera. The exoccipitals are much larger in *Lepidosiren*. The descending process or præopercular part of the squamosal is best developed in *Lepidosiren*, whilst its dorsal part (proper squamosal) is larger in *Ceratodus*.

In both, there are two opercular bones, an operculum and an interoperculum; and in *Lepidosiren*, as in *Ceratodus*, there are cartilaginous plates attached to the inner faces of these bones.

The branchial apparatus of *Lepidosiren* differs from that of *Ceratodus* mainly in the greater number of complete branchial arches.

It can hardly be doubted that the bone *D* of *Ceratodus* is represented, though incompletely, by the supraorbital of *Lepidosiren*, while the bony nasal shield of the latter corresponds very closely with the anterior median bone (*A*) of *Ceratodus*. The posterior boundary of the bone, however, lies further back in *Ceratodus* than it does in *Lepidosiren*. The argument of Dr. Günther that the posterior median bone (*B*) in *Ceratodus* is not the homologue of the parieto-frontal of *Lepidosiren*, because it lies above the muscles, while the latter is situated beneath them, is weighty against the identification of the bones in question; and, in other respects, the parieto-frontal of *Lepidosiren* is very unlike the "scleroparietal" of *Ceratodus*.

When the comparison of the cranial and facial bones of *Ceratodus* with those of the Vertebrata is extended beyond the limits of the Dipnoi, the determination of their homologues is beset with many difficulties. *Polypterus* has an anterior and a posterior median shield in the roof of the skull, which at first seem to correspond with those of *Ceratodus*; these shields are each formed by the union of two bones, which are evidently comparable to the frontals and parietals of the higher Vertebrata, while the frontals unite with a pair of broad nasals which cover the olfactory sacs. The apices of the posterior triangular edges of these bones reach back to near the level of the middle of the orbits; and the frontal bones are continued forwards on each side of them. Between the two nasal bones there is a median ossification which lies upon the mesethmoidal cartilage and spreads out in front, ending by a broad edge which articulates with the præmaxillæ.

The median bone, the piscine "ethmoid," occupies the same position as the anterior median bone of *Ceratodus* would do if the ethmoidal region were reduced to the proportions it has in *Polypterus*. Therefore, from this point of view, the determination of the bone as "ethmoid" by Dr. Günther seems fully justifiable; and the inner lateral and the median posterior bones would seem to represent the frontal and parietal bones of *Polypterus*.

On the other hand, the many points of resemblance between *Ceratodus* and the Amphibia suggest the comparison of the anterior and posterior median bone to the frontals of *Menobranchnus*, and of the inner lateral bones to the parietals of this Amphibian. The forward extensions of the latter, at the sides of the frontals, are especially noticeable in comparison with the anterior extremities of the inner lateral bones of *Ceratodus*. On the whole, I am inclined to think that *Polypterus* is the better guide in the interpretation of the cranial bones of *Ceratodus*, though the difference between the bones of *Ceratodus* and those of the Crossopterygian ganoids, all of which are readily reducible to the Polypterine type, is very considerable.

In other respects the skull of *Ceratodus* finds its closest parallel among the Amphibia, especially such Urodela as *Menobranchnus*\*, and the Anura in their tadpole state.

\* See P. Z. S. March 17, 1874.

I have already indicated the chief points of resemblance to the amphibian skull, and need not recapitulate them here. The most important feature is the manner in which the mandibular arch is connected with the skull.

The part of the palato-quadrate cartilage which is united with the skull, between the exits of the fifth and second nerves, answers to the "pedicle of the suspensorium" of the amphibian, while its backward and upward continuation onto the periotic cartilage corresponds with the otic process. As in the Amphibia and in the higher Vertebrata, the mandibular arch is thus attached directly to the skull by that part of its own substance which constitutes the suspensorium. It may thus be said to be *autostylic*.

Among fishes, the only groups which possess an autostylic skull, or in which the dorsal end of the mandibular arch is continuous with the cartilage of the brain-case, are the Chimæroids and the Marsipobranchii.

In *Chimæra*, the general form and connexions of the palato-quadrate cartilage are the same as in *Ceratodus*; but it differs from that of *Ceratodus* as that of the tadpole differs from that of a young Frog, or as that of *Menobranchnus* differs from that of *Menopoma*; that is to say, the articular condyle is situated far more forward, and the gape is, in consequence, relatively shorter in the former than in the latter. There are the same large olfactory capsules in both cases. In *Chimæra*, however, these project beyond the termination of the ethmoidal cartilage, while in *Ceratodus* the latter projects beyond the olfactory capsules, which are more lateral in position, more elongated, and, in accordance with the general form of the head, much more depressed.

Just as in *Ceratodus*, the palato-quadrate cartilage of *Chimæra* bears two teeth marked with radiating ridges, while two others, the vomerine teeth, are supported by the ethmoidal cartilage in front of these; and in both cases there is a tooth with radiating ridges on its surface in each ramus of the mandible.

In the disappearance of the notochord and the articulation of the skull with the anterior coalesced vertebræ, the skull of *Chimæra* presents a higher degree of differentiation than that of *Ceratodus*; while it is needless to speak of such aberrant peculiarities as its supracerebral interorbital septum, or the vast crest into which the skull is raised above the anterior part of the brain-cavity. In other respects, however, as in the inclination of the axis of the suspensorium already noted, the skull of *Chimæra* presents lower characters than that of *Ceratodus*. Among these may be reckoned the great size of the upper and lower labial cartilages and the condition of the hyoidean arch, which, except in size and some peculiarities of form, is altogether similar to the four branchial arches which follow it. Like them, it terminates, dorsally, in a flat, expanded, triangular piece, which is connected with the superjacent floor of the skull by muscles and ligaments, but by no direct articulation. The dorsal pieces of the succeeding branchial arches have the same form and attachments, and unite with the ventral segments at a sharp angle. These angles

are all connected together by a strong ligament, which is continued to the pectoral arch. Moreover a small styliform cartilage passes from the last angle to the pectoral arch, and is connected with the dorsal end of the fifth branchial arch. It appears to represent the dorsal element of that arch.

Johannes Müller, fully appreciating the importance of the differences between the skull of the Chimæroids and those of other "Elasmobranchii," and sagaciously remarking that "the skull of *Chimæra* is most like that of a tadpole"\* was thereby led to separate the Chimæroids as a suborder of the Elasmobranchii under the name of *Holocephali*. It appears to me that he might have been justified in going still further; for, considering, in addition to the cranial characters, the structure of the vertebral column and of the branchiæ, the presence of an opercular covering to the gills, the peculiar dentition, the almost undeveloped gastric division of the alimentary canal, the opening of the rectum quite separately from and in front of the urinogenital apertures, the relatively small and simple heart, the Chimæroids are far more definitely marked off from the Plagiostomes than the Teleostei are from the Ganoidei.

In all other Fishes, except the Marsipobranchii, the mode of connexion of the mandibular arch with the skull is different from that which obtains in the Chimæroids and the Dipnoi. The palato-quadrate cartilage is no longer continuous with the chondrocranium (though the bony elements of that arch may unite suturally with those of the skull, as in the Plectognathi), but is, at most, united with it by ligament. Moreover the dorsal element of the hyoidean arch, or the hyomandibular, usually attains a large size and becomes the chief apparatus of suspension of the hinder end of the palato-quadrate cartilage with the skull: Skulls formed upon this type, which is exemplified in perfection in Ganoidei, Teleostei, and ordinary Plagiostomes, may therefore be termed *hyostylic*.

But though the typical forms of autostylic and hyostylic skulls, as exemplified, *e. g.*, by a Sturgeon, a Pike, and a Dogfish or Ray, on the one hand, and *Chimæra*, *Ceratodus*, and *Menobranchus* on the other, are thus widely different, certain Plagiostomes present a condition of the cranium which tends to connect the two by a middle form, which may be termed *amphistylic*.

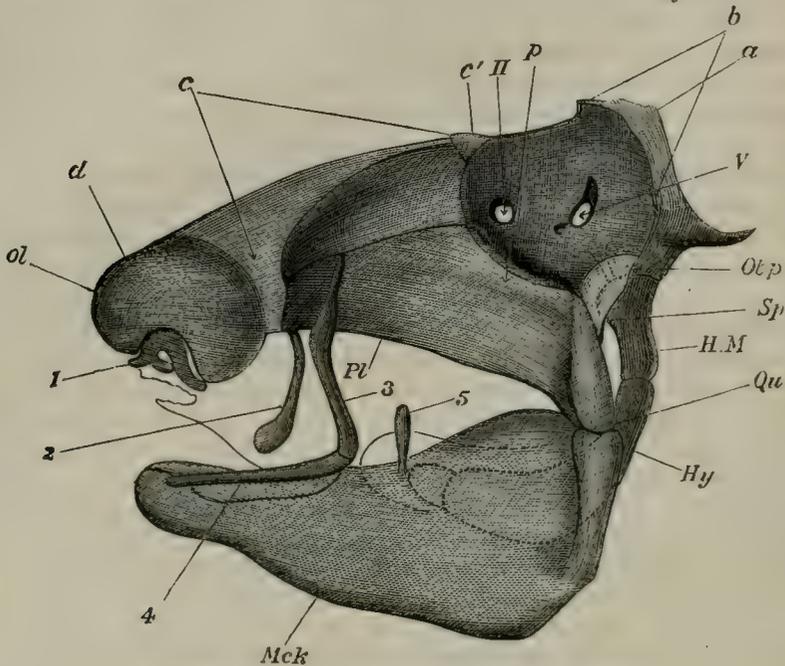
In the amphistylic skull the palato-quadrate cartilage is quite distinct from the rest of the skull; but it is wholly, or almost wholly, suspended by its own ligaments, the hyomandibular being small and contributing little to its support. The embryo amphibian is amphistylic before it becomes autostylic; and, in view of certain palæontological facts, it is very interesting that the link which connects the amphistylic with the ordinary Selachian skull is that of *Cestracion* (fig. 8).

If the palato-quadrate cartilage of *Chimæra* were membranous in the centre, as it is in the tadpole, and if along three lines radiating from this centre the cartilage were converted partly into fibrous tissue and partly into a true joint, the result would be to produce a palato-

\* 'Vergleichende Anatomie der Myxinoiden,' erster Theil, p. 150.

quadrate apparatus such as that exhibited by *Cestracion*. The huge palato-quadrate cartilage (*Pl, Qu*) of *Cestracion* is united with the skull in the præorbital region by a joint, and in the orbital region by fibrous tissue, and answers to that part of the palato-quadrate cartilage of *Chimæra* which lies between the nasal capsule and the mandible.

Fig. 8.



*Cestracion philippi*. Left lateral view of the skull.

**a**, occiput; **b**, postorbital process; **c, c'**, antorbital process; **d**, anterior end of the chondrocranium; **ol**, olfactory capsule; **Ot.p**, otic process, or spiracular cartilage; **Sp**, place of the spiracle; **H.M**, hyomandibular cartilage; **Qu**, articulation of the palato-quadrate cartilage (**Pl, Qu**) with the lower jaw (**Mck**); **p**, part of the palato-quadrate arch which answers to the pedicle of the suspensorium in Amphibia; **Hy**, hyoid; **II**, foramen for the optic, and **V**, for the trigeminal nerves; 1, 2, 3, 4, the upper and lower labial cartilages; 5, a small cartilaginous style attached by ligament to the mandibular cartilage.

The small cartilaginous plate (**Ot.p**), which is connected only by ligament with the periotic cartilage above and with the quadrate below, answers to the *otic process* of the Frog's suspensorium. This cartilage lies in the front wall of the spiracle, which in *Cestracion* is situated low at the sides of the head, nearly in a line with the branchial clefts, or in the position which it occupies in foetal Selachians. Moreover this so-called *spiracular cartilage* bears a rudimentary gill and is so far comparable to any of the branchial arches\*.

In possessing this permanent mandibulo-hyoid cleft, or spiracle, which is the homologue of the tympanic cavity and Eustachian tube of the higher Vertebrata, and in the permanence of its rudimentary

\* Gegenbaur considers the spiracular cartilage to be a ray of the mandibular arch.

branchia, *Cestracion* exhibits a lower stage of organization than *Chimæra*, in which, as in *Ceratodus*, the mandibulo-hyoid cleft has disappeared. On the other hand, the hyoidean arch presents a form intermediate between that of the ordinary Selachians and that of *Ceratodus* and *Chimæra*. It is stout; and its dorsal element, still retaining a little of its original form, but much thicker and more cylindrical, is no longer united with the skull by ligament and muscle merely, but articulates with a process of the underside of the periotic capsule. Moreover its distal end is connected by strong ligamentous fibres with the posterior end of the palato-quadrate cartilage and with an inward process of the articular end of the mandible (the *sustentaculum* of Gegenbaur).

In fact, the "epibranchial" of the hyoidean arch of *Cestracion* is just beginning to take on a new function, that of suspending the palato-quadrate cartilage and mandible to the skull. It is a true hyomandibular, though small and insignificant relatively to what it becomes in other Plagiostomes, in Ganoids, and in Teleostei.

Had I been acquainted with the skull of *Cestracion* in 1858, I should have been spared the hesitation which I then felt\* as to identifying the hyomandibular of Fishes with the summit of the hyoidean arch, and which has subsequently been removed by abundant evidence published by Mr. Parker and myself.

In the general form of the skull, the position and proportions of the olfactory capsules, and the characters of the principal labial and alinasal cartilages, *Cestracion* has a stronger resemblance to *Chimæra* than is exhibited by any other Plagiostomes; and I take it to be one of the lowest of Selachian skulls.

I am aware that in expressing this opinion I am diametrically opposed to Gegenbaur†, whose elaborate study of the Plagiostome skull entitles his opinion to the greatest weight, and who regards *Cestracion* as possessed of one of the highest of skulls in its group, while *Heptanchus* and *Hexanchus* have the lowest.

There is a certain ambiguity about the terms "highest" and "lowest;" but if by the former we understand the most extreme modification of the hyostylic type of skull characteristic of the group, then I should have no hesitation in regarding the skulls of the Rays as the highest of Plagiostome skulls, while *Cestracion* represents a low form of the autostylic type.

*Notidunus*, on the other hand, appears to me to have an essentially low form of skull, so far as it is more completely amphistylic than any ordinary Plagiostome; but on this low form is superinduced a modification by which it approaches the higher autostylic skull. This is the union of the palato-quadrate arch with the postorbital

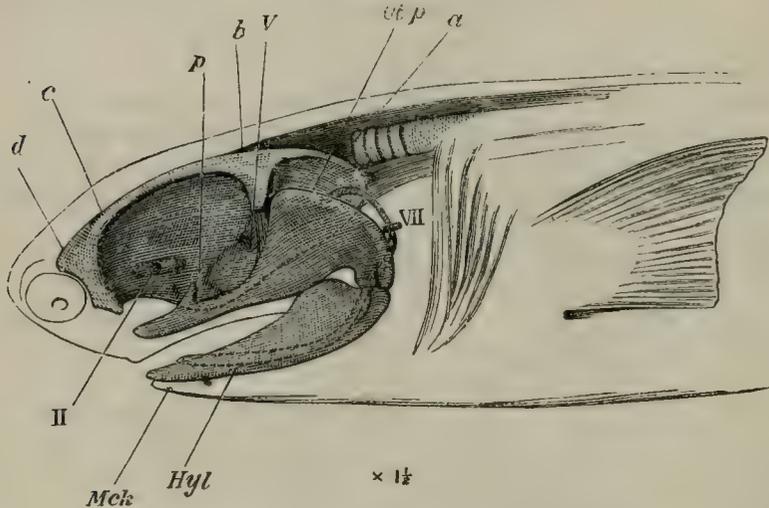
\* Croonian Lecture, 1858, and Lectures on the Theory of the Skull, 1864. See also "On the Malleus and Incus," P. Z. S. 1869; 'Manual of Vertebrate Anatomy,' 1871, p. 85; and Mr. Parker's "Memoir on the Development of the Salmon," Phil. Trans. 1872.

† 'Das Kopfskelet der Selachier,' p. 60. In controverting the opinion of Professor Owen that the *Cestracion* is less advanced in cranial development than *Squatina*, Gegenbaur observes, "So möchte ich gerade das Gegentheil behaupten, und nicht etwan bloss bezüglich der Basalverhältnisse des Craniums."

process of the skull—an articulation which, in Prof. Gegenbaur's view, represents the primitive attachment of the mandibular arch, but, in my apprehension, is an altogether secondary connexion.

I am indebted to Dr. Günther for a fœtus of *Notidanus* (*Heptanchus*) *cinereus* in excellent condition; and the examination of the skull (fig. 9), which presents all the characteristic features of the adult\*, has confirmed the suspicion which I previously entertained, that the

Fig. 9.



*Notidanus cinereus*. Left lateral view of the skull.

Letters as in the preceding figures. VII, the posterior division of the portio dura.

skull of *Notidanus*, though fundamentally of a low type, is greatly modified so far as the jaws are concerned. What first led me to suspect that this might be the case was the backward position of the articular end of the suspensorium and the relative length of the gape—features in which the skull of *Notidanus* differs from that of ordinary Selachians as an old frog differs from a young one.

The palato-quadrates cartilage of *Notidanus* has an inward process (*p*), which lies in a strong ligamentous band, by which it is attached to the skull between the optic and trigeminal foramina. This answers to the pedicle of the suspensorium in the Amphibia. From this point the palato-quadrates cartilage extends backwards, as a laterally compressed deep plate, the posterior and inferior extremity of which gives attachment to the mandible. The dorsal and anterior angle of this plate is attached only by ligament to the postorbital process, in the fœtus, but appears to articulate therewith in the adult. I think that there can be no doubt that this upward and backward extension of the palato-quadrates cartilage answers to the *otic process* in the amphibian. It has similar relations to the posterior division of the seventh nerve; and between it and the hyoidean arch lies the

\* See Gegenbaur, *op. cit.*

spiracle, in correspondence with its homologue the tympano-eustachian passage. The dorsal and posterior edge of this process no less clearly corresponds with the spiracular cartilage in *Cestracion*, otherwise absent in *Notidanus*. The hyoidean arch is attached to the periotic region of the skull. It is very slender; and though closely bound by ligament to the mandibular arch, close to the articulation of the mandible, it can contribute little or nothing to the support of the latter. Remove the great otic process of the palato-quadrate arch of *Notidanus*, and bring its quadrate end further forward, and the result would be a typically amphistylic skull, such as exists in the larval *Siredon* and *Triton*\*.

The relations of the skulls of *Notidanus*, *Cestracion*, and *Ceratodus* may be thus expressed:—

*Notidanus* most nearly approaches the amphistylic skull, such as exists in all the autostylic Vertebrata in the embryonic state; but it is considerably altered by the development of a great otic process from the mandibular arch.

In *Cestracion* the palato-quadrate has become massive, and, in the region of the pedicle, is firmly united with the skull, while the otic process is a separate cartilage, connected only by ligament with the postorbital process above and with the palato-quadrate below.

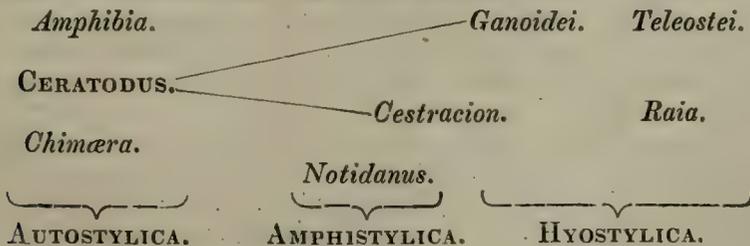
In *Ceratodus* the palato-quadrate has coalesced with the skull both by its pedicle and by its otic process; and the same change occurs in the autostylic skulls of the Amphibia.

In the ordinary Plagiostomes, on the other hand, the palato-quadrate becomes smaller and more freely united with the skull. The otic process (=spiracular cartilage) is smaller, and the hyomandibular takes a larger and larger share in suspending the mandibular arch to the skull, which is therefore eminently hyostylic.

Turning now to osseous fishes, the skull which presents the nearest resemblance to *Ceratodus* is that of *Polypterus*. This will be obvious to any one who studies the excellent description of the chondrocranium of this fish given by Dr. Traquair†.

But in the character of the palato-quadrate arch and the great relative size of the hyomandibular, the skull is as thoroughly and completely hyostylic as is that of any other existing Ganoid or Teleostean.

Thus, having regard only to the structure of the cranium, the relations of *Ceratodus* may be expressed as follows:—



\* P. Z. S. 1874, pl. xxxi. figs. 1 & 2.

† "The Cranial Osteology of *Polypterus*," Journal of Anatomy and Physiology, 1870.

### III. *The Pectoral Limb.*

In the memoir cited, Dr. Günther describes the limbs of *Ceratodus* and their skeleton as follows:—

“The limbs consist of two pairs of paddles, similar in appearance to the termination of the tail; viz. a longitudinal axis, formed by the endoskeleton and muscles and covered with scales, is surrounded by a broad rayed fringe. These paddles are structurally identical with the fins of *Lepidosiren*; only the axis and also the fringe are much dilated. The pectoral and ventral paddles taper to a fine point, the former being longer than the head, the latter rather shorter. The ventral paddles are inserted at a short distance in front of the vent” (p. 515).

“The paddle is joined to the scapular arch by an elongate, flattish, slightly curved cartilage; its proximal end has a glenoid cavity, fitting into the humeral condyle; the joint is simple, free, allowing of a considerable amount of motion, its parts being held together by a ligament fastened round its circumference. This is the only true joint in the limb, all the other parts being fixed to one another by connective tissue. I consider this cartilage to be the forearm; a horizontal section along its longitudinal axis does not show any primary division. The next following cartilage forms the base of the paddle; although externally it appears as a single flat, broad, short piece, unevennesses of its surface indicate that several primary pieces are coalesced in it.

“I am confirmed in this view by a horizontal section, in which the lines of the former divisions are preserved in the shape of tracts of a white connective tissue. Three such divisions may be distinguished, corresponding to the three carpals of most Plagiostomes\*. If this determination is correct, then the antibrachial cartilage just described is not represented in that order.

“The remaining framework of the paddle shows an arrangement unique among the Vertebrata. From the middle of the basal cartilage a series of about twenty-six subquadrangular pieces takes its origin, forming a longitudinal axis along the middle of the paddle to its extremity. The pieces become gradually smaller, and are scarcely distinguishable towards the end of the paddle. On the two posterior corners of each piece a branch is inserted, running obliquely backwards towards the margin of the fin; the branches of the first eight or twelve pieces are three-jointed, the remainder two-jointed, the last having no branch at all. Slight irregularities, such as the origin of two branches from one side of a central piece, occur, as also several four-jointed branches being inserted immediately on the basal cartilage” (pp. 532-3).

In general, this description suits the pectoral fins of the specimen I have described very well. Mine, however, has only twenty median cartilages. All but the very last bear lateral rays; but towards the distal end of the fin these become minute, and consist of a single piece. Moreover the distal joints are much more slender, especially

\* Pro-, meso-, and metapterygium of Gegenbaur.

the last. A more important point is that the second shows no trace of such divisions as those described by Dr. Günther. To make sure of this I made a thin microscopic section of this cartilage on the right side, and thereby satisfied myself of the homogeneity of the cartilage of which it is composed.

I find no true joint between the proximal median piece and the scapular arch, the connexion between the two being effected by a solid fibrous mass.

Again, the "slight irregularities" in the distribution of the rays, in respect of the median pieces, of which Dr. Günther speaks, are constant peculiarities of no small importance. This becomes obvious when the fin of *Ceratodus* is compared with that of other fishes. But before proceeding to this point I must make a few remarks on the normal and primitive position of the vertebrate limb, and on the changes from that normal position which take place in fishes on the one hand, and the higher Vertebrata on the other, as, for want of attending to this fundamental matter, grave errors have crept into the interpretation of the parts of the limbs of different vertebrates.

The fins occupy the normal position in such a fish as *Scyllium*. When the axis of the body is horizontal the plane of the fin is also horizontal. Its upper surface is covered by a continuation of the dorsal integument, and its lower surface by that of the ventral side of the body. The distinctive spotting of the dorsal aspect in the Dogfish makes this very plain; therefore, to adopt the nomenclature which I some time ago proposed, the convex thick edge of the fin is præaxial, while its concavo-convex thin edge is postaxial, and its two aspects look respectively upwards and downwards.

In *Ceratodus*, however, the fin has undergone a rotation upon its axis, in virtue of which its proper ventral surface looks more or less outwards, and its proper dorsal surface more or less inwards; and at the same time the præaxial edge is turned upwards, while the postaxial edge is turned downwards. This is very marked when the fin is applied to the trunk; but the primitive disposition of the surfaces and edges of the limb becomes obvious when the fin is made to stand out at right angles to the axis of the body.

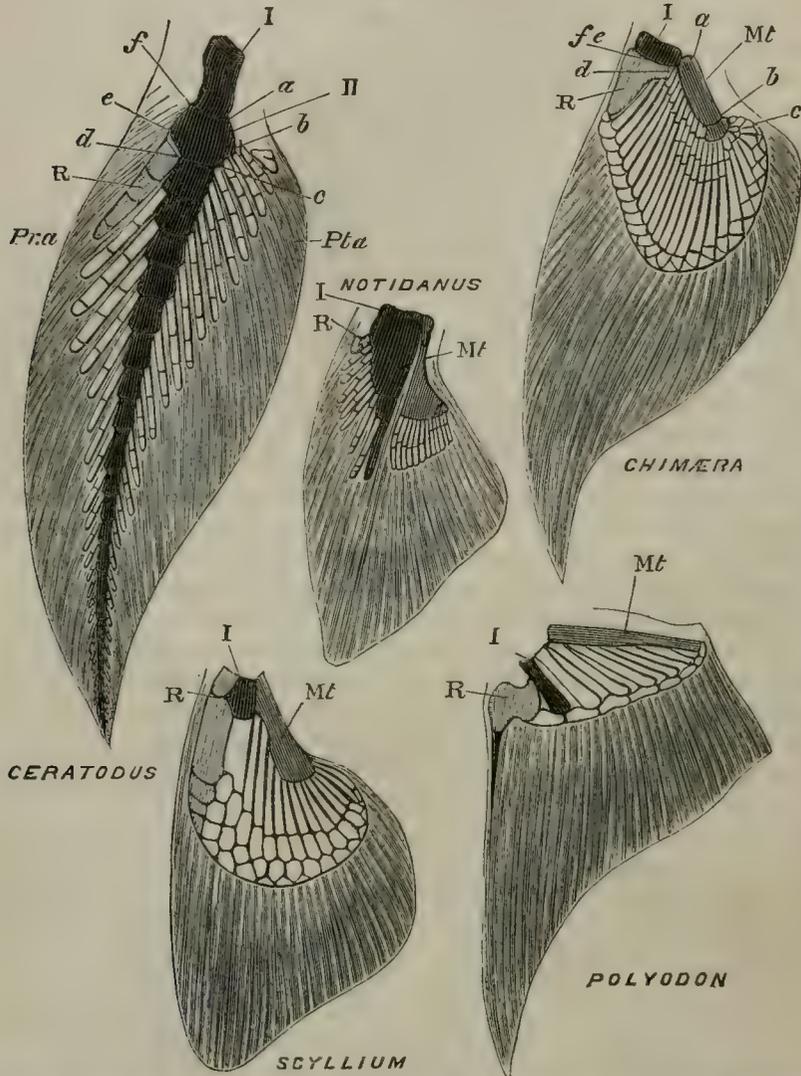
In *Acipenser*, as in any Teleostean fish, the rotation becomes still more marked; and divarication of the fin does not greatly diminish it, by reason of the articulation of the præaxial fin-ray with the pectoral arch at a point higher than the proper glenoid cavity.

When *Ceratodus*, or a Teleostean fish, is placed side by side with a Urodele Amphibian, such as *Menobanchus*, in which the fore limb naturally takes a position nearly parallel with the axis of the trunk, the manus being directed backwards, nothing is more natural than to imagine that the outer and inner aspects and the dorsal and ventral edges of the two correspond.

But a very little consideration will show that nothing can be more erroneous; for the outer surface of the *Menobanchus* limb is its proper dorsal aspect, and the inner surface is its ventral aspect, as will be seen the moment the limb is placed at right angles with the trunk. In fact, though in the amphibian, as in the fish, the limb

has undergone a twist, the direction of its rotation is exactly contrary to that which has occurred in the fish. Taking the left limb in each case, the normal fin would have to be turned in the direction of movement of the hands of a watch to bring it to the teleostean position,

Fig. 10.



The left pectoral fins of *Ceratodus forsteri*, *Notidanus cinereus* (fœtal), *Scyllium canicula*, *Chimera monstrosa*, and *Polyodon folium*.

The præaxial (*Pr.a*) and postaxial (*Pt.a*) margins of all are turned in the same direction; *R*, the præaxial ray (propterygium of Gegenbaur); *Mt*, the metapterygium; *I*, the basal or proximal joint of the axial skeleton.

while it would have to be turned in the contrary way to bring it into the amphibian position. Hence the præaxial edge in the teleostean fin is dorsal, while in the amphibian limb it is more or less ventral ;

and the skeletal elements on the dorsal side of the axis of the fish-fin answer to those on the ventral side of the axis in the amphibian limb.

As Dr. Günther has observed, the contour of the fin in *Ceratodus* is somewhat like that of a sickle. The præaxial edge is convex forwards and rather thicker, especially at its proximal end, than the posterior edge, which is concave backwards in its distal and convex in its proximal half. The apex of the fin is slender and recurved. A rounded and narrowed neck unites the limb with the trunk.

Thus the limb, as a whole, is essentially unsymmetrical when its postaxial and præaxial halves are compared. A corresponding asymmetry is strikingly obvious in the skeleton when it is prepared by removing the integument and muscles of the dorsal face, while the undisturbed condition of the parts is preserved by leaving the ventral integument and muscles untouched (fig. 10).

It will be seen that, on the præaxial side (*Pr.a*), each of the subquadrate segments of the median part of the skeleton, except the first and the terminal segments, gives attachment by its distal angle to a single jointed ray. The proximal or first ray (*R*) is much stouter than any of those which succeed it; and all take a direction approximately parallel to one another, their long axes forming an acute angle with that of the series of median segments. In the distal portion of the fin, the postaxial rays have a similar arrangement, and are only more slender than the præaxial rays. But the second segment bears no fewer than five rays. Of these, the proximal, which is shortest and slenderest, stands out at right angles to the axis of the series of median segments; while the others are gradually inclined at a less and less angle to it. The third segment and the fourth each carry two postaxial rays; the rest have but one.

Dr. Günther's figures show that, in his specimen also, the fourth and the third segments each bore two postaxial rays; but there are only four attached to the second segment, and all these are represented as if they had nearly the same inclination to the axis of the fin as the præaxial rays.

To dwell so strongly upon these minutiae may seem to be making a great deal of a very small matter; but its importance becomes manifest when the fin of *Ceratodus* is compared with that of other fishes.

In my "Preliminary Essay on the systematic arrangement of the Fishes of the Devonian epoch"\*, I made use of the term "Crossopterygian" to express a peculiarity which is very strikingly manifest in the fishes to which I applied it, the fin-rays of the paired fins being disposed, like a fringe, round an oval, or elongated, central space covered with scales. The Crossopterygii, however, were not defined by this character alone; and hence the fact that truly fringed fins are found beyond the limits of that group does not interfere with its perfectly natural character. In strictness, all fishes which possess paired fins are Crossopterygian in so far as the fin-rays always fringe the

\* Memoirs of the Geological Survey of the United Kingdom, decade x. 1861.  
 PROC. ZOOL. SOC.—1876, No. IV.

edges of the fin; and they differ only in the relative extent of the central area, on which the fin-rays do not encroach.

All the Chimæroids and Plagiostomes are eminently crossopterygian so far as their fins are concerned; and therefore we might expect to find in the skeleton of the pectoral fins of these fishes a modification of the skeleton of that of *Ceratodus*. But in most of these fishes the skeleton of the fins has undergone such an amount of metamorphosis that it is difficult to reduce it to the type of *Ceratodus*. In *Notidanus*\*, however, the skeleton of the pectoral fin affords the key to the nature of this metamorphosis. Here (fig. 10) there is an axial cartilage, the broad proximal end of which articulates with the pectoral arch. Distally it diminishes in diameter, and ends by a truncated face, with which another slender cylindrical cartilage, also axial in position, is articulated.

I take these two cartilages to represent the shrunken axis of the fin of *Ceratodus*. The præaxial basal angle of this axial mass is occupied by a distinct cartilage. Whether this represents the proximal axial cartilage of *Ceratodus*, or whether it is the proximal præaxial ray, is not clear.

The præaxial edge of the principal axial cartilage, at some little distance from this piece, presents a series of notches, with which are articulated a corresponding number of præaxial rays, while, as has been already stated, a single ray is articulated to the base of the terminal axial cartilage. The uppermost or proximal præaxial ray is two-jointed and broader than the others. On the postaxial side there is a triangular cartilage (*Mt*), wide distally, very narrow proximally, where it is connected with the proximal end of the axial cartilages. Twelve postaxial rays are articulated with the wide distal edge of this cartilage. I conceive that this triangular postaxial cartilage is formed by the coalescence of the axial ends of the postaxial rays.

The fin-skeleton of *Notidanus* thus results, in the simplest possible manner, from the shortening of the axis of such a fin-skeleton as that of *Ceratodus* and the coalescence of some of its elements.

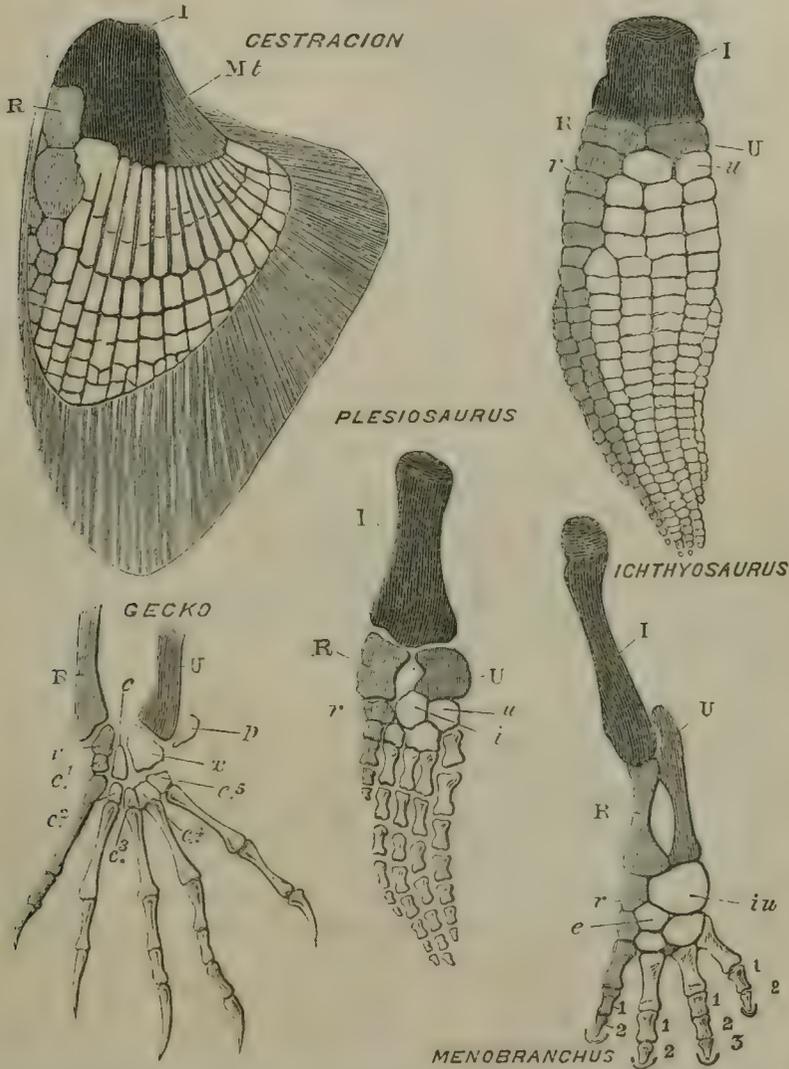
In *Cestracion* (fig. 11) the same process is carried a step further. Here there is a large cartilage (*I*) which articulates with the pectoral arch by a concave facet, and corresponds with the proximal axial cartilage of *Ceratodus* and *Notidanus*. United by ligament with its hinder concave margin is the triangular postaxial cartilage (*Mt*), which obviously answers to the similarly shaped postaxial cartilage of *Notidanus*, and which bears a series of postaxial rays, of which the first is directed almost at right angles to the axis of the fin, as in *Ceratodus*. The first præaxial ray (*R*) is very large and bifurcates distally. The ray which is attached to the distal angle of the axial cartilage probably answers to the ray-like termination of the axial skeleton in *Notidanus*; but it is not distinguishable from the rest.

In the Dogfish (*Scyllium*) (fig. 10) the further shortening of the axis gives rise to still greater changes. The axial cartilage (*meso-*

\* The figure represents the fin of the fœtal *Notidanus* to which I have already referred. The figure of the fin of an adult of the same species given by Gegenbaur (Untersuchungen, Heft ii. Taf. ix. fig. 2) shows essentially the same structure.

*pterygium* of Gegenbaur, I) is relatively small; but the enlarged post-axial cartilage (*metapterygium*, *Mt*) has extended upwards along the

Fig. 11.



The left pectoral fin of *Cestracion philippi* (letters as before), the left fore limbs of *Ichthyosaurus*, *Plesiosaurus*, *Menobranchus*, and the left manus of *Gecko verus*.

I, humerus; R, radius; U, ulna; r, radiale; i, intermedium; u, ulnare; c, centrale; c<sup>1</sup>, c<sup>2</sup>, c<sup>3</sup>, c<sup>4</sup>, c<sup>5</sup>, distal carpals; 1, 2, 3, phalanges of *Menobranchus*. In *Gecko* it is uncertain whether *x* represents the intermedium and the ulnare coalesced as in *Menobranchus* (*i u*), or whether *x* is the intermedium and *p* is the ulnare, occupying the place of a pisiform bone.

postaxial face of the first, until it has not only reached the articular surface of the pectoral arch, but furnishes a large part of the articular

cavity. In like manner the proximal præaxial ray (*propterygium*, *R*) has ascended along the præaxial face of the axial cartilage, until it also is able to furnish a facet which completes the anterior part of the cup for the condyle of the pectoral arch.

In *Squatina*, similar modifications have occurred; but the axial cartilage remains large, and the large præaxial and postaxial cartilages are directed respectively forwards and backwards, in accordance with the form of the vastly expanded fin.

In *Raia*, yet further expansion is obtained by the separation of the axial and postaxial cartilages and the interpolation of postaxial rays between them. The proximal ends of these enter into the articulation, as the great postaxial cartilage had already done.

The interpretation of the skeleton of the pectoral fin of *Chimæra* presents some difficulties. This skeleton consists (fig. 10) of:—(1) a proximal cartilage (*I*), which articulates by an excavated surface with the condyle of the pectoral arch; (2) a flat, curved, elongated middle cartilage (*Mt*), which is inclined backwards; (3) a small semi-lunar distal cartilage (*c*), which fits onto the convex distal end of the last. At the end of the convex posterior edge of the distal cartilage is a small cartilaginous ray, consisting of a long basal and a short terminal segment. Similar rays, which gradually become longer, follow this along the free convex edge of the distal cartilage and that of the middle cartilage; but the proximal end of the latter bears a much stronger ray, with a wide base (*R*), which for the most part unites with the ventral edge of the proximal cartilage (*I*), but is connected with the middle cartilage (*Mt*) by its posterior produced angle.

There can, I think, be no doubt that the proximal cartilage (*I*) in *Chimæra* answers to the proximal cartilage in *Ceratodus*. The small proximal postaxial cartilages also exactly correspond; and the large proximal præaxial rays no less closely answer to one another. But if this be so, it follows that the whole skeleton of the fin in *Ceratodus* is represented in that of *Chimæra*. The distal cartilage (*c*) in *Chimæra* is the result of the coalescence of the bases of a certain number of the postaxial rays, as is obvious on tracing the series round.

Hence it would appear that all that can represent the series of median segments except the first is the middle cartilage (*Mt*). It further seems probable that this middle cartilage in great part, if not wholly, represents the second segment of the *Ceratodus* limb. The postaxial edges, *a b* and *b c*, correspond closely; but the edge *e f*, long in *Ceratodus*, is reduced to nothing in *Chimæra*; while the edge *c d*, occupied exclusively by the third segment in *Ceratodus*, is greatly elongated and bears all the præaxial rays in *Chimæra*.

In order to change the skeleton of the pectoral fin of *Ceratodus* into that of *Chimæra*, all that will be necessary, if this comparison is correct, is that the third and following median segments of the former shall be gradually reduced, either by abortion or coalescence with the second, more and more postaxial fin-rays becoming attached

to the postaxial edge of the second segment, and more and more of the præaxial rays to its præaxial edge. At the same time the first præaxial ray, enlarging backwards and forwards, intercepts the proximal ends of two or three of the following rays, and comes into connexion with the proximal segment.

The difficulty which arises out of this apparently natural interpretation of the parts of the skeleton of the fin of *Chimæra* consists in this—that it leads to a doubt as to the true nature of the postaxial cartilage (*Mt*) in *Scyllium*, and therefore in other Plagiostomes. For this metapterygial cartilage cannot at the same time represent coalesced postaxial rays, as the analogy of *Notidanus* would suggest, and the second joint of the axial skeleton, as the analogy of *Chimæra*, on the interpretation just given, indicates. If, following the analogy of *Notidanus*, we consider *Mt* in *Chimæra* to be formed of coalesced postaxial fin-rays, then the structure will present no difficulty, but will come very near that presented by the fin of *Cestracion*. The study of the development of the parts can alone solve this problem; but I am inclined provisionally to adopt the latter hypothesis, plausible as the former seems.

*Polypterus* and *Polyodon* furnish the best connecting links between the Plagiostome fin and that of the other Ganoidei and the Teleostei. In *Polypterus*, the *Scyllium* type is essentially preserved. In *Polyodon* and all other Ganoids of which the fin-structure is known, the type is essentially that of the Rays, in so far as fin-rays enter into the glenoid articulation behind the proximal median segment (I). These and many other special modifications of the fish's fin have been carefully worked out by Gegenbaur\*, to whose excellent descriptions I have nothing to add.

If the interpretation which I have here endeavoured to make good is correct, it is clear that, as Gegenbaur has suggested, *Ceratodus* presents us with the nearest known approximation to the fundamental form of vertebrate limb, or *archipterygium*. But the asymmetry of the skeleton of the fin of *Ceratodus*, and the differences between its distal and its proximal portions, as well as the fact that the proximal median segment has no rays, appear to indicate that the veritable *archipterygium* has undergone a certain amount of modification even in *Ceratodus*. Analogy leads to the suspicion that a still more archaic fish than *Ceratodus* would have as many pairs of rays as median pieces. In this condition the skeleton would be made up of homologous segments, which might be termed *pteromeres*, each of which would consist of a *mesomere* with a præaxial and a postaxial *paramere*. And as this is the actual state of a great portion of the skeleton of the fin in *Ceratodus*, it may perhaps be permissible to carry speculation as to the primitive condition of the vertebrate limb thus far. Dr. Günther and Professor Gegenbaur go a step further, and suggest that even this *archipterygium* may be the secondary product of the coalescence of many longitudinal cartilaginous elements, which are united by their bases, while they fray out, as it were, at regular intervals towards the distal end of the limb. In this case,

\* 'Untersuchungen,' Heft ii. "Brustflosse der Fische," 1865.

Gegenbaur has most ingeniously suggested that the pectoral arch, with its limb, would correspond with a branchial arch and its rays.

It will be observed that the view of the special homologies of the elements of the skeletons of the fins of fishes which I have ventured to put forth differs, fundamentally, both from that suggested by Dr. Günther and from that advanced by Gegenbaur, either in its original form or as he has modified it subsequently to the discovery of *Ceratodus*.

The former says (*l. c.* p. 533):—"When I designated the arrangement of the parts of this pectoral skeleton unique, I did not mean to convey the idea that no homological relation could be pointed out between the parts of the pectoral skeleton of *Ceratodus* and that of other fishes. It is quite evident that we have here a further development of the simple pectoral axis of *Lepidosiren* in the direction towards the Plagiostomes. The pectoral skeleton of *Lepidosiren paradoxa* consists merely of the central series of cartilages of *Ceratodus*; there is no fin-like expansion of the skin of the pectoral limb, which is a simple tapering filament. In *Lepidosiren annectens* this pectoral filament is bordered by an expansion of the skin along its lower edge; and even minute fin-rays are imbedded in each lamina of the fold; in order to support this low, one-sided, rayed fringe, very small, single-jointed cartilages are added to the axis\*. The fin is still more developed in *Ceratodus*: it has become a broad, scythe-shaped paddle, dilated by a fold of the skin, with two layers of fin-rays surrounding it in its entire circumference; therefore supporting cartilaginous branches are added on both sides of the axis; and most of the branches are composed of several joints, in order to reach the more distant parts which require the support."

This is the exact converse of the view of the relations of *Lepidosiren* and *Ceratodus* which, in agreement with Gegenbaur, I am disposed to take. The fin of the former appears to me to be a reduced and metamorphosed state of the more primitive condition retained in *Ceratodus*.

Dr. Günther goes on to say that "the arrangement of the limb-skeleton of *Ceratodus* is foreshadowed in the pectoral fin of *Acipenser*." On the contrary, in my judgment, the pectoral fin of *Acipenser* has been derived by much modification from a *Ceratodus*-like type.

In referring to those points in which I venture to dissent from Professor Gegenbaur's interpretation, I cannot refrain from expressing my sense of the very great value of his investigations into the morphology of vertebrate limbs, and my grateful indebtedness to the rich fund of new facts and new ideas which they contain. However, I found myself unable fully to accept his theory of the fish's fin and the vertebrate limb generally, in its original form; and I expressed my hesitation and its grounds in the German version of my 'Manual of the Vertebrata' †. Gegenbaur's later view is con-

\* Four or five of these ray-bearers are obliquely attached to each joint of the axis (Peters, Müller's 'Archiv,' 1845, Taf. 2. fig. 2).

† 'Handbuch der Anatomie der Wirbelthiere,' übersetzt von Dr. F. Ratzel (Breslau, 1873), pp. 34, 35.

cisely stated in his 'Grundriss der vergleichenden Anatomie,' 1874, p. 493, in the following words:—

“The very various forms of the skeleton of the free limbs are deducible from a fundamental form of which only a few instances remain, and which, as representing the first and lowest condition of the fin-skeleton, I term the *archipterygium*. This is represented by a jointed cartilaginous *stem*, articulated with the pectoral arch and giving attachment, on each side, to a series of likewise jointed pieces, the *radii*. The whole structure, resembling a pinnate leaf, is singularly like the supporting apparatus of many Selachian gills, and thus throws a gleam of light upon the phylogeny of the limbs.

“*Ceratodus* presents this form of fin-skeleton, which was perhaps usual among the *Crossopterygida*, at present represented only by *Polypterus*. The biserial rays of the fin undergo different modifications. Among the Dipnoi the medial [postaxial] rays are retained in the form of thin rods of cartilage; while in the Selachians the lateral [præaxial] rays attain a considerable development and constitute the greater part of the massive fin-skeleton. Of the medial [postaxial] rays but few remain, though they are sufficiently distinct to sanction the assumption of a former more extensive biserial arrangement of rays on the stem of the fin.”

The *metapterygium* Gegenbaur considers to answer to the axial skeleton of the *archipterygium*. The *propterygium* is formed by the union of the proximal præaxial fin-rays. The *mesopterygium* is formed by a certain number of the succeeding præaxial fin-rays.

The only part of this interpretation with which I can agree is the determination of what Gegenbaur names the propterygium as the representative of the proximal præaxial fin-ray or rays in most cases, but not in *Chimæra*, and probably not in *Notidanus*.

In my judgment, the mesopterygium of Gegenbaur is the proximal piece of the axial skeleton, which constantly retains its primary articulation with the pectoral arch. His propterygium represents the proximal præaxial fin-ray, and his metapterygium the proximal postaxial fin-ray in almost all cases; and the *ichthyopterygium*, as the typical fish-fin may be termed, differs from the archipterygium not by the more or less complete suppression of the postaxial rays, but by the general abbreviation of the whole skeleton and the gradual connexion of more or fewer fin-rays (*parameres*) with the pectoral arch.

In the effectual discharge of the function of the fish's fin, increase of breadth is needed; and this increase of surface is obtained by the gradual approximation of more and more lateral elements of the archipterygium to the shoulder-girdle.

Professor Gegenbaur has extended his theory of the limbs to the higher Vertebrata. He conceives that the axis of the archipterygium (which he considers to be the homologue of the metapterygium of the Selachian) is represented by the series of bones which is formed by the humerus, the radius, the radial segments of the carpus, and the radial digit or pollex; while the ulna, the radial segments of the carpus and the ulnar digit, the other carpal bones, and the fourth,

third, and second digits represent so many præaxial rays. The very serious objection that this hypothesis makes the radius and the radial digit postaxial, while, as a matter of fact, in every vertebrate animal it is præaxial, is met by the assumption of a torsion of the humerus. But I must confess that I am wholly unable to satisfy myself of the existence of any torsion of the humerus capable of bringing about the effect attributed to it in any vertebrate animal; and, moreover, if such torsion has brought about the observed position of the manus and pes in the higher Vertebrata, any reversal of that torsion would destroy the homology of the pollex and the hallux—which is surely out of reach of doubt.

I am disposed to think, though I am far from imagining that the hypothesis can at present be demonstrated, that the higher vertebrate limb has arisen from the archipterygium in another and simpler method.

According to Gegenbaur's view, the higher vertebrate limb is the result of further progress, in the same direction, of the metamorphosis which has given rise to the ichthyopterygium. But this appears to me to be highly improbable. The ichthyopterygium is specialized *pari passu* with the other peculiarities of piscine structure, and is not developed in the Dipnoi, which are the nearest allies of the Amphibia. Moreover the higher vertebrate limb, which may be termed the *chiropterygium*, as an organ of support and prehension, requires length, strength, and mobility of its segments—conditions exactly the opposite of those which give the ichthyopterygium its special utility.

Hence, as the most highly specialized forms of ichthyopterygium result from the shortening of the skeleton of the fin, the approximation of its distal elements to the shoulder-girdle, and the multiplication of its rays, we might expect that the chiropterygium would take its origin by the lengthening of the axial skeleton, accompanied by a removal of its distal elements further away from the shoulder-girdle, and by a diminution in the number of the rays.

The parts which are traversed by a line drawn through the humerus, the intermedium, the centrale, the third distal carpal, and the third digit in the cheiropterygium may be regarded as so many mesomeres, representing the axis of the archipterygium. Two pairs of parameres are retained on each side. The præaxial are:—(1) the radius, the radiale, the first distal carpal, and the pollex; (2) the second distal carpal and the index. The postaxial parameres are:—(1) the ulna, the ulnare, the fifth distal carpal, and the digitus minimus; (2) the fourth carpal and the annularis.

In fig. 11 the skeleton of the pectoral fin of *Cestracion* is represented side by side with the skeleton of the fore limbs of *Menobranchus*, *Ichthyosaurus*, *Plesiosaurus*, and *Gecko*; and the shading of the different parts of the ichthyopterygium is repeated in what I suppose to be the homologous elements of the chiropterygium. In the case of *Menobranchus*, however, it is possible that the true pollex is suppressed, and that the actual radial digit represents the second of the pentadactyle limb, and therefore should have been left unshaded.

In accordance with the view thus suggested, the humerus in the chiropterygium is the homologue of the proximal mesomere or joint of the axis of the archipterygium, while the radius and the ulna are the homologues of the proximal ends of præaxial and postaxial parameres of the archipterygium.

The confirmation or refutation of this hypothesis is to be sought in development, and in the condition of the limbs in those Palæozoic Amphibia which may have more nearly approximated to Dipnoi than any existing or extinct forms at present known. I suggest it mainly in the hope of stimulating investigation in both these directions.

#### IV. *Taxonomy of Ceratodus, and Remarks on the Classification of Fishes.*

The indications afforded by the brain, the skull, and the limbs of *Ceratodus* are sufficient to show that it occupies a curiously central position among the Ichthyopsida, being allied on one side to the Amphibia, on another to the Chimæroidei and Plagiostomi, and on yet another to the Ganoidei—especially to that group of the Ganoids which I have termed *Crossopterygidæ*, and to the affinities of which with *Lepidosiren* I called attention in 1861.

But even *Dipterus*, which approaches *Ceratodus* and *Lepidosiren* so closely in its dentition and in the form of its fins, is far more similar to *Polypterus* and *Amia* in other respects; and there is, at present, no reason to believe that any of the Crossopterygian Ganoids possessed other than a hyostylic skull, or differed from *Polypterus* in those respects in which *Polypterus* differs from the existing Dipnoi. All known Crossopterygians have jugular plates, of which there is no trace in the Dipnoi. And as to the position of the anterior nares, which appear to have been situated on the under face of the broad snout, not only in *Dipterus*, but in *Osteolepis* and *Diplopterus*, I have shown above that, so far from being a diagnostic character of the Dipnoi, it is simply an embryonic feature retained in them, the Selachians, and very probably in many of the early Ganoidei. On the other hand, in *Amia*, there is an even closer approximation between the Ganoids and the Teleosteans than can at present be shown to exist between any Ganoids and the Dipnoi; while the differences between the Dipnoi and the Chimæroidei, and between the Chimæroidei and the Plagiostomi respectively, are not less than those between the Ganoids and the Dipnoi.

It seems to me, therefore, that by forming the Dipnoi, Ganoidei, Chimæroidei, and Plagiostomi into a group of "Palæichthyes," from which the Teleostei are excluded, as Dr. Günther proposes to do, the differences between the Teleostei and the other hyostylic fishes are brought into undue prominence, and that it is better to retain the Müllerian groups of Dipnoi (*Sirenoidei*, Müller), Ganoidei, Teleostei, Plagiostomi, and Chimæroidei (*Holocephali*, Müller) as equivalent and distinct natural assemblages.

In discussing any system of classification, however, it must be

recollected that known forms certainly represent but a portion, and probably a small portion, of those which have existed, and that the most natural groups are therefore, to a great extent, the result of the influence of extraneous, and what may be properly termed accidental, conditions.

It has occurred to me that, in the present state of science, it is very desirable to have some mode of stating the facts of morphology in a condensed and comprehensible form, which shall be purely objective and free from speculation; and I now proceed to illustrate my meaning by drawing up a scheme of the morphology of the Ichthyopsida.

Looking at the animals included under this head as a whole, or at the development of any of the higher members of the group, it is observable that they present a certain series of stages of differentiation marked by the broad characters of the skull, the nature of the olfactory and respiratory organs, and the development or non-development of an opercular fold of the integument.

Thus the skull either retains its primitive segmentation (*Entomocrania*), or the primitive segmentation is lost, and a chondrocranium is developed (*Holocrania*). There are two external nostrils (*Amphirhina*) or only one (*Monorhina*).

A *pneumatocæle*, or air sac, which may become either an air-bladder or a lung, is developed (*Pneumatocæla*), or not (*Apneumatocæla*); and a fold of the integument may cover the branchial apertures (*Operculata*), or not (*Inoperculata*).

The Ichthyopsida also exhibit a series of stages of differentiation of the limbs, being either apodal or pedate; and, when pedate, having the limb-skeleton constructed upon the type of the archipterygium, or on that of the ichthyopterygium, or on that of the chiropterygium.

Moreover, when the limb is an ichthyopterygium, it may possess one, or at most two basal elements, which articulate with the pectoral arch (unibasal), or there may be three (tribasal), or there may be many (multibasal), in accordance with the greater and greater divergence of the fin from the archipterygial type.

The chondrocranium may be constructed upon either the amphistylic, the hyostylic, or the autostylic plan.

Now, if the stages of general differentiation be indicated by points on a vertical line from which horizontal lines are drawn, and the stages of subordinate differentiation of the skull and limbs be indicated by points on a horizontal line from which vertical lines are drawn, we shall have vertical series of intersections indicating general differentiation, and horizontal series of intersections indicating special differentiation. Every known form will occupy some given intersections, and the unoccupied intersections will indicate unfulfilled, or unknown, possibilities of organization.

The following Table exhibits the groups of the Ichthyopsida arranged according to this scheme.

I. HOLOCRANIA.

A. Amphirhina.

α. Pneumatocœla.

1. operculata.

2. inoperculata.

β. Apneumatocœla.

1. operculata.

2. inoperculata.

B. Monorhina.

1. operculata.

2. inoperculata.

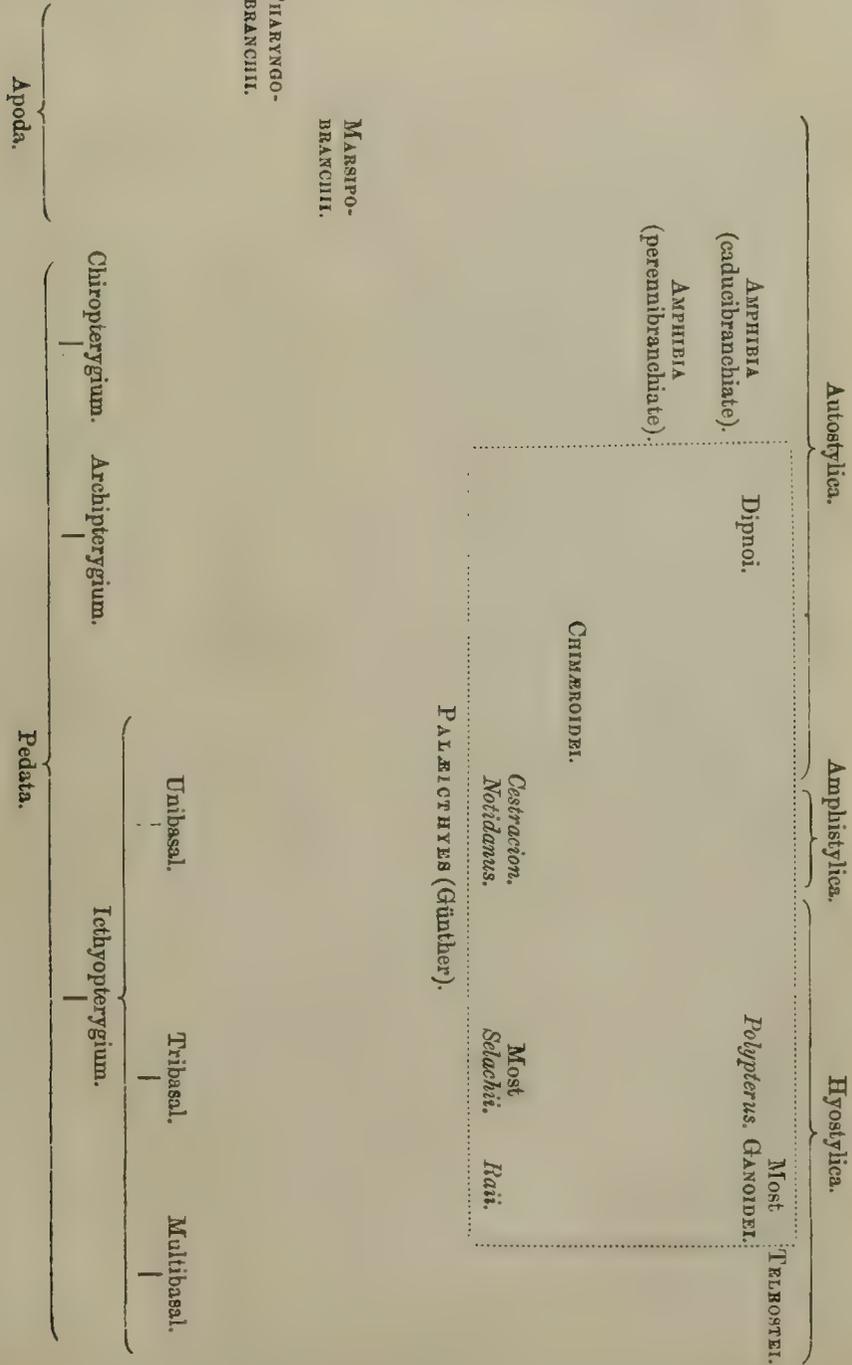
II. ENTOMOCRANIA.

1. operculata.

2. inoperculata.

МАРСПО-  
БРАЧНИИ.  
ПЛАВУНГО-  
БРАЧНИИ.

МАРСПО-  
БРАЧНИИ.



January 18, 1876.

Robert Hudson, Esq., F.R.S., V.P., in the Chair.

The following papers were read :—

1. On a Peculiarity in the Carotid Arteries, and other Points in the Anatomy, of the Ground-Hornbill (*Bucorvus abyssinicus*). By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

[Received December 10, 1875.]

A specimen of *Bucorvus abyssinicus* having recently died in the Society's Gardens, I have had the opportunity of examining the anatomy of that genus for the first time. In all respects, except the one to be referred to as regards its arterial system and a minor myological feature, it agrees with *Buceros*. As is the case in all the Bucerotidæ, there was not a trace of fat to be found on any part of the body of the adult bird, though it may be present in young individuals; and the air-cells extended so extensively among the muscles that on removing the skin no dissection was required to display each muscle from origin to insertion. The muscular tissue was also strikingly compact and dry, as in the Hares among mammals, in which animals also it is known that fat is never deposited. The oil-gland, as in *Buceros*, instead of being simply tufted, was also covered with a dense mat of short feathers, about a square inch in area.

In *Buceros*, as in most birds, the two carotid arteries, immediately they separate from their respective innominate arteries, converge, and meet before they have gone any considerable distance up the neck, to run together in the median hypapophysial canal on the anterior surface of the cervical vertebræ. In some Parrots the left carotid, instead of coursing the above-mentioned canal with its fellow, runs up along the side of the neck together with the left pneumogastric nerve to reach the head. In *Bucorvus*, in the specimen dissected by me at least\*, a further extension of this peculiarity obtains; for both the carotids, instead of meeting and running together, course up the sides of the neck in company with the pneumogastric nerves and jugular veins of their respective sides, as they do in mammals, and in no other birds, as far as I am aware. Another peculiarity is, that these abnormally placed carotids are particularly small in calibre; and I noticed that the vertebrals were as conspicuously large, evidently to make up the blood-supply of the head.

As to the visceral anatomy, it may be mentioned that the uniformly cylindrical crop leads, through the zonary proventriculus, to the stomach, which is much like that of *Buceros*†, but more muscular, and with the dense epithelial lining much more firmly

\* A second specimen, since received, entirely agrees with the above description.

† *Vide* Trans. Z. S. vol. i. pl. xviii. p. 122.



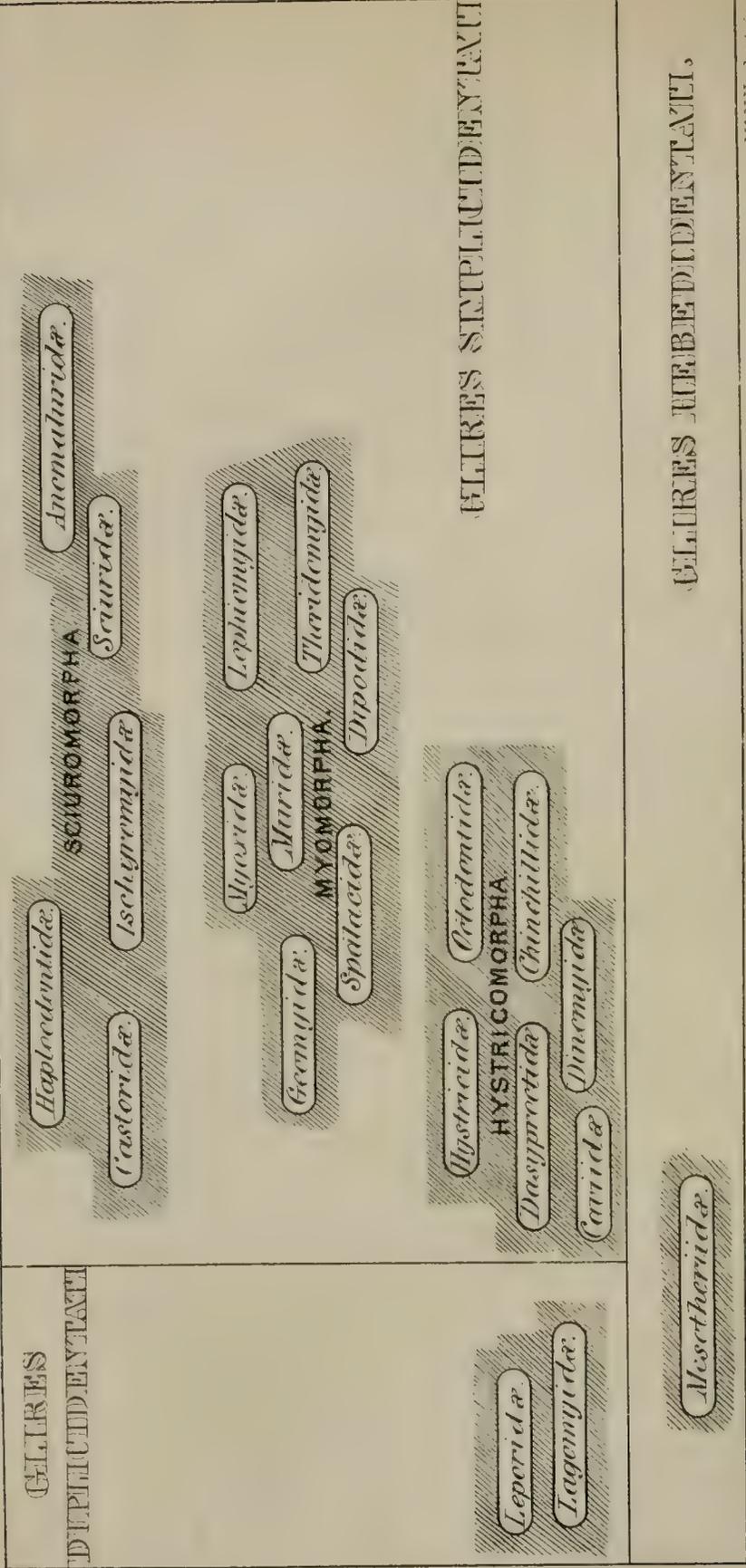


CHART OF FAMILIES OF THE ORDER GLIRES.

attached. The intestines are particularly capacious, being quite an inch in diameter; they are four feet in length, and have no colic cæca connected with them. The liver has a gall-bladder; and the left of the two lobes which go to form it is a little the smaller. In the syrinx there is a pair of intrinsic muscles to the first bronchial half-ring. The tongue is almost as small as it is in the Pelicans.

Myologically, of the five muscles in the thigh, which, in my estimation, are specially significant\*, the ambiens is absent, as are the femoro-caudal and the accessory femoro-caudal, the semitendinosus and the accessory semitendinosus being well represented. In this respect *Bucorvus*, therefore, differs from *Buceros* and *Toccos*, the accessory femoro-caudal muscle being present in the two latter genera. As is most probably known to many, *Bucorvus* walks, placing one foot in front of the other, whilst *Buceros* always hops, with both feet together.

## 2. On the Classification of the Order Glires.

By EDWARD R. ALSTON, F.G.S., F.Z.S.

[Received December 14, 1875.]

(Plate IV.)

The following attempt at a natural arrangement of the gnawing mammals is the result of a revision of the genera of that order, undertaken at the suggestion of Professor Flower, on which I have been for some time engaged.

In laying it before the Society it may be well to say at once that the proposed classification has few claims to novelty, being in fact a modification of that first suggested by Mr. Waterhouse, and since improved by Professors Gervais, Brandt, and Lilljeborg. Nevertheless I have found it necessary to propose several changes in the arrangement of the families and subfamilies, as well as rectifications in their nomenclature. I have also taken the fossil forms into consideration, and have thereby been compelled to propose the establishment of a new suborder. Lastly, I have endeavoured to bring the whole up to a level with the improved state of our knowledge, which has gained much of late years from the labours of Milne-Edwards, Gray, Günther, Leidy, Coues, and others, but, above all, from those of Dr. Peters.

The order *Glires* has always been a stumbling-block to naturalists, owing to the immense number and variety of the forms which it includes, and to their puzzling cross-relationships to one another. Nor has palæontology here yielded, save in a few instances, the same help which she has lent the student of some other orders of mammals; for most of the fossil rodents yet discovered are referable to families which still exist, and are often closely allied to recent genera.

\* P. Z. S. 1873, p. 626, and 1874, p. 111.

These difficulties were insuperable as long as zoologists placed their trust in outward appearances; and when sounder principles gained ground it was some time before the necessary anatomical data could be collected. Without detailing all the classifications which have been proposed within the last fifty years, I must briefly mention the memoirs of the four zoologists on whose labours, as already stated, the following proposed arrangement is chiefly based.

In 1839, Mr. G. R. Waterhouse, then Curator of this Society, published the first of a series of essays in which he may confidently be said to have laid down the groundwork of a natural arrangement of this order\*. Unfortunately, as the mammalogist must think, this accurate and thoughtful zoologist has long since turned his attention to other departments, and only a small portion of his great work on the Rodentia ever appeared†. In his first papers Mr. Waterhouse, taking the characters of the skull and mandible as his chief guides, arranged the Rodents into three great families, the *Murina*, *Hystričina*, and *Leporina*, with twelve subfamilies. Continuing his labours for ten years, his views were naturally changed on many points. Latterly he separated the *Sciuridæ* as a group equal in value to the other two, the following being the arrangement of families and subfamilies adopted in his later writings:—

#### RODENTIA.

- |                            |                          |
|----------------------------|--------------------------|
| I. <i>Sciuridæ</i> .       | III. <i>Hystričidæ</i> . |
| II. <i>Muridæ</i> .        | 1. <i>Hystričina</i> .   |
| 1. <i>Sacomomyina</i> .    | 2. <i>Dasyproctina</i> . |
| 2. <i>Dipodina</i> .       | 3. <i>Echimyina</i> .    |
| 3. <i>Ctenodactylina</i> . | 4. <i>Octodontina</i> .  |
| 4. <i>Murina</i> .         | 5. <i>Chinchillina</i> . |
| 5. <i>Spalacina</i> .      | 6. <i>Caviina</i> .      |
| 6. <i>Arvicolina</i> .     | IV. <i>Leporidæ</i> .    |
| 7. <i>Bathyergina</i> .    |                          |

In 1848 Professor Gervais published an arrangement of this order, in which he instituted two principal sections or suborders‡. The first of these included the ordinary Rodents with only one pair of incisors above and below; the second consisted of those with two pairs in the upper jaw, and was consequently equivalent to Illiger's group *Duplicidentæ*§. The following was Professor Gervais's arrangement of the families:—

\* "Observations on the Rodentia," Mag. Nat. Hist. iii. pp. 90-96, 184-188, 274-279, 593-600; Ann. Nat. Hist. viii. pp. 81-84, x. pp. 197-203 (1839-42). "On the Geographical Distribution of the Rodentia," P. Z. S. 1839, pp. 172-174. "Order Rodentia," Keith Johnston's Physical Atlas, Phytology and Zoology, map. 5, letterpress (1849).

† Natural History of the Mammalia, vol. ii. "Rodentia." London 1848 (includes only the families *Leporidæ* and *Hystričidæ*).

‡ Dict. Univ. d'Hist. Nat. xi. p. 202 (1848); Ann. Scien. Nat. 3<sup>me</sup> sér. t. xx. pp. 245, 246 (1853).

§ Prod. Syst. Mamm. p. 91 (1811).

## GLIRES.

- |                                |                                    |
|--------------------------------|------------------------------------|
| I. <i>Rongeurs ordinaires.</i> | 6. Lagostomidæ.                    |
| 1. Sciuridæ.                   | 7. Hystricidæ.                     |
| 2. Pseudostomidæ*.             | 8. Caviadæ.                        |
| 3. Muridæ.                     |                                    |
| 4. Dipodidæ.                   | II. <i>Rongeurs duplicidentés.</i> |
| 5. Ctenomydæ.                  | 9. Leporidæ.                       |

In 1855 appeared Professor J. F. Brandt's learned and elaborate review of the cranial structure and classification of recent Rodents†. On the whole he adopted Mr. Waterhouse's arrangement; but recognizing the fact that his four groups were of more than family value, he raised them to the rank of suborders. He also made several changes in the arrangement of the families and the position of some of the more doubtful forms, and imposed new names on all the divisions, which he arranged in the following order:—

## GLIRES.

- |                         |                             |
|-------------------------|-----------------------------|
| I. <i>Sciuiomorphi.</i> | III. <i>Hystricomorphi.</i> |
| 1. Sciuroïdes.          | 8. Hystricoïdes.            |
| II. <i>Myomorphi.</i>   | 9. Spalacopodoïdes§.        |
| 2. Myoxoïdes.           | 10. Eriomyoïdes  .          |
| 3. Castoroïdes.         | 11. Hemionyochoïdes¶.       |
| 4. Sciurospalacoïdes‡.  | IV. <i>Lagomorphi.</i>      |
| 5. Myoïdes.             | 12. Lagoïdes.               |
| 6. Spalacoïdes.         |                             |
| 7. Dipodoïdes.          |                             |

Eleven years later Professor Lilljeborg published his admirable systematic review of this order\*\*. Appreciating the great importance of the characters which separate the *Leporidæ* and *Lagomyidæ* from all other rodents, he adopted Gervais's two suborders under the names *Glires Simplicidentati* and *Glires Duplicidentati*. In the arrangement of the former he pointed out a well-marked and constant character which separates the *Myomorphi* of Brandt from both the *Sciuiomorphi* and the *Hystricomorphi*, namely the complete ankylosis in the former of the lower part of the tibia and fibula. Although Professor Lilljeborg does not retain these divisions in his tabular arrangements, he observes that the *Myomorphi* include the

\* *Sacomomyina*, Waterhouse.

† J. F. Brandt, "Untersuchungen über die craniologischen Entwicklungsstufen . . . und Classification der Nager der Jetztwelt," Mém. de l'Acad. Imp. de St. Pétersbourg, 6<sup>me</sup> série (Sciences Naturelles), vii. pp. 127-336, 12 pls. (1855).

‡ Containing *Geomys* and *Thomomys*.

§ Equal to *Echimyina* and *Octodontina* of Waterhouse.

|| *Chinchillina*, Waterh.

¶ Equal to *Dasyproctina* and *Caviina*, Waterh.

\*\* Systematisk Öfversigt af de Gnaagande Däggdjuren, *Glires*. 4to. Upsala, 1866.

first *six*, the *Sciuromorphi* the *seventh*, and the *Hystricomorphi* the *eighth* to *eleventh* families in the following Table :—

## GLIRES.

- |                             |                             |
|-----------------------------|-----------------------------|
| I. <i>Simplicidentati</i> . | 8. Haploodontidæ.           |
| 1. Muridæ.                  | 9. Chinchillidæ.            |
| 2. Spalacidæ.               | 10. Spalacopodidæ.          |
| 3. Dipodidæ.                | 11. Hystricidæ.             |
| 4. Myoxidæ.                 | II. <i>Duplicidentati</i> . |
| 5. Saccomyidæ.              | 12. Lagomyidæ.              |
| 6. Castoridæ.               | 13. Leporidæ.               |
| 7. Sciuridæ.                |                             |

In his recent work on Scandinavian mammals\*, Professor Lilljeborg retains the above arrangement, adding a new family, allied to the Muridæ, for the reception of Milne-Edwards's genus *Lophiomys*.

As it became clear that the cranial characters of the groups proposed by Waterhouse and Brandt are liable to exceptions, and that they are connected by more or less intermediate forms, they have not been regarded with favour by recent systematic writers; nevertheless the affinities which they indicate have been very generally accepted in the arrangement of the families. But if a group is a natural one, it should not, I think, be rejected because it is difficult to characterize. The Insectivora may be taken as an example of a very natural order, of which, in Professor Huxley's words, "it is exceedingly difficult to give an absolute definition." Even if it were not possible to separate the first three of Waterhouse's great families by perfectly constant characters, they ought, as it appears to me, to be recognized as indicating three distinct lines of development. But by the help of the characters of the leg-bones, pointed out by Professor Lilljeborg, the difficulty is overcome. In the few cases in which the cranial differences fail us in separating the sciurine rodents from the murine, and the latter from the hystricine, the complete ankylosis of the lower part of the tibia and fibula in the second group comes to our aid. As far as I am aware, there is no real exception to this rule; for the union between these bones sometimes observed in the genus *Pteromys*, in aged individuals of *Castor*, and in several of the hystricine series, is totally different from the true fusion which we meet with in all the known *Myomorphi*. The first and third groups, which agree with one another in this point, are at once separated from each other by the form of the mandible, as well as by the whole type of cranial structure.

But while recognizing these groups as true and natural, I cannot consider them to have any thing like the rank of Brandt's *Lagomorphi*, and rather treat them as sections of Lilljeborg's suborder *Glires Simplicidentati*, of somewhat similar value to the sections instituted by Turner and Flower in the *Carnivora fissipedia*.

Before proceeding to some general remarks on these various divisions, it should be premised that an absolutely equal value is not

\* *Sveriges och Norges Rygradsdjur*, I. Däggdjuren. Upsala, 1874.

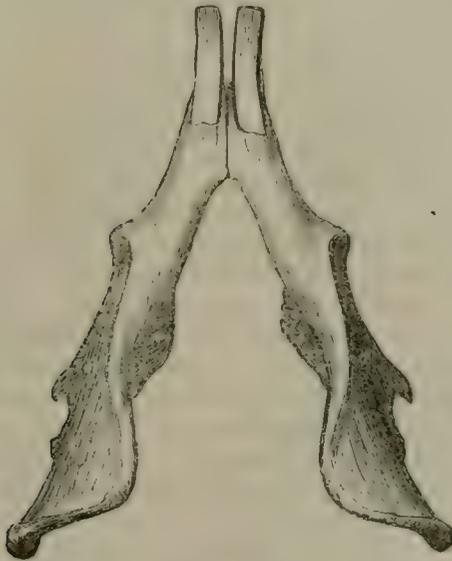
here claimed for all the families and subfamilies. Such is the variety of the extent of differentiation that it appears to me that no Procrustean standard can be applied. Either we must load our memories with tribes, legions, cohorts, series, superfamilies, &c., or we must be content with divisions pretending only to an *approximate* equality of value.

*General Remarks.*

The first suborder of Rodents, GLIRES SIMPLICIDENTATI, contains an enormous majority of both the recent and extinct forms, and is at once proved by its dentition to be the most highly specialized division of the order. There is only one pair of incisors above and below at all ages; and their enamel is restricted to their front surface. In the skull, the incisive foramina are moderate and separate, the optic foramina are very rarely confluent, and there is an alisphenoid canal\*. The fibula is either ankylosed below to the tibia or free, and does not articulate with the calcanium. Vesicular glands are present; and the testes are usually abdominal, only temporarily descending into the scrotal pouches†.

Of this suborder the first section, *Sciuromorpha*, has for constant characters the combination of a peculiar form of mandible with

Fig. 1.



Mandible of *Arctomys marmotta*.

the persistence of the fibula as a distinct bone throughout life. The former character at once separates it from the *Hystriomorpha*, the latter from the *Myomorpha*. In the mandible the angular portion springs from the lower edge of the bony covering of the inferior incisor, not from its outer side: and its outline is more or less rounded.

\* Cf. Turner, P. Z. S. 1848, p. 65. † Cf. Owen, Anat. of Vert. iii. p. 649.

The difference between the mandible characteristic of the *Sciuromorpha* and *Myomorpha* and that peculiar to the *Hystricomorpha* will be best shown by a comparison of the figures\*. In the more typical forms the infraorbital opening is not enlarged to give passage to a portion of the masseter muscle; and in all the malar extends far forward, and is not supported below by a continuation backwards of the maxillary zygomatic process. The incisive foramina are small, and confined to the intermaxillaries; the foramina of the base of the skull are proportionally small; and there is no interpterygoid canal†. The clavicles are always perfect, the posterior ridge of the scapula is strongly developed, and the acromion is broad and flattened. Externally the muffle is naked, the upper lip usually cleft, the nostrils rounded above and comma-shaped, the ears hairy, and the tail cylindrical and well haired, except in *Castor*, in which it is flattened and scaly.

The typical family, the *Sciuridæ*, easily distinguished by their postorbital frontal processes, has been divided for convenience into two subfamilies, the long-tailed arboreal Squirrels (*Sciurinae*), and the short-tailed terrestrial Marmots (*Arctomyiinae*), though it must be confessed that their differences are merely adaptive and not very striking. The other families are all more or less aberrant, and their true affinities have been the subject of much discussion.

The first of these is the *Anomaluridæ*; and I have already‡ given my reasons for considering that it must be regarded as an undoubted though specially differentiated family of this section. The sciurine affinities of the *Haplodontidæ*, in spite of its peculiar dental and cranial characters, have been definitely established by Dr. Peters§, although Prof. Lilljeborg has strangely relegated it to the *Hystricomorpha*¶. The position of the remaining family, *Castoridæ*, has been a still more vexed question, ever since the Beaver has been extricated from the old jumble with the Musquash and the Coypu. Professor Gervais appears to have been the first to treat *Castor* as an aberrant member of the present group¶, in which Mr. Waterhouse\*\* and Professor Baird†† have concurred; and although these writers have not been generally followed, it seems evident to me that we must revert to their views. Professor Brandt fully recognized that in all the more important points the osteology of *Castor* agrees with that of the *Sciuromorpha*, but considers this resemblance to be negated by the external *habitus* and manner of life, as well as by the structure of the teeth, feet, and tail‡‡. Prof. Lilljeborg places the

\* By permission of Professor Flower the illustrations have been drawn from specimens in the Museum of the Royal College of Surgeons.

† This name was proposed by Mr. Waterhouse for the fissure which in some rodents leads from the bottom of the pterygoid fossa into the orbit. Cf. Turner, P. Z. S. 1848, p. 63.

‡ "On *Anomalurus*, its Structure and Position," P. Z. S. 1875, pp. 88-97.

§ Monatsb. Ak. Berlin, 1864, p. 177. || *Op. cit.* p. 9.

¶ Dict. Univ. d'Hist. Nat. xi. p. 203.

\*\* Physical Atlas, Zool. map, 5 (letter-press).

†† North-American Mammals, p. 350.

‡‡ *Op. cit.* pp. 149, 150.

*Castoridae* among the *Myomorpha*, but on the boundary between them and the *Sciuromorpha*, remarking that the fibula is stout, and remains long separate from the tibia\*. But the characters of these bones seem to me to be strictly sciurine; for though they are more or less firmly attached to one another in aged individuals, yet they always appear to remain essentially distinct throughout their length. Less weight is now generally given to external characters than was the case when Prof. Brandt wrote; and the purely adaptive differentiation of the teeth, feet, and tail cannot be allowed to outweigh the numerous and important characters which are at once evident on a careful comparison of the skulls and skeletons of a Beaver and a Marmot. These external peculiarities, coupled with those of the digestive, excretory, and generative organs, certainly show that the *Castoridae* is a very isolated and aberrant family; but they do not appear to indicate any specially murine affinities.

Fig. 2.

Mandible of *Cricetomys gambianus*.

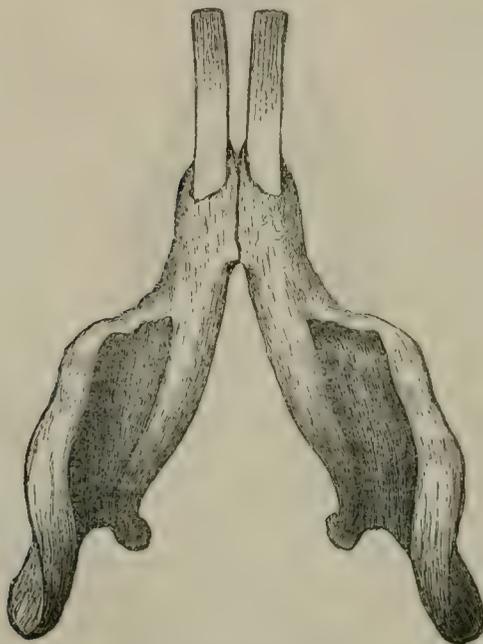
An interesting confirmation of these views as to the position of the Beaver is afforded by the fossil rodent of the American Miocene, to which Professor Leidy has given the name of *Ischyromys*. In this form the dentition of the typical *Sciuridae* is combined with a form of skull which very closely resembles that of the *Castoridae*, and especially that of the Miocene genus *Stenofiber*. It differs from both these groups, however, in the possession of a large infra-orbital opening, and should form, as it appears to me, a fifth family of the *Sciuromorpha*, under the name of *Ischyromyidae*†.

The second section, *Myomorpha*, is at once separated from either of the others by the single character of the complete fusion in the adult of the lower part of the tibia and fibula. Externally, the muffle and upper lip are as in the last section; and the tail is cylin-

\* *Op. cit.* pp. 7, 35.† *Cf.* Leidy, Journ. Acad. Philadelphia, 2nd ser. vol. vii. pp. 335-338, pl. xxvi.; Cope, Report U.S. Geol. Survey, 1873, p. 477.

drical, either covered with scales arranged in rings, or more or less hairy. The *Myomorpha* contains such a variety of forms, many of them much specialized, that it is only by allowing for exceptions that its definition can be carried further; still many and important distinctions are common to the vast majority. The form of the mandible, by which the section was first separated from the *Hystricomorpha*, agrees with the last section, the angular portion springing from the lower edge of the bony covering of the lower incisor, excepting in the subfamily *Bathyerginae*, in which it has exactly the form so characteristic of the hystricine rodents. The other cranial characters are very varied. In the more typical forms the infra-orbital opening has a peculiar shape, which may be termed *murine*; it is high, perpendicular, narrow, wider above than below; and the lower root of the maxillary zygomatic process is perpendicular and flattened into a thin plate with a rounded anterior edge. The zygoma is comparatively slender; the malar seldom advances far forward (except in the *Dipodidae*), and is usually supported below by a continuation backwards of the maxillary process, being reduced in some

Fig. 3.

Mandible of *Bathyergus maritimus*.

of the typical genera to a mere splint between the latter and the squamosal process. The outer walls of the pterygoid fossæ are generally obsolete; and they have no direct fissure at the bottom, except in the aberrant subfamily named above. The clavicles are perfect except in the *Lophiomyidae*.

Of the seven well-marked families into which this section may be divided, the typical one, the *Muridæ*, comprises a great number of genera. The best classification of these with which I am acquainted is that of Dr. Peters, which is here adopted with some little modification, his groups being ranked as subfamilies, and a slight alteration being made in their arrangement\*. M. A. Milne-Edwards having clearly proved that the genera *Ellobius* and *Siphneus* really belong to this family†, the subfamily *Siphneinæ* is now placed alongside of the *Arvicolinæ*, with which it is so nearly allied.

Of the other families, the *Myoxidæ* bear a very strong outward resemblance to the *Sciuromorpha*, which, however, is not markedly confirmed by their anatomy. Dr. Peters having shown that *Platacanthomys* must be removed to the *Muridæ*‡, the remaining genera of Dormice are all very closely allied, and are isolated from all other known rodents by the complete absence of the cæcum. The next family, *Lophiomyidæ*, contains a single form differing in structure not only from all the rest of the order, but even from all the known members of the mammalian class§. Nevertheless, if the extraordinary development of the temporal and malar regions be overlooked, the whole skull of *Lophiomys* is truly murine in type; and this is confirmed by all the other more important points in its anatomy. It is strange that, although its habits appear to be at least partly arboreal, *Lophiomys* should differ from all the rest of the section in the incomplete development of its clavicles.

The *Spalacidæ*, even when disencumbered by the removal of *Siphneus* and *Ellobius*, are still divisible into two subfamilies—the typical *Spalacinæ*, which have the normal mandible of the section, and the *Bathyerginæ*, in which are found the hystricine characters already mentioned (*suprà* p. 68), and which were hence named *Spalaces subhystriciformes* by Prof. Brandt. The next family, which includes the American rodents with cheek-pouches which open *outside* the mouth, was founded by Mr. Waterhouse under the name of *Sacommyidæ*, and subsequently divided by Prof. Baird into two subfamilies, *Geomyinæ* and *Sacommyinæ*. Dr. E. Coues, in a recent valuable memoir, has contended that these latter divisions should rank as separate though allied families||—a view in which I cannot agree. The diversity in their outward form may be paralleled by that in the Squirrels and Marmots; and the differences in their cranial structure are, as Dr. Coues himself observes, of a superficial nature. In any case, Mr. Waterhouse's name must be changed; for Dr. Peters has shown¶ that the genus *Sacomys* of Frederic Cuvier is in all probability, a synonym of Desmarest's *Heteromys*. The oldest and best-

\* The names only of these divisions appeared in the Monatsb. Ak. Berlin, 1866, pp. 13, 14.; for access to Dr. Peters's hitherto unpublished characters I am indebted to the courtesy of the author.

† Recherches pour servir à l'Hist. Nat. des Mammifères, pp. 71–129.

‡ P. Z. S. 1865, pp. 397–399.

§ Cf. A. Milne-Edwards, Nouv. Arch. du Mus. iii, pp. 81–118.

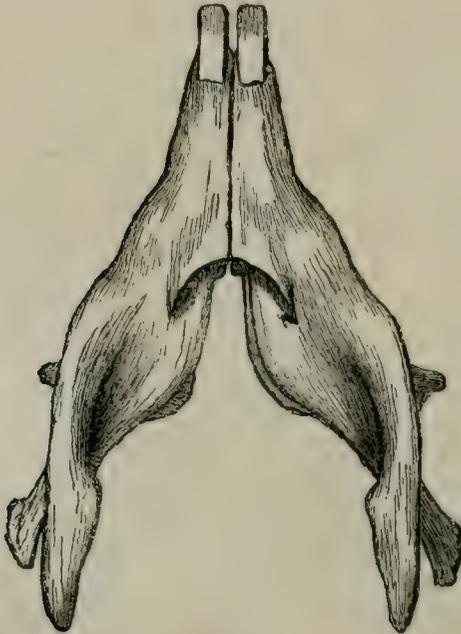
|| Rep. Explor. Colorado River, p. 215; Bull. U.S. Survey of Territories, 2nd ser. no. 2, pp. 81–90.

¶ Monatsb. Ak. Berlin, 1874, p. 354–359.

known genus will therefore legitimately give name to the family *Geomyidæ*, the subfamilies standing as *Geomyinæ* and *Heteromyinæ*.

Here I am inclined to place, at least provisionally, a family of Rodents which flourished in Europe in the later Eocene and Miocene periods, and of which three genera are known. Each of these was at first ascribed to a distinct family of the *Hystricomorpha*—namely, *Theridomys* to the *Octodontidæ*, *Archæomys* to the *Chinchillidæ*, and *Issiodoromys* to the *Caviidæ*. M. Gervais was the first to remove them entirely from that section, uniting the first two in his tribe *Théridomins* of the family *Myoxidés* (which also included *Anomalurus*). He placed *Issiodoromys* in his *tribu des Pédétins* of the *Dipodidæ*, but with the remark that it might have to be relegated to the *Théridomins*\*. That these animals were strictly myomorphine is clearly shown by the form of their mandibles. Now that *Anomalurus* has been definitely separated from the *Myoxidæ*, there seems to be nothing to unite these ancient rodents with that

Fig. 4.



Mandible of *Capromys pilorides*.

family; and, both in their very varied dentition and in what we know of their cranial characters, they appear to me to be very nearly related to the *Dipodidæ*—the two former to the true *Dipodinæ*, and the last to the *Pedetinæ*. Meantime it may be best to allow them to stand as a distinct family under the name of *Theridomyidæ*.

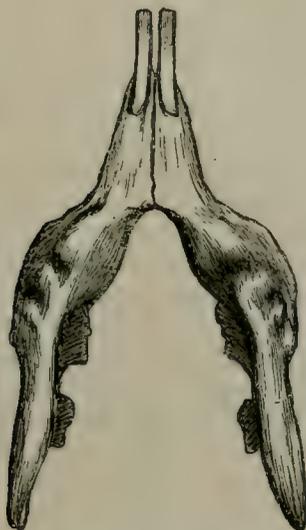
The last family of the *Myomorpha*, the *Dipodidæ*, is divisible into three plainly marked subfamilies—*Jaculinæ*, *Dipodinæ*, and

\* Zool. et Paléont. Franç. (2<sup>me</sup> ed.), pp. 31–36.

*Pedetinae*, of which the first is the most murine, and the second the most highly specialized, while the third shows more than superficial resemblances to the *Chinchillidae*.

The third section, *Hystricomorpha*, is characterized by the form of the mandible, combined with persistence of the fibula as a distinct bone throughout life. In the mandible the ascending ramus and coronoid process are low, and the angular portion does not spring from the lower edge of the bony covering of the lower incisor. In the great majority of forms in which that tooth is long, the angular portion springs from the outer side of its bony sheath, so that when viewed from below there is a longitudinal groove between the angular and dental portions. In the *Caviidae*, in which the incisors are short, "the direction of the incisor is such that, were it prolonged

Fig. 5.



Mandible of *Cavia aperea*.

backwards, the alveolus of the tooth and the angular portion of the jaw would hold the same relative positions" as in the other members of the section\*. This difference in the form of jaw will be best understood by a comparison of figures 4 and 5. In the skull the infraorbital opening is always large, oval or subtriangular, an interpterygoid fissure is present, and the foramina of the base of the skull are proportionally large, while the incisive foramina are small. The frontals have no distinct postorbital processes (except in *Chaetomys*); and the malar, which is rarely continued far forward, is not supported below by a continuation of the maxillary zygomatic process. The clavicles are either perfect or imperfect; and one premolar is present above and below (except in *Otenodactylus*). The upper lip is rarely cleft, the muffle is usually clad with very fine hairs, and the

\* Waterhouse, Nat. Hist. Mamm. ii. p. 149.

nostrils pointed above, sigmoid or linear. The ears are very generally emarginate behind; and the tail, when present, is cylindrical, hairy, scaly, or subnaked.

In the division of the hystricine Rodents into families much diversity of opinion has prevailed. Mr. Waterhouse, laying too great stress on dental characters, entirely separated the *Dasyproctina* from the *Caviina*, and placed them between the *Hystricina* proper and the *Echimyina*\*. Prof. Brandt reunited the two former in his family *Hemionychoides*, equivalent to the *Subungulata* of Illiger†. But the group thus formed is so ill defined that Prof. Lilljeborg found it impossible to separate it from the *Hystricidæ*‡. It seems to me that, although Mr. Waterhouse was certainly misled in entirely separating the Agoutis and Pacas from the Cavies and Capybara, they must still be ranked as distinct but allied families, and that the same value must be given to the curious form named *Dinomys* by Dr. Peters§. Accordingly I would recognize six families of the *Hystricomorpha*.

Of these the first, the *Octodontidæ*, consists of three subfamilies; for here, I think, must be placed the *Ctenodactylinæ*, formerly associated with the Jerboas, but of which the hystricine affinities have been established by Dr. Peters||. The other subfamilies are the *Octodontinæ* and *Echinomyinæ* of Mr. Waterhouse. Some of the genera of the latter make a close approach to the next family, the *Hystricidæ*, which in its turn is composed of two very distinct subfamilies, *Sphingurina* and *Hystricina*; for I cannot follow Professor Lilljeborg in relegating the former to the *Octodontidæ*¶, principally on account of their better-developed clavicles, which are probably an adaptive peculiarity connected with their arboreal habits. Of the remaining families the *Chinchillidæ* form a small but very natural group, connected in some characters with the *Dinomyidæ*; and the latter, again, has close affinities with the nearly allied *Dasyproctidæ* and *Caviidæ*. These latter families in many points, as in the mode in which their incisors wear down, their emarginated palates, and the large size of their basiscranial foramina, show a striking approach to the next great group of Rodents.

The second suborder, *GLIRES DUPLICIDENTATI*, containing only two families, is clearly less specialized than the first, and appears to be a survivor, representing a comparatively early stage in the development of the Rodent type. At birth, the upper jaw contains the normal number of incisors; but only the two inner pairs are retained; and of these the second remain very small, and are placed directly behind the large middle pair. In the mandible there is never more than one pair. Another important proof of the inferior degree of specialization in the *Glires duplicidentati* is the fact that the enamel of the incisors may be traced round to their posterior surface, though it is here much thinner than in front\*\*. Of cranial characters, it may be

\* Nat. Hist. Mamm. ii. p. 360.

† Prod. Syst. Mamm. p. 92.

‡ *Op. cit.* p. 54.

§ Festschrift. Gesellsch. nat. Freunde, pp. 227-234 (1873).

|| Tr. Z.S. vii. pp. 397-409.

¶ *Op. cit.* p. 51.

\*\* Cf. Owen, Comp. Anat. Vert. iii. p. 296.

noted that they have no true alisphenoid canal, but a carotid canal is present in the tympanic\*. The optic foramina are confluent; and the bony palate is reduced to a mere bridge between the molar series, being bounded in front by the large confluent incisive foramina, and behind by the deep posterior emargination. The fibula is ankylosed below with the tibia, and articulates with the calcaneum. There are no vesicular glands; and the testes are permanently external.

The two families *Leporidae* and *Lagomyidae* are certainly very nearly allied, but differ in several important characters; and I have therefore followed Professor Lilljeborg in keeping them distinct. The absence of postorbital frontal processes, the posterior continuation of the zygoma towards the auditory meatus, the absence of reticulation in the facial portion of the maxillary, and the full development of the clavicles in the Pikas are among the points in which their anatomy confirms their distinction from the Hares, outwardly indicated by the different proportion of their ears and tails.

The remark has been made above that palæontology has hitherto not yielded much of interest to the student of this order. A striking exception, however, is to be found in certain wonderful forms from the South-American Miocene and Pliocene, of which the true position has been much disputed. Of these the most striking is the huge animal whose skull, discovered by Mr. Darwin, was described by Professor Owen under the name of *Toxodon*†, and since more fully investigated by Dr. Burmeister‡. Its Ungulate characters, however, much overweigh in importance those which it has in common with the Rodents; and it may therefore be dismissed from present consideration.

Another animal presenting an extraordinary combination of characters is that discovered by M. Bravard, and placed by him, under the name of *Typotherium*, among the Pachydermata§. Almost every part of its skeleton has been obtained; and the whole has been well described by M. Serres|| under the name of *Mesotherium*, and by Professor Gervais¶ under Bravard's name\*\*. The last-named zoologist considers that it must be regarded as a link between the Rodents and the Perissodactyles, and that its nearest affinities are with the *Leporidae*.

The most important characters in which *Mesotherium* differs from existing Rodents are, briefly, the transversely hollowed crowns of the incisors (which have not the chisel-edge so characteristic of

\* Cf. Turner, P. Z. S. 1848, p. 65.

† Zoology of the 'Beagle,' pt. 1, pp. 16-35.

‡ Ann. Mus. Pub. de Buenos Aires, i. pp. 254-286.

§ Catalogue des espèces d'anim. foss. recueillies dans l'Amér. du Sud, 4to. Parana, 1860.

|| Comp. Rend. Ac. Paris, xlv. p. 961 (1857); lxxv. pp. 6, 17, 140-148, 273-279, 429-437, 593-599, 740-748, 841-848.

¶ Zool. et Paléont. Générales, pp. 134-137, pls. xxii.-xxv.

\*\* M. Gervais regards Bravard's name as having priority; on what grounds I cannot discover. It does not appear whether or not it was used in the latter writer's paper on the Geology of La Plata, published in the 'Registro Estadístico' of Buenos Ayres in 1857 (which M. Gervais was unable to find in Paris, and which is not in the British Museum); but even if it was it would only be contemporary with M. Serres's very appropriate name.

the order), their number in the lower jaw (as in *Hyrax*), the curvature of the molars, of which the convexity is not inwards but outwards (as in *Toxodon*), the transverse form of the condyle of the mandible and the glenoid fossa, and the articulation of the ischia with some of the caudal vertebræ (as in some Edentates). With regard to the first of these characters, we have seen that the enamel is present, though very thin, on the back as well as the front of the incisors of the *Glires duplicidentati*; and a side view of these teeth in the Hares and in some of the lower *Hystricomorpha* shows a sort of gradation between the acute edge of the more highly specialized forms and the hollowed crown of *Mesotherium*. Of the condyle and glenoid cavity also it is to be noted that, although they are not transverse in any existing Rodent, yet their shape is much less clearly defined in the less-specialized forms. In other respects the whole skeleton of *Mesotherium* presents so many resemblances to the Rodents that it seems to me that we must follow Professor Gervais in placing it in that order rather than in any other. Its affinities with the more aberrant Ungulates, and especially with *Toxodon*, cannot, however, be overlooked; and it appears to have been a survivor, to Pliocene times, of a much earlier type, which represented an era at which the Rodents were not yet clearly marked off from their allies\*. In fact *Mesotherium* seems to continue *into* the order *Glires* that line of affinity which Prof. Flower has pointed out as extending from the typical Ungulates through *Hyracodon*, *Homalodontotherium*, *Nesodon*, and *Toxodon*†.

As to the affinities of *Mesotherium* within the Order *Glires*, they do not appear so exclusively leporine to me as to M. Gervais. While agreeing with the Hares in many important points, as in the form of the mandible (which, however, is still more like that of *Hyrax*), in that of the brain, as indicated by a cast of the cranial cavity, and in the articulation of the fibula with the calcaneum, *Mesotherium* rather inclines in other particulars to the *Glires simplicidentati*, and especially to *Hydrochærus*. Among these may be enumerated the comparative shortness of the incisors, the smallness of the incisive foramina, the development of the bony palate and of the paroccipital processes, the depth of the malar, the form of the scapula, &c. Some at least of the toes seem to have been subungulate; and the terminal phalanx figured by Gervais (pl. xxv. fig. 34) very closely resembles the same bone in the Capybara.

As *Mesotherium* thus appears to present relationships to each of the existing suborders, combined with peculiarities which forbid its admission into either, I venture to propose the establishment of a third for its reception. It might be named GLIRES HEBETIDENTATI‡, and characterized by the incisors being two above and four below, the molars curved inwards and the condyles placed transversely.

Before ending this paper, with a Table of the characters of the various divisions here adopted, attention may be drawn to the accom-

\* We have seen that in Europe the Rodents were fully differentiated in the Eocene period (*antèa*, p. 70).

† Phil. Trans. 1874, p. 181.

‡ *Hebes-tis*, blunt; *dentatus*, toothed.

panying chart (Plate IV.), on which I have endeavoured to indicate approximately the relationship of the different families to one another.

*Arrangement.*

Order GLIRES.

<p>Suborder I. GLIRES SIMPLICI- DENTATI.</p> <p>Sec. 1. <i>Sciuromorpha</i>. Fam. 1. Anomaluridæ.     " 2. Sciuridæ.     " 3. Ischyromyidæ.     " 4. Haplodontidæ.     " 5. Castoridæ. Sec. 2. <i>Myomorpha</i>. Fam. 1. Myoxidæ.     " 2. Lophiomyidæ.     " 3. Muridæ.     " 4. Spalacidæ.     " 5. Geomyidæ.     " 6. Theridomyidæ.     " 7. Dipodidæ.</p>	<p>Sec. 3. <i>Hystricomorpha</i>. Fam. 1. Octodontidæ.     " 2. Hystricidæ.     " 3. Chinchillidæ.     " 4. Dasyproctidæ.     " 5. Dinomyidæ.     " 6. Caviidæ.</p> <p>Suborder II. GLIRES DUPLICI- DENTATI. Fam. 1. Lagomyidæ.     " 2. Leporidæ.</p> <p>Suborder III. GLIRES HEBETI- DENTATI. Fam. 1. Mesotheriidæ.</p>
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*Table of Characters.*

Order GLIRES.

The middle pair of incisors long, curved, rootless, and constantly growing, their points more or less chisel-edged (except in *Mesotherium*), the other pairs very small or absent; no canines, a large space intervening between the incisors and the grinding-teeth, which are variously formed; premolars present or absent; three molars above and below (except in *Hydromys*). Skull with the temporal fossæ continuous with the orbits, within which the lachrymal foramen opens; an interparietal almost always distinct; the periotic and tympanic ankylosed to one another, but not to any other bone; and the auditory bullæ moderately or largely developed. Scapula narrow with a deep notch, a well-developed more or less bifurcated acromion, and a small coracoid. Clavicles perfect or imperfect. Scaphoid and lunar usually combined. Manus with five or four digits. Tibia and fibula either separate or ankylosed below. Pes with five, four, or three digits. Intestinal canal long; cæcum large (except in *Myoxidæ*). Liver with a bifid Spigelian lobe (except in *Anomalurus*). Placenta deciduate and discoidal.

Suborder I. GLIRES SIMPLICIDENTATI.

Incisors  $\frac{2}{2}$  only, even at birth, their enamel confined to the front surface. Skull with both a true alisphenoid and an external alisphenoid canal\*; optic foramina rarely confluent; incisive foramina separate; and bony palate well developed. Fibula either ankylosed

\* Cf. H. N. Turner, P. Z. S. 1848, p. 65.

with the tibia below or free, not articulating with the calcaneum. Testes abdominal, descending periodically; vesicular glands present\*.

### Section I. *Sciuromorpha*.

Premolars present; when there is more than one in the upper jaw the first is smaller than the others; grinding-teeth rooted or rootless. Postorbital frontal processes present or absent, infraorbital opening various. Zygomatic arch mainly composed of the malar, which is not supported below by a continuation of the maxillary zygomatic process. Outer walls of pterygoid fossæ obsolete; no inter-ptyergoid fissure. Incisive foramina small or moderate, not extending into the maxillaries. Mandible with the angular portion springing from the lower edge of the bony covering of the lower incisor, its outline more or less rounded, not pointed; coronoid process high and falcate. Clavicles perfect. Fibula persistent as a distinct bone through life, and usually perfectly free. Upper lip usually cleft, muffle small and naked; nostrils comma-shaped, rounded above. Tail cylindrical and hairy (except in *Castoridae*). Five families:—

#### Family I. ANOMALURIDÆ.

One premolar above and below; grinding-teeth subequal, not tuberculate, with flat crowns and transverse enamel loops. Skull with postorbital processes obsolete; infraorbital opening large, subovate; palate contracted in front, deeply emarginate behind. Sixteen pairs of ribs. Limbs connected by a flying expansion of the skin, supported by a chondrified fascia articulating with the olecranon. Tail long, hairy, with a series of large scales on the lower basal portion. Distribution Ethiopian. Recent genus:—

*Anomalurus*, Waterhouse, P. Z. S. 1842, p. 124 . . . (1842).

(Characters those of the family.)

#### Family II. SCIURIDÆ.

Two premolars above, and one below; the first upper premolar very small, sometimes deciduous; grinding-teeth rooted, tubercular (at least in youth). Skull with distinct postorbital processes; infraorbital opening small, usually placed in front of the maxillary zygomatic process; palate broad, flat. Twelve or thirteen pairs of ribs. Tail cylindrical, hairy. Two subfamilies:—

A. SCIURINÆ. Incisors compressed. Limbs either free or united (*Pteromys*) by an expansion, whose fascia articulates with the carpus. Form slender, tail long. Cosmopolitan (exc. Australasian region). Recent genera:—

1. *Pteromys*, G. Cuvier, Leçons d'Anatomie . . . . . (1800).

Limbs united by a flying expansion, the supporting fascia of which articulates with the carpus; tail long, bushy. Grinders usually soon ground flat, in some tuberculate through life.

\* Cf. Owen, Comp. Anat. Vert. iii. p. 649.

2. *Sciurus*, Linnæus, Syst. Nat. i. p. 86 . . . . . (1766).

Limbs free, form agile, tail long, bushy. No cheek-pouches; three or four pairs of teats. First upper premolar sometimes soon lost. Frontals ankylosed with parietals; postorbital processes moderate; infraorbital opening in front of anterior root of zygoma. Palate broad, flat.

3. *Xerus*, Hemprich & Ehrenberg, Symbol. Phys., Mamm. i., *gg* (1832).

Ears very short or rudimentary, tail <sup>rather long</sup> ~~short~~, fur sparse, harsh, with flattened spines. No cheek-pouches, two pairs of teats. Nasals and palate narrower, and postorbital processes much smaller than in *Sciurus*.

4. *Tamias*, Illiger, Prod. Syst. Mamm. p. 83 . . . . . (1811).

Ears short, fore feet with the fourth digit longest, limbs subequal, tail short. Large internal cheek-pouches. First upper premolar soon lost. Skull slender; infraorbital opening in anterior root of zygoma, not in front of it.

B. ARCTOMYINÆ. Incisors not compressed. Limbs free, form usually stout, tail short. Palæarctic and Nearctic. Recent genera:—

5. *Spermophilus*, F. Cuvier, Mém. du Mus. vi. p. 293 . (1822).

Form somewhat slender; tail short or moderate. Claw of pollex rudimentary or absent. Large cheek-pouches. Series of grinding-teeth nearly parallel. Skull with no marked ridges; postorbital processes slender, directed backwards.

6. *Cynomys*, Rafinesque, Amer. Monthly Mag. ii. p. 45 (1817).

Form thickset, tail short, claws of fore feet long on all the digits, shallow cheek-pouches. Series of grinding-teeth strongly convergent behind. Skull short and broad; postorbital processes long, directed backwards; parietals narrow, parallelogrammatic.

7. *Arctomys*. Schreber, Säugethiere, iv. p. 721 . . . . . (1792).

Form thickset, tail short; pollex rudimentary, with a flat nail. Cheek-pouches rudimentary or absent. Series of grinding-teeth nearly parallel. Skull broad; postorbital processes large, triangular, standing out at right angles; parietals narrow, parallelogrammatic.

Fossil genera. The following genera, characterized from details of dentition, seem to be referable to this family:—*Plesarctomys*, Bravard, in Gervais's 'Zool. et Pal. Franç.' pl. xlvi. (1852), Eocene of France; *Pseudosciurus*, Hensel, Z. Deutsch. geol. Ges. 1856, p. 660, bone-beds of Württemberg; *Sciuravus*, Marsh, Am. Journ. Sc. 1871, p. 120, Eocene of North America; *Paramys*, Leidy, Geol. Survey, Montana, 1871, p. 363 (perhaps the same as the last); *Gymnotrichus*, Cope, Pal. Bulletin, i. p. 6 (1874), Miocene of North America.

## Family III. ISCHYROMYIDÆ (fam. nov.)\*.

Dentition as in *Sciuridæ*. Skull resembling *Castoridæ*, but with the infraorbital opening large, a sagittal crest, no postorbital processes, palate broad, basioccipital keeled. Miocene of North America. Fossil genus:—

*Ischyromys*, Leidy, Proc. Acad. Philad. 1856, p. 89 . . (1856).  
(Characters those of the family.)

## Family IV. HAPLODONTIDÆ.

Two premolars above and one below, the first upper premolar small; grinding-teeth rootless, simple, and prismatic. Skull much depressed, no postorbital processes, infraorbital opening small, angular portion of mandible much twisted. Tail short, cylindrical, hairy. Nearctic. Recent genus:—

*Haplodon* = *Aplodontia*, Richardson, Zool. Journ. iv. p. 334  
(1829).

(Characters those of the family.)

## Family V. CASTORIDÆ.

One premolar above and below; grinding-teeth subequal, semi-rooted or rootless, with reentering enamel-folds. Skull massive, no postorbital processes, infraorbital opening small and placed low, a sagittal crest, angle of mandible rounded. Carpus with a large accessory ossicle. Stomach with a glandular appendage, excretory and generative organs opening into a common cloaca. Tail broad, flattened, spatulate and reticulated. Hind feet fully webbed. Palæarctic and Nearctic. Recent genus:—

1. *Castor*, Linnæus, Syst. Nat. i. p. 78 . . . . . (1766).

(External characters those of the family.) Upper grinding-teeth subequal, each with one internal and three external enamel-folds; the lower similar but reversed; the subsidiary folds not soon isolated from the exterior. Parietals narrow, parallelogrammatic; interparietal triangular; basioccipital concave.

Fossil genera:—

2. *Diobroticus*, Pomel, Arch. Bibl. Univ. Genève, ix. p. 167 †.  
(1848).

Skull much as in *Castor*. Third upper molar and lower premolar elongate, with four enamel folds, the rest with only two; all the folds soon isolated.

3. *Stenofiber*, Is, Geoffroy, Revue Encyclopédique. . . . (1833).

Parietals not parallelogrammatic; interparietal subhexagonal; basioccipital not concave. Grinding-teeth as in *Castor*, the subsidiary folds sooner isolated.

\* It seems probable that *Pseudotomys*, Cope, Proc. Am. Phil. Soc. 1872, p. 467, from Eocene of North America, may prove to belong to this family.

† = *Trogotherium* Owen (nec Fischer), Brit. Foss. Mamm. p. 184; Geol. Mag. vi. pp. 49–56 (cf. Gervais, Zool. et Paléont. Générales, pp. 80–84).

4. *Castoroides*, J. W. Foster, 2nd Rep. Geol. Ohio, p. 81 (1838).

Parietals not parallelogrammatic; interparietal very small; basi-occipital concave. Incisors with numerous longitudinal grooves; grinding-teeth with the enamel-folds extending quite across their crowns, completely separated and united only by cement; the last upper molar and lower premolar with four folds, the rest with three only.

More doubtful fossil genera are:—*Trogontherium*, Fischer, Mém. Soc. Imp. Nat. Mosc. ii. p. 260 (1809); *Palæomys*, Kaup, Isis, 1832, p. 992; *Chalicomys*, Kaup, *op. cit.* p. 994; *Chelodus*, Kaup, *op. cit.* p. 995; *Palæocaster*, Leidy, Journ. Ac. Philad. vii. p. 338 (1869).

## Section II. *Myomorpha*.

Premolars present or absent; grinding-teeth rooted or rootless. No postorbital frontal processes; infraorbital opening various. Zygomatic arch slender; the malar rarely extending far forward, and being usually supported below by a continuation of the maxillary zygomatic process. Incisive foramina usually long, and extending into the maxillaries. Outer walls of pterygoid fossæ often obsolete, no inter-ptyergoid fissure (except in *Bathyerginæ*). Angular portion of mandible springing from the lower edge of the bony covering of the lower incisor (except in *Bathyerginæ*). Clavicles perfect (except in *Lophiomysidæ*). Tibia and fibula completely ankylosed in the adult for at least their lower third. Upper lip usually cleft; muffle small and naked; nostrils comma-shaped, rounded above. Tail cylindrical, either hairy or covered with scales arranged in rings. Seven families:—

### Family I. MYOXIDÆ.

One premolar above and below, which is rather smaller than the molars; all the grinding-teeth rooted, with transverse enamel-folds. Skull with frontals much contracted, clasped by the parietals; interparietal broad, articulating with the squamosals. Infraorbital opening moderate, high, narrow. Mandible with the angle rounded or subquadrate, coronoid long and slender. No cæcum. Form gracile; eyes and ears large; fore limbs small; tail long, hairy. Palæarctic and Ethiopian. Recent genera:—

1. *Myoxus*, Schreber, Säugeth. iv. p. 824 . . . . . (1792),

Tail bushy and distichous throughout. Stomach simple. Angular portion of mandible not perforate. Premolars small; molars large, with well-marked enamel-folds.

2. *Muscardinus*, Kaup, Entw. europ. Thierw. p. 139 . . (1829).

Tail bushy and cylindrical throughout. Stomach complicated. Mandible not perforate. Grinding-teeth large; their crown flat, with well-marked and numerous folds.

3. *Eliomys*, Wagner, Abhand. baierisch. Akad. iii. p. 179 (1843).

Tail with short hairs at base, tufted and distichous towards its

end. Stomach simple. Angular portion of the mandible perforate. Grinding-teeth smaller; their crowns concave, with few and faintly marked folds.

4. *Graphiurus*, F. Cuvier & Geoffroy, Mammifères, 60<sup>me</sup> livr. (1845).

Tail short, cylindrical, ending in a pencil. Mandible not perforate. Grinding-teeth very small; their crowns flat, with hardly a trace of enamel-folds.

#### Family II. LOPHIOMYIDÆ.

No premolars; molars rooted and tuberculate. Skull as in the typical *Muridæ*, but with the temporal fossæ completely arched over by thin plates developed from the temporal ridge and the malar, articulated with one another; surface of skull granulated. Clavicles imperfect. Cæcum small. Form thickset. Hair long, forming a crest along the back and tail. Ethiopian. Recent genus:—

- Lophiomyis*, A. Milne-Edwards, L'Institut, xxxv. p. 46 . (1867).  
(Characters those of the family.)

#### Family III. MURIDÆ.

Lower incisors compressed; no premolars (except in *Sminthineæ*); molars rooted or rootless, tuberculate or with angular enamel-folds. Frontals contracted. Infraorbital opening in typical forms high, perpendicular, wide above and narrowed below, with the lower root of the maxillary zygomatic process more or less flattened into a perpendicular plate; very rarely the opening is either large and oval or small and subtriangular. Malar short and slender, generally reduced to a splint between the maxillary and squamosal processes. External characters very variable. Pollex rudimentary, but often with a small nail. Tail generally subnaked and scaly, rarely densely haired. Cosmopolitan. Ten subfamilies\*:—

(a Molars rooted.)

A. SMINTHINÆ. Premolars  $\frac{1}{2}$ , molars  $\frac{3}{2}$ . Infraorbital opening subtriangular, widest below. Incisive foramina long. Palæarctic. Recent genus:—

1. *Sminthus*, Keyserling & Blasius, Wirbelth. Europ. p. 38 (1840).  
(Characters those of the subfamily.)

B. HYDROMYINÆ. Molars  $\frac{2}{2}$ , divided into transverse lobes. Infraorbital opening crescentic, scarcely narrowed below. Incisive foramina and auditory bullæ very small. Hind feet partly webbed. Australasian. Recent genus:—

2. *Hydromys*, Geoffroy, Ann. du Mus. vi. p. 81 . . . . (1805).  
(Characters those of the subfamily.)

\* *Suprà*, p. 69.

C. PLATACANTHOMYINÆ. Molars  $\frac{3}{3}$ , divided into transverse laminæ. Infraorbital opening typical; incisive foramina and auditory bullæ small. Form myoxine; fur mixed with flattened spines; tail densely haired. Indian. Recent genus:—

3. *Platacanthomys*, Blyth, Proc. As. Soc. Bengal, xxviii. p. 289 (1859).

(Characters those of the subfamily.)

D. GERBILLINÆ. Incisors narrow; molars divided into transverse laminæ. Infraorbital opening typical; pterygoid fossæ short; auditory bullæ usually large. Hind limbs elongated; tail long, hairy. Palæarctic, Indian, and Ethiopian. Recent genera:—

4. *Gerbillus*, Desmarest, Nouv. Dict. d'Hist. Nat. xxiv. p. 22 (1804).

Form murine; muzzle pointed; ears moderate, sparsely haired; tail long, hairy, slightly tufted. Skull with occipital region broad; auditory bullæ large. Incisors grooved or plain. First molar with three laminæ, the second with two, the third with one only.

5. *Mystromys*, Wagner, Wieg. Arch. 1841, p. 132 . . . (1841).

Ears large and broad; tail moderately long, truncated, not tufted. Auditory bullæ smaller. Incisors plain. First molar with three laminæ, the second and third with two each; these are alternated, and the last is very small.

6. *Otomys*, F. Cuvier, Dents des Mamm. p. 168 . . . . (1825).

Ears large, hairy; tail moderate, clad with scales and short hairs, not tufted. Nasal profile more arched than in *Gerbillus*. Incisors grooved. Molars with their laminæ completely separated and united by cement; the third the longest, with from three to seven laminæ.

7. *Dasymys*, Peters, Monatsb. Akad. Berlin, 1875, p. 12 (1875).

Ears moderate, hairy; fur somewhat coarse; tail moderate, scaly, and sparsely haired. Skull intermediate between *Gerbillus* and *Mus*. Lower branch of maxillary zygomatic process produced forward in a hook-shape. Incisors plain. Front molars the longest; the posterior lamina of the first and the anterior laminæ of the second and third upper molars large and complicated.

E. PHLÆOMYINÆ. Incisors broad; molars divided into transverse laminæ. Infraorbital opening typical. Claws large. Indian. Recent genera:—

8. *Phlæomys*, Waterhouse, P. Z. S. 1839, p. 108 . . . . (1839).

Muzzle blunt; lip imperfectly cleft; ears moderate, hairy externally; tail moderately long, densely haired. Skull ovate; frontals not contracted, with a rudimentary postorbital process at their junction with the squamosals; auditory bullæ very small. Incisors very broad. First upper molar with three laminæ; second and third with two; first lower with four, second with three, and third with two laminæ.

9. *Nesokia*, Gray, Ann. and Mag. Nat. Hist. x. p. 264. (1842).

Muzzle blunt; ears moderate; claws long; fur rather harsh; tail short, scaly, sparsely haired. Palate narrow; incisive foramina short; auditory bullæ rather small. Incisors broad. First molars with three laminæ; the rest with two only.

F. DENDROMYINÆ. Incisors convex in front; molars tuberculate. Infraorbital opening not narrowed below; coronoid process very small. Ears hairy. Claws long. Ethiopian. Recent genera:—

10. *Dendromys*, A. Smith, S. African Q. Journ. ii. p. 158 (1834).

Form slender; tail long, scaly, and sparsely haired. Three middle digits of each foot much longer than the first and fifth. Incisors grooved. Molars parallel in series; the first as long as the second and third taken together; their tubercles arranged in pairs.

11. *Steatomys*, Peters, Reise n. Mossambique, i. p. 162. (1852).

Form plump; tail rather short, finely scaled and densely haired; claws of fore feet the longest. Incisors grooved. Molars converging behind; the first longer than the second and third taken together; their tubercles arranged in twos and threes.

12. *Lophuromys*, Peters, Monatsb. Ak. Berlin, 1874, p. 234

(1874).

Form as in *Steatomys*, but fur developed into fine flattened bristles, pterygoid fossæ longer, and coronoid process better-developed. Incisors plain. Molars nearly parallel in series; the third upper with only two anterior tubercles.

G. CRICETINÆ. Molars tuberculate. Infraorbital opening subtypical, not much narrowed below, and the perpendicular plate little developed. Large internal cheek-pouches. Palæarctic and Ethiopian. Recent genera:—

13. *Cricetus*, G. Cuvier, Règne Animal (1<sup>re</sup> éd.), i. p. 198 (1817).

Form thickset; limbs short; claws large; tail short, not scaly, sparsely haired. Cheek-pouches large. Skull with marked but rounded supraorbital ridges continued into temporal ridges; coronoid process high and falcate. Incisors plain. Molars with tubercles arranged in pairs, of which the first has three and the rest two only; these entirely disappear in aged specimens.

14. *Saccostomus*, Peters, Monatsb. Ak. Berl. 1846, p. 258 (1846).

Form as in *Cricetus*, but feet and claws weaker and more murine. Cheek-pouches moderate. Supraorbital ridges more parallel, and infraorbital opening more typically murine; incisive foramina longer. Incisors plain. Molars with tubercles arranged in threes, one of each row being smaller than the other two.

15. *Cricetomys*, Waterhouse, P. Z. S. 1840, p. 2. . . . (1840).

Form more murine; muzzle pointed; tail long, scaly, and very

sparsely haired. Cheek-pouches large. Skull most like that of *Saccostomus*, but incisive foramina much smaller. Upper incisors grooved. Molars as in *Saccostomus*.

H. MURINÆ. Molars tuberculate, at least in youth. Infraorbital opening typical; pterygoid fossæ lengthened; auditory bullæ moderate. Cheek-pouches absent or very small. Tail scaly, more or less naked. Cosmopolitan. Recent genera:—

16. *Mus*, Linnæus, Syst. Nat. i. p. 79 . . . . . (1766).

Muzzle pointed; eyes prominent; ears rather large, subnaked; fur soft (rarely mixed with spines); pollex rudimentary; claws short; tail moderate or long, scaly, with scattered hairs. No cheek-pouches. Skull elongate, narrow; temporal ridges nearly parallel; palate compressed; incisive foramina long; auditory bullæ moderately large; coronoid process high, falcate. Incisors rarely grooved. Molars with transverse ridges, each composed in youth of three tubercles.

17. *Pelomys*, Peters, Reise n. Mossambique, i. p. 157 . (1852).

Middle three digits of each foot longer than the first and third; fur bristly; tail short, scaly. Palate much compressed. Incisors grooved. Molars broader than in *Mus*.

18. *Echinothrix* (= *Echiothrix*), Gray, P. Z. S. 1867, p. 599 (1867).

Head elongate, muzzle produced; fur mixed with flattened spines; tail long, scaly. Facial portion of skull greatly elongated; nasals very narrow; palate much compressed; incisive foramina long; coronoid process small. Incisors grooved. First upper molars large, with three ridges, second with one only; third small, simple, subcircular.

19. *Uromys*, Peters, Monatsb. Ak. Berlin, 1867, p. 343 (1867).

External characters as in *Mus*; but the caudal scales thick, polygonal, and not overlapping, auditory bullæ and incisive foramina smaller, and pterygoid processes more like those of *Hapalotis*.

20. *Hapalotis*, Lichtenstein, Darst. neu. Säugeth. Th. iv. pl. 29  
(1829).

Muzzle produced; ears long, tapered, sparsely haired outside; hind limbs elongated; fur soft; tail long, hairy, terminating in a pencil. Skull with no distinct occipital crest or supraorbital ridges; incisive foramina very large; coronoid process obsolete. Incisors plain. Molars as in *Mus*.

21. *Acomys*, Is. Geoffroy, Ann. Sc. Nat. 2<sup>me</sup> sér. x. p. 126 (1840).

Fur mixed with flattened spines, especially on the head and back; tail short, scaly. Skull as in *Mus*, but the pterygoid fossæ more shallow, and the incisive foramina extremely small; coronoid process little developed. Teeth as in *Mus*.

22. *Nesomys*, Peters, Sitzungs-Ber. Gesell. nat. Freunde, 1870, p. 54  
(1871).

Form murine; upper lip grooved, not cleft; ears and eyes large;

feet as in *Mus*; tail long, scaly. Skull as in *Mus*; the infraorbital foramen lower and wider. Incisors plain. Molars like those of *Hesperomys*; the first upper, when worn, with one internal and two external indenting folds; the first lower with one external and two internal, the rest with one external and one internal fold.

23. *Brachytarsomys*, Günther, P. Z. S. 1875, p. 79 . . (1875).

Upper lip grooved, not cleft; eyes small; ears short; hind feet much shorter than the lower leg; tail long, scaly. No supraorbital ridges; auditory bullæ moderate. Incisors plain. Molars with two or three indenting folds on each side, one of which in the upper molars passes quite across the crown.

24. *Drymomys*, Tschudi, Fauna Peruana, p. 178 . . (1844-6).

Form murine; muzzle pointed; upper lip cleft; ears large; tail long, scaly. Incisors furrowed on the sides. Molars small; the first with three pairs of tubercles, the second with two, the third with one pair only.

25. *Holochilus*, Brandt, Mém. Ac. St. Pétersb. (6<sup>me</sup> sér.) iii. p. 428 (1835).

Muzzle obtuse; upper lip not fully cleft; fore feet small; hind limbs large and strong; tail long, sparsely haired. Skull short, strong; supraorbital ridges well marked. Incisors broad, flat, plain. Molars large, the third as large as the second, with tubercles arranged in pairs, which soon wear away, leaving the crown flat with indenting folds.

26. *Hesperomys*, Waterhouse, Zool. Voy. Beagle, i. p. 75 (1839).

Upper lip cleft; ears large or moderate; tail sparsely haired. Small internal cheek-pouches in a few species. Skull murine, with or without marked supraorbital ridges. Incisors plain. Molars as in the last genus, but narrower; the third smaller than the second, and the first upper with three roots.

27. *Ochetodon*, Coues, Proc. Acad. Philad. 1874, p. 184 (1874).

As in the last genus; tail moderate. Upper incisors grooved. First upper molar with four roots.

28. *Reithrodon*, Waterhouse, P. Z. S. 1837, p. 29 . . . (1837).

Profile arched; eyes large; ears hairy; hind feet with first and fifth digits very short; tail moderate, hairy. Skull with nasal portion large, supraorbital ridges well marked, posterior nares narrowed by the approximation of the pterygoids. Upper incisors grooved. Molars as in *Hesperomys*, their indenting folds deep.

29. *Sigmodon*, Say & Ord, Journ. Acad. Philad. iv. p. 352 (1825).

Muzzle blunt; upper lip partially cleft; ears large, but nearly concealed in the long fur; hind feet with first and fifth digits very short; tail moderate, nearly naked. Skull with supraorbital ridges sharp, perpendicular plate of zygoma emarginate in front, incisor

foramina large. Incisors plain. Molars never tuberculate, the indenting folds deep and closed, those of the second and third lower molars sigmoid.

30. *Neotoma*, Say & Ord, Journ. Acad. Philad. iv. p. 346 (1825).

Ears large, nearly naked; tail long, either sparsely haired or bushy. Upper incisors broad, plain. Molars never tuberculate, with open angular indenting folds, giving them a very arvicoline appearance.

( $\beta$ . *Molars semirooted or rootless*.)

I. ARVICOLINÆ. Molars composed of triangular prisms placed alternately. Skull with brain-case rhomboidal, frontals much contracted, infraorbital opening typical. Limbs moderate; tail moderate or short, hairy. Palæartic and Nearctic. Recent genera:—

31. *Fiber*, G. Cuvier, Leçons d'Anatomie . . . . . (1800).

Form thickset; muzzle blunt; limbs short, subequal; hind feet fringed with long stiff hairs; tail moderate, compressed, clad with scales and short hairs; supraorbital ridges united in a sagittal crest. Palate and lower surface of maxillaries minutely perforated. Incisors plain. Molars semirooted, separated into prisms, which are placed alternately.

32. *Arvicola*, Lacépède, Tableau . . . . . (1803).

Muzzle blunt; fore feet small, with short claws, soles naked; tail longer than the hind foot, clad with short hairs. Skull as in *Fiber*; but the supraorbital ridges diverge after meeting, and converge again on the interparietal; palate not perforated. Incisors plain. Molars as in *Fiber*, rootless (rarely semirooted).

33. *Myodes*, Pallas, Zoogr. Rosso-Asiat. i. p. 173 . . . (1811).

Muzzle blunt; fore feet moderate, with strong hooked claws; soles hairy; tail not longer than hind foot, hairy. Skull as in *Arvicola*, but the brain-case broader and the zygomatic arches stronger. Molars rootless, as in *Arvicola*, but the prisms of the posterior teeth usually compressed and twisted.

K. SIPHNEINÆ. Molars as in the *Arvicolinæ*; infraorbital opening small and subtriangular. Form cylindrical; ear-conch rudimentary; limbs and tail very short. Palæartic. Recent genera:—

34. *Ellobius*, Fischer, Zoognosia, iii. p. 72 . . . . . (1814).

Body subcylindrical; limbs very short, upper lip cleft; eyes small; no external ear-conch; fore feet with short claws, but stronger than the hind feet; tail very short. Skull as in *Arvicola*, but the profile more arched and the facial portion shorter. Upper incisors arched forward.

35. *Siphneus*, Brants, Het Geslacht der Muizen, p. 20 . . (1827).

Eyes small; ears rudimentary; fore feet with long, strong claws,

that of the fifth digit being longer than the toe itself; tail short, hairy. Skull broader and more truncated behind than in *Ellobius*; supraorbital ridges nearly parallel; occipital crest sharp; infraorbital foramen subtriangular. Upper incisors perpendicular.

Fossil genera. The following genera will probably prove to be referable to this family:—*Cricetodon*, Lartet, Notice, p. 20 (1851); *Eumys*, Leidy, Proc. Ac. Philad. 1856, p. 90; *Heliscomys*, Cope, New Vert. Colorado, p. 3 (1873), Miocene of North America; *Mysops*, Leidy, U.S. Geol. Surv. Terr. i. p. 111 (1873), Eocene of America.

#### Family IV. SPALACIDÆ.

Incisors large; premolars present or absent; grinding-teeth rooted, not tuberculate, with reentering enamel-folds. Infraorbital opening moderate or small, with no perpendicular plate; occipital plane high, often sloped boldly forward; palate narrow. Form cylindrical; eye and ear-conch very small, sometimes rudimentary; limbs short and stout; claws large; tail short or absent. Two sub-families:—

A. SPALACINÆ. Palate between the molars broader than one of the alveoli. No interpterygoid fissure. Mandible of normal myomorphine form (the angular portion springing from *the edge* of the bony covering of the lower incisors). Palæarctic, Indian and Ethiopian. Recent genera:—

1. *Spalax*, Gldenstdt, Nov. Comment. Petrop. xiv. i. p. 409 (1770).

Head broad, flat, with a ridge of long stiff hairs on each side; eyes rudimentary, covered by the skin; no ear-conch or external tail; feet broad, claws short. Skull depressed, occipital plane high and sloped boldly forward; parietals and interparietal small and soon ankylosed; infraorbital opening moderate, suboval. Upper incisors plain, nearly perpendicular. No premolars. Molars with curved enamel-folds in youth only.

2. *Rhizomys*, Gray, P. Z. S. 1830, p. 95 . . . . . (1830).

Form robust; eyes very small; ears very short, naked; pollex rudimentary; tail rather short, partially haired. Skull broad, occipital plane only slightly sloped forward; infraorbital opening small, subtriangular. Upper incisors arched forward. No premolar. Upper molars with one deep internal and two or more external enamel-folds; the lower molars reversed.

3. *Heterocephalus*, Rppell, Mus. Senkenb. i. Sugeth. p. 99 (1834).

Eyes very small; no ear-conch; pollex short, not rudimentary; tail short; whole body almost hairless. Skull as in *Rhizomys*, but broader, occipital plane more perpendicular, and infraorbital foramen larger. Dentition similar, but the upper molars with an external indenting fold only, the lower with one external and one internal fold.

**B. BATHYERGINÆ.** Palate between the molars not broader than one of the alveoli; an interpterygoid fissure; mandible hystricine in form (the angular portion springing from *the side* of the bony covering of the lower incisor). Ethiopian. Recent genera:—

4. *Bathyergus*, Illiger, Prod. Syst. Mamm. p. 86 . . . (1811).

Eyes small; no ear-conch; fore feet with very long claws; hind feet with the third digit longest; tail short, hairy. Skull massive, occipital plane perpendicular; nasals very narrow; parietals very small; infra-orbital foramen very small, subcircular; angle of mandible pointed. Upper incisors enormously large, broad, grooved. One premolar above and below. Molars with indenting enamel-folds in youth only.

5. *Georychus*, Illiger, Prod. Syst. Mamm. p. 87 . . . (1811).

Externally like *Bathyergus*, but the claws, especially of the fore feet, shorter and weaker, skull with the profile more arched, the occipital plane slightly sloped forward, and the angle of the mandible rounded. Upper incisors long, arched forwards, plain. Grinding-teeth as in *Bathyergus*.

6. *Heliophobius*, Peters, Monatsb. Ak. Berlin, 1846, p. 239  
(1846).

Differs externally from *Georychus* in the second digit of the hind feet being the longest. Skull with the infraorbital opening smaller, the bony palate shorter, and the coronoid process larger. Incisors plain. Three premolars above and below; but sometimes two only are developed.

#### Family V. GEOMYIDÆ.

One premolar above and below. Grinding-teeth rooted or rootless. Malar extending forward to the lachrymal. Squamosals extremely large. Angular portion of mandible strongly twisted. Large cheek-pouches, opening on the cheeks *outside* the mouth. Upper lip not cleft. Other external characters very variable. Nearctic and Neotropical. Two subfamilies:—

**A. GEOMYINÆ.** Incisors broad. Skull massive; infraorbital opening very small; mastoid not appearing on the top of the skull; malar stout. Form thickset; eyes small; ear-conch rudimentary; limbs short, subequal; fore claws very large. Recent genera:—

1. *Geomys*, Rafinesque, Am. Monthly Mag. ii. p. 45 . . (1817).

Fore feet large, with very large compressed curved claws; tip of tail naked; cheek-pouches large. Skull very massive; zygomatic arches stout. Upper incisors deeply grooved. Crowns of premolars divided into two subequal lobes.

2. *Thomomys*, Max. Prinz zu Wied, Nov. Act. Ac. Car. Leop. xix. i. p. 383 . . . . . (1839).

Fore feet comparatively small, with moderate claws; cheek-pouches moderate. Skull less massive; zygoma more slender. Upper incisors plain, or with merely a fine groove near their inner edge. An-

terior lobes of premolars small. A third upper molar small, sub-circular.

B. HETEROMYINÆ. Incisors narrow. Skull more delicate, with the mastoid appearing largely on its top; infraorbital opening not defined, through the non-development of the lower root of the maxillary zygomatic process; malar slender. Cervical vertebræ sometimes ankylosed (as in *Dipodinae*). Form slender; hind limbs and tail elongated; eye and ear moderate or large. Recent genera:—

3. *Dipodomys*, Gray, Ann. & Mag. Nat. Hist. vii. p. 521 (1840).

Ear large, rounded; tail long, densely haired, tufted; soles hairy; pollex very small, with a small claw. Cheek-pouches large. Skull with nasals produced in front; upper part of zygoma produced into a flat plate articulating with the frontals; interparietal very small, narrow; auditory bullæ enormous, projecting far beyond the occipital plane. Incisors plain. Grinding-teeth rootless, at first with slight indenting enamel-folds, afterwards simple.

4. *Perognathus*, Max. Prinz zu Wied, Nov. Act. Ac. Car. Leop. xix. i. p. 369 . . . . . (1839).

Ears shorter; tail thinly haired; soles more or less naked; pollex with a flat nail. Skull less modified; nasals not so much produced; zygoma not developed into a flat plate; interparietal broad; auditory bullæ not projecting behind the occipital plane. Incisors grooved. Grinding-teeth rooted, tuberculate in youth, afterwards with isolated enamel-loops.

5. *Heteromys*, Desmarest, Mammalogie, p. 313. . . . . (1820).

Like *Perognathus*, but the fur bristly, mixed with flattened spines; tail shorter, clad with large scales and scattered hairs. Skull with sharp supraorbital ridges; interparietal very broad. Upper incisors plain. Grinding-teeth as in *Perognathus*.

#### Family VI. THERIDOMYIDÆ.

One premolar present above and below. Grinding-teeth rooted or rootless, not tuberculate, with more or fewer transverse enamel-folds. Infraorbital opening large, suboval. Palate somewhat contracted in front and emarginate behind. Eocene and Miocene of Europe. Fossil genera:—

1. *Theridomys*, Jourdan, Compt. Rend. Ac. Paris, v. p. 483 (1837).

Grinding-teeth rooted, with three or four reentering enamel-folds, which become isolated enamel-loops in the worn teeth.

2. *Archæomys*, De Laizer et De Parieu, C. R. Ac. Paris, viii. p. 206 (1839).

Grinding-teeth rootless, the enamel-folds continued diagonally across the crowns, which are thus divided into laminæ, of which the anterior is the largest above, while they are subequal below.

3. *Issidiromys* (Croizet), De Blainville, C. R. Ac. Paris, x. p. 932 (1840).

Grinding-teeth rootless, with open reentering folds dividing their crowns into heart-shaped lobes; the subsidiary folds only represented here and there by a minute isolated enamel-loop.

#### Family VII. DIPODIDÆ.

Incisors compressed. Premolars present or absent. Grinding-teeth rooted or rootless, not tuberculate, with more or fewer transverse enamel-folds. Skull with the brain-case short and broad; infraorbital opening rounded, very large (often as large as the orbit); zygomatic arch slender, curved downwards; the malar ascending in front to the lachrymal in a flattened perpendicular plate; facial surface of maxillaries minutely perforated; mastoid portion of auditory bullæ usually greatly developed. Metatarsal bones greatly elongated, often fused into a cannon bone. Form gracile; front portion of body and fore limbs very small; hind limbs long and strong, with from three to five digits; tail long, hairy. Three subfamilies:—

A. JACULINÆ\*. One premolar above. Grinding-teeth rooted. Cervical vertebræ free, metatarsals separate. Hind feet with five developed digits. Tail sparsely haired. Nearctic. Recent genus:—

1. *Jaculus*, Wagner, Syst. Amph. &c. p. 23 . . . . . (1830).  
(Characters those of the subfamily).

B. DIPODINÆ. Premolars present or absent. Grinding-teeth rooted. Cervical vertebræ more or less ankylosed. Metatarsals united in a cannon-bone. Hind feet with only three digits functionally developed. Tail thickly haired, often tufted. Palæarctic and Ethiopian. Recent genera:—

2. *Dipus*, Gmelin, Syst. Nat. ed. 13, i. p. 157 . . . . . (1788).

Hind feet with three digits only; tail cylindrical, tufted. Skull with occipital region very broad, auditory bullæ enormously developed, infraorbital opening with a separate canal for the nerve. Incisors grooved. Premolars absent or almost rudimentary, and found above only.

3. *Alactaga*, F. Cuvier, P. Z. S. 1836, p. 141 . . . . . (1836).

Hind feet with five digits, of which the first and fifth do not reach the ground; tail cylindrical, tufted. Skull with the occipital region less broad, auditory bullæ smaller, infraorbital opening with no separate canal for the nerve. Incisors plain. One very small premolar present above only.

4. *Platycomys*, Brandt, Bull. Ac. St. Pétersb. p. 209 . (1844).

As in *Alactaga*, but the hind limbs proportionally shorter, and

\* Since the above went to press, Dr. E. Coues has published a paper in which he rejects the generic names *Jaculus* and *Meriones* as preoccupied, substitutes *Zapus*, and regards the form as the type of a distinct family, *Zapodidæ* (Bull. U.S. Geol. Surv. v. pp. 253-262).

the tail flattened, lancet-shaped, covered with short hairs and not tufted. No premolars.

C. PEDETINÆ. One premolar above and below. Grinding-teeth rootless. Cervical vertebræ free. Metatarsals separate. Hind feet with four well-developed digits, with short broad hoof-like nails. Tail bushy throughout, not tufted. Ethiopian. Recent genus:—

5. *Pedetes*, Illiger, Prod. Syst. Mamm. p. 81. . . . . (1811).  
(Characters those of the subfamily.)

### Section III. *Hystricomorpha*.

One premolar above and below (except in *Ctenodactylus*). Grinding-teeth rooted or rootless, not tuberculate. Frontals with no distinct postorbital processes (except in *Chatomys*). Infraorbital opening large, subtriangular, or oval. Zygomatic arch proportionally stout; malar not advancing far forward (except in *Ctenodactylinae* and *Chinchillidae*), and not supported below by a continuation of the maxillary zygomatic process. Incisive foramina small; foramina in base of skull proportionally large; an interpterygoid fissure. Mandible with its angular portion springing from the *outer side* of the bony covering of the lower incisor, triangular, usually pointed behind; coronoid process small, and condyle low. Clavicles perfect or imperfect. Fibula persistent as a distinct bone throughout life. Upper lip rarely cleft. Muffle clad with fine hairs. Nostrils pointed above, sigmoid or linear. Ears usually emarginate behind. Tail hairy, subnaked, or scaly.

### Family I. OCTODONTIDÆ.

Grinding-teeth with external and internal enamel-folds. Malar with an inferior angle; incisive foramina usually long, extending into the maxillaries; clavicles perfect. Both hind and fore feet usually with five digits, rarely with four; claws curved. Teats placed high on the flanks. Tail clad with short hairs or with scales. Three subfamilies:—

A. CTENODACTYLINÆ. Grinding-teeth semirooted. Malar extending to the lachrymal (as in the last family) in a flattened perpendicular plate. Hind feet with the claws of the two inner digits covered by comb-like series of bristles. Ethiopian. Recent genera:—

1. *Ctenodactylus*, Gray, Spicilegia Zoologica, p. 10 . . (1830).

Ears very small, with no antitragus. Tail rudimentary. Interparietal and auditory bullæ large; coronoid process reduced to a ridge. No premolars. Molars with single external and internal enamel-folds.

2. *Pectinator*, Blyth, J. A. S. B. xxiv. p. 294 . . . . . (1855).

Ears with a small antitragus. Tail half as long as the body, bushy. Interparietal smaller, auditory bullæ larger, and palate more contracted than in *Ctenodactylus*. Premolars present, but very small. Third upper molar with two external folds.

B. OCTODONTINÆ. Grinding-teeth semirooted or rootless, with short and simple enamel-folds. Fur soft. Tail usually short. Ethiopian and Neotropical. Recent genera :—

3. *Petromys*, A. Smith, S. African Quart. Journ. ii. p. 2 (1831).

Ears short. Fur rather harsh. Pollex very short, with a small nail. Claws short. Tail moderate, rather bushy. Infraorbital opening with a small groove for the nerve. Grinding-teeth semirooted, with single external and internal folds, which nearly meet in the middle.

4. *Ctenomys*, De Blainville, Bull. Soc. Philomath. 1826, p. 62 (1826).

Eye and ear very small. Fur soft. Claws longer than the toes, those of the hind feet with comblike bristles (as in *Ctenodactylinae*). Tail rather short, clad with short hairs. Skull and mandible very massive; auditory bullæ long and pear-shaped; malar with strong superior and inferior angles; infraorbital opening with no groove for the nerve. Incisors very broad. Grinding-teeth rootless, with kidney-shaped crowns; the third molar above and below small and sub-circular.

5. *Schizodon*, Waterhouse, P. Z. S. 1841, p. 91 . . . . . (1841).

External characters much as in *Ctenomys*, but the ears larger and the claws, though strong, not longer than the digits themselves. Skull less massive; the superior and inferior angles of the malar weaker; infraorbital opening with a groove for the nerve. Incisors broad, convex. Grinding-teeth placed transversely, with single external and internal folds, which meet in the middle.

6. *Spalacopus*, Wagler, Isis, 1832, p. 1219 . . . . . (1832).

Ear rudimentary; tail short; claws of fore feet shorter than the digits. Skull shorter than in *Schizodon*; superior and inferior angles of malar obsolete; infraorbital opening smaller, with no separate canal for the nerve. Incisors broad, the upper arched boldly forward, the lower very long. Grinding-teeth like those of *Schizodon*; but the external and internal folds do not meet in the middle line.

7. *Octodon*, Bennett, P. Z. S. 1832, p. 46 . . . . . (1832).

Ears rather large. Claws small, that of the pollex truncated. Tail long, hairy, bushy at the tip. Skull similar to that of *Spalacopus*, but with a separate canal in the infraorbital opening for the nerve. Incisors narrow. Molars like those of *Spalacopus*, but placed diagonally, and the posterior lobe smaller than the anterior in the upper teeth.

8. *Habrocoma* (= *Abrocoma*), Waterhouse, P. Z. S. 1837, p. 30 (1837).

Ears very large. Fur very soft. Tail moderate, clad with short hairs, not tufted. Pollex obsolete. Skull with the facial portion elongated; malar with moderate superior and inferior angles; auditory bullæ very large. Incisors narrow. Upper grinding-teeth with single exter-

nal and internal enamel-folds; the lower with one external and two internal folds, dividing them into narrow angular lobes.

C. ECHINOMYINÆ. Grinding-teeth semirooted or rooted, with deep, curved enamel-folds. Fur more or less harsh, often mixed with spines. Tail usually long. Neotropical and Ethiopian. Recent genera:—

9. *Carterodon*, Waterhouse, Nat. Hist. Mamm. ii. p. 351 (1848).

Muzzle blunt; ears moderate; tail short, clad with scales and rather long hairs. Skull broad, with no marked crests; frontals with delicate supraorbital ridges. Incisors broad, with longitudinal furrows and raised ridges. Upper grinding-teeth with one internal and two external enamel-folds; the lower similar but reversed.

10. *Myopotamus*, Geoffroy, Ann. du Mus. vi. p. 81. . . . (1805).

Muzzle blunt; pollex with a truncated nail; hind feet large, with the first four digits fully webbed and the fifth free; tail moderate, cylindrical, scaly. Skull elongated, with sharp occipital and sagittal crests; auditory bullæ small; paroccipital processes very long. Incisors flat, plain. Grinding-teeth as in *Carterodon*, but the lower with three internal folds.

11. *Cercomys*, F. Cuvier & Geoffroy, Mammifères, 6<sup>me</sup> livr. (1829).

Muzzle pointed; ears rather large; fur without bristles or spines; pollex very small, with a short nail; hind feet not webbed; tail long, scaly. Skull ovate; frontals contracted, with sharp supraorbital ridges, coronoid process small. Incisors flat. Grinding-teeth with nearly circular crowns; the upper with one internal and three external enamel-folds; the lower similar but reversed.

12. *Loncheres*, Illiger, Prod. Syst. Mamm. p. 90 . . . . (1811).

Muzzle blunt; ears rather short; fur in most species mixed with flattened lanceolate spine; toes subequal; second digit of fore feet with a broad truncated nail; tail long, clad with scales and hairs. Skull like that of *Cercomys*. Incisors narrow. Upper grinding-teeth like those of *Cercomys*, but longer, with the middle folds usually meeting in the middle; the lower with one external and two internal folds.

13. *Mesomys*, Wagner, Wieg. Arch. 1845, Th. ii. p. 145 (1845).

External characters as in *Loncheres*; but pollex with a short curved claw, fur without spines, and tail short, thickly haired. No distinct supraorbital ridges. Incisors broad. Upper grinding-teeth with one or two external folds; the lower similar but reversed.

14. *Echinomys* (= *Echimys*), Desmarest, Nouv. Dict. d'Hist. Nat. x. p. 45 . . . . . (1817).

Muzzle pointed; ears larger than in *Loncheres*; feet narrower, the toes more uneven in length, fur usually mixed with spines. Palate shorter and broader. Incisors narrow. Grinding-teeth as in *Mesomys*.

15. *Dactylomys*, Is. Geoffroy, Ann. Sc. Nat. (2<sup>me</sup> sér.) x. p. 126 (1838).

Ears short; tail long, scaly; fore feet with the pollex obsolete, and the third and fourth digits elongated, with short convex nails. Skull with proportionally small orbits and high occiput. Incisors flat. Grinding-teeth (except the lower premolar) each divided into two lobes, each of which has a single enamel-fold.

16. *Plagiodon* (= *Plagiodontia*), F. Cuvier, Ann. Sc. Nat. (2<sup>me</sup> sér.) vi. p. 347 . . . . . (1836).

Form stout; muzzle blunt; pollex rudimentary; outer hair coarse; under-fur silky; tail short, scaly. Grinding-teeth rootless, the upper with a deep enamel-fold running diagonally forward from near the internal posterior angle, and another running back from near the outer anterior angle; the lower with one external and two internal folds.

17. *Capromys*, Desmarest, Mém. Soc. d'Hist. Nat. i. p. 44 (1822).

External characters much as in *Plagiodon*; fur long and harsh; tail moderate or long, scaly, sparsely haired. Liver divided into minute lobules. Skull elongate, with no marked crests; malar deep; paroccipital process long. Incisors small, convex. Upper grinding-teeth with one internal and two external folds; the lower similar but reversed.

18. *Aulacodus*, Temminck, Monogr. de Mamm. i. p. 245 (1827).

Form stout; muzzle blunt; fur harsh; tail moderate, sparsely haired; fore feet with the pollex rudimentary and the fifth digit very short; hind feet with four digits, of which the outer is rudimentary. Skull with the facial portion much inflated; the brain-case small, with strong sagittal and occipital crests; parietals small; infraorbital opening with a separate canal for the nerve. Incisors very broad, the upper with three deep grooves. Grinding-teeth rooted, with folds arranged as in *Capromys*.

#### Family II. HYSTRICIDÆ.

Grinding-teeth with external and internal enamel-folds. Skull ovate, often greatly inflated by large air-sinuses in the bones; facial portion short and broad; malar with no inferior angle; occipital plane perpendicular, with a median ridge. Form robust; limbs subequal; fur more or less modified into spines and hollow quills. Two subfamilies:—

A. SPHINGURINÆ. Grinding-teeth rooted. Skull short; lachrymal bone not bounding the canal. Clavicles perfect. Upper lip unfurrowed. Tail moderate or long, usually prehensile. Soles of feet tuberculated. Four teats. Nearctic and Neotropical. Recent genera:—

1. *Chaetomys*, Gray, P. Z. S. 1843, p. 21 . . . . . (1843).

Head and body clad with stout wavy bristles; feet with four

digits; the hind feet with a nailless tubercle instead of the first digit, and an internal lobe, supported by two accessory tarsal ossicles. Skull short; the frontal and malar with large postorbital process, which almost meet; walls of auditory meatus produced. Upper grinding-teeth each divided into three lobes, of which the anterior and posterior have deep single enamel-folds; lower teeth with one external and two internal folds.

2. *Sphingurus* (= *Sphiggurus*), F. Cuvier, Dents d. Mamm. p. 256 (1825)\*.

Nostrils far apart; head and body clad above with short stiff spines, or with mixed spines and bristly hair; feet as in *Chaetomys*; tail long, prehensile at its tip. Skull short; the air-sinuses greatly developed in some species; no postorbital processes; walls of auditory meatus not produced; interparietal broad; angle of mandible pointed. Grinding-teeth subequal, like those of *Sphingurus*, but with two lobes only.

3. *Erythizon*, F. Cuvier, Dents d. Mamm. p. 256 . . . (1825).

External characters as in *Sphingurus*, but the nostrils nearer together, the quills more concealed by hair, the hind feet with five toes and hardly any internal lobe; the tail short, thick, and non-prehensile. Skull with walls of auditory meatus slightly produced; angle of mandible rounded. Grinding-teeth like those of *Sphingurus*, but the anterior much longer than the posterior.

B. HYSTRICINÆ. Grinding-teeth semirooted. Skull more elongate; lachrymal partly bounding the canal. Clavicles imperfect. Upper lip furrowed; tail not prehensile; soles of feet smooth; six teats. Palæarctic, Indian, and Ethiopian. Recent genera:—

4. *Atherura*, G. Cuvier, Règne Animal (2<sup>me</sup> éd.), i. p. 215 (1829).

Spines flattened, channelled; tail long, scaly, with a tuft of compressed bristles at the point. Nasal part of skull moderate. Upper grinding-teeth with one internal and three or four external folds, the latter soon separated as enamel-loops; the lower teeth similar, but reversed.

5. *Hystrix*, Linnæus, Syst. Nat. i. p. 76 . . . . . (1766).

Spines cylindrical; tail short, covered with spines and slender-stalked open quills. Nasal cavity usually very large. Air-sinuses of frontals greatly developed. Teeth as in *Atherura*.

### Family III. CHINCHILLIDÆ.

Incisors short; grinding-teeth divided by continuous folds into transverse laminae. Malar extending forward to lachrymal, with no inferior angle, and only a rudimentary superior angle. Optic foramina confluent. Auditory bullae moderate or very large. Palate contracted in front, and deeply emarginate behind. Clavicles perfect.

\* = *Syntheres* and *Sphiggurus*, F. Cuvier (1825) = *Cercolabes*, Brandt (1835).

Fore limbs small; hind limbs elongate, with four or five toes. Fur very soft. Tail moderate or long, bushy. Neotropical. Recent genera:—

1. *Chinchilla*, Bennett, Gardens &c. Zool. Soc. pt. i. p. 1 (1829).

Ears broad, not elongated. Fore feet with five digits; the pollex very small, but bearing a claw; hind feet with four digits. Tail long, bushy. Skull with the auditory bullæ enormous, appearing on the top of the skull between the supraoccipital, interparietal, and squamosals. Grinding-teeth rootless, with their enamel-folds nearly straight, each with three laminae; the two anterior laminae of the lower premolar imperfectly separated.

2. *Lagidium*, Meyer, Nov. Act. Acad. Nat.-Cur. xvi. p. 576 (1833).

Ears elongated. Both fore and hind feet with four digits. Skull as in *Chinchilla*, but the auditory bullæ more moderate, articulating on the top of the skull with the supraoccipital and squamosals only. Grinding-teeth similar, but their folds curved; all three laminae of the lower premolar perfectly separated.

3. *Lagostomus*, Brooks, Tr. Linn. Soc. xvi. p. 102 . . . (1828).

Ears moderate. Fore feet with four digits, and hind feet with three; the tarsus elongated. Tail moderate, bushy, tufted. Skull more massive than in the other genera, with well-marked sagittal and occipital crests; auditory bullæ smaller, not appearing on the top of the skull; infraorbital opening with a separate canal for the nerve. Grinding-teeth with two laminae, except the last upper molar, which has three.

Fossil genera:—

4. *Amblyrhiza*, Cope, Proc. Amer. Phil. Soc. xi. p. 183 . (1869).

Grinding-teeth semirooted, each with either four or five laminae.

5. *Loxomylus*, Cope, *op. cit.* p. 187 . . . . . (1869).

Grinding-teeth as in *Amblyrhiza*, but each with three laminae only, their crowns obliquely sloped both longitudinally and laterally.

#### Family IV. DASYPROCTIDÆ.

Incisors long. Grinding-teeth semirooted, with external and internal enamel-folds. Milk-teeth long retained. Optic foramina separate; palate broad; incisive foramina short; mandible with the masseteric ridge obsolete. Clavicles rudimentary. Form somewhat slender, limbs moderate; upper lip entire; ears short; tail short and naked or rudimentary. Fore feet with five digits; hind feet with five or three; claws short and hoof-like. Neotropical. Recent genera:—

1. *Dasyprocta*, Illiger, Prod. Syst. Mamm. p. 93 . . . (1811).

Form compact; limbs long; hind feet with three digits only; tail either obsolete or short and subnaked. Skull elongate, smooth; infraorbital opening with no separate canal; malar simple; parocci-

pital processes short. Upper grinding-teeth with one internal and three or four external folds, the latter soon separated as isolated enamel-loops; the lower teeth similar but reversed.

2. *Cœlogenys*, F. Cuvier, Ann. du Mus. x. p. 203 . . . (1807).

Muzzle obtuse; skin of cheeks reflected below the zygoma; hind feet with five digits; tail reduced to a tubercle. Skull with the zygoma enormously inflated, the anterior two thirds composed of the maxillary zygomatic process, which is hollowed out below into a great chamber, lined with mucous membrane and communicating with the mouth; infraorbital opening with a canal for the nerve; paroccipital processes long. Upper grinding-teeth with two internal and three external folds, except the third molar, which is reversed; lower teeth with one external and three internal folds.

#### Family V. DINOMYIDÆ.

Incisors broad. Grinding-teeth rootless, with folds dividing them into transverse lobes. Optic foramina confluent. Paroccipital processes short. Palate broad. Clavicles imperfect. Manubrium broad. Upper lip cleft. Hair harsh. Tail rather long, bushy. Both fore and hind limbs with four digits; claws as in the last family. Neotropical. Recent genus:—

1. *Dinomys*, Peters, Monatsb. Ak. Berlin, 1873, p. 551 (1873).  
(Characters those of the family.)

#### Family VI. CAVIIDÆ.

Incisors short. Grinding-teeth with folds dividing them into transverse lobes. Milk-teeth shed during fetal life. Optic foramina separate; paroccipital processes long and curved; palate contracted in front; mandible with a strong masseteric ridge. Clavicles imperfect. Upper lip entire; ears short or long; fur moderately soft; tail very short or absent. Fore feet with four digits, hind feet with three only; claws as in last family. Neotropical. Recent genera:—

1. *Cavia*, Pallas, Misc. Zool. p. 30 (*ex* Klein, 1751) . . (1766).

Body plump; limbs very short, subequal; ears short; hind feet not palmated; no external tail. Skull much depressed; malar slender; palate much contracted in front, deeply emarginate behind, exposing the præsphenoïd; incisive foramina long. Grinding-teeth each divided into two angular lobes.

2. *Dolichotis*, Desmarest, Mammalogie, p. 360 . . . . (1822).

Limbs and ears long; tail very short or rudimentary. Skull less depressed than in *Cavia*, and the facial portion comparatively larger; palate still more deeply emarginate, exposing the vomer; incisive foramina long. Grinding-teeth each divided into two angular lobes, except the third upper molar and the lower premolar, which have each three lobes.

3. *Hydrochærus*, Brisson, Règn. An. p. 116 . . . . . (1756).

Body massive ; limbs moderate ; muzzle very blunt ; eyes and ears small ; tail obsolete ; hair coarse and sparse ; all the feet fully webbed. Skull massive ; malar very deep ; palate produced behind the last molar ; incisive foramina short ; paroccipital processes very large and long. Upper incisors grooved in front ; upper grinding-teeth each with two lobes, united only by cement, except the third molar, which has twelve narrow transverse plates ; lower premolar and first molar with three narrow lobes, the second and third with four.

## Suborder II. GLIRES DUPLICIDENTATI.

Incisors  $\frac{6}{2}$ , at birth  $\frac{6}{2}$  ; the outer upper incisors soon lost ; the next pair very small, placed directly behind the large middle pair ; their enamel continuous round the tooth, but much thinner behind. Skull with the optic foramina confluent, with no true alisphenoid canal ; incisive foramina usually confluent ; bony palate reduced to a bridge between the alveolar borders. Fibula ankylosed to tibia below, and articulating with the calcaneum. Testes permanently external ; no vesicular glands. Two families :—

## Family I. LAGOMYIDÆ.

Either one or two premolars above and below ; grinding-teeth rootless, with transverse enamel-folds dividing them into lobes. Skull depressed ; frontals contracted, with no postorbital processes ; facial surface of maxillary with a single perforation ; posterior angle of malar produced almost to the auditory meatus ; basisphenoid not perforate, nor separated by a fissure from the vomer ; coronoid process in the form of a tubercle. Clavicles complete. Ears short. Hind limbs not markedly elongated. No external tail. Palæarctic and Nearctic. Recent genus :—

1. *Lagomys*, G. Cuvier, Tabl. Elém. de l'Hist. Nat. p. 132 (1798).

External characters those of the family ; two premolars above and below.

Fossil genus :—

2. *Titanomys*, Von Meyer, Jahrb. für Mineralog. 1843, p. 393 (1834).

One premolar only, both above and below.

## Family II. LEPORIDÆ.

Three premolars above, and two below ; grinding-teeth as in last family. Skull compressed ; frontals with large wing-shaped post-orbital processes ; facial portion of maxillaries minutely reticulated ; basisphenoid with a median perforation and separated by a fissure from the vomer ; coronoid process represented by a thin ridge of bone. Clavicles imperfect. Ears and hind limbs elongated. Tail short, bushy, recurved. Cosmopolitan (except Australasian region). Recent genus :—

1. *Lepus*, Linnæus, Syst. Nat. i. p. 77 . . . . . (1766).

External characters those of the family; all the grinding-teeth with three narrow laminæ, except the last lower molar, which is small and simple.

Fossil genus:—

2. *Palæolagus*, Leidy, Proc. Acad. Philad. 1856, p. 89 . (1856).

Incisors longer than in *Lepus*, first lower premolar with only two laminæ.

### Suborder III. GLIRES HEBETIDENTATI (subord. nov.).

Incisors  $\frac{2}{4}$ ; the second lower pair very small, and placed rather behind the middle pair, their enamel continuous round the tooth, and their crowns transversely hollowed, not chisel-edged. Grinding-teeth rootless, curved, with their convexity directed outwards. Mandibular condyles and glenoid cavity transverse. Fibula articulating with the calcaneum. One family:—

#### Family I. MESOTHERIIDÆ.

Two premolars above and one below; grinding-teeth rootless, with single reentering enamel-folds. Skull massive, with sagittal and occipital crests enormously developed, the latter running forwards at the sides to the zygoma; frontals with large postorbital processes; infraorbital opening small; malar very deep, running forward to the lachrymal; auditory bullæ moderate; paroccipital processes long; bony palate perfect, produced behind the molars; mandible resembling in form that of *Leporida*. Clavicles perfect; scapular and humerus resembling those of *Castorida*. Both fore and hind limbs with five digits, claws probably short and hoof-like. Ischia articulated with two of the caudal vertebræ. Pliocene of South America. Fossil genus:—

1. *Mesotherium*, Serres, Compt. Rend. Ac. Paris, xlv. p. 961  
(1857).

(Characters those of the family.)

P.S. Since this paper was written I have been much pleased to find that the researches of my friend Mr. A. Doran, of the Royal College of Surgeons, into the form of the auditory ossicles of mammals, essentially confirm the views of affinity here adopted. Mr. Doran's observations are yet unpublished; and it will be sufficient here to indicate their more general result. He finds in the auditory ossicles of the more typical *Sciuromorpha* a different type from that presented in the typical *Myomorpha*. *Castor*, though aberrant, approaches nearest to *Arctomys*; and *Anomalurus* is very close to *Sciurus*. Among the *Myomorpha*, *Bathyergus* has the characteristic type of the *Hystriomorpha*, in which, with few or no exceptions, the malleus and incus are ankylosed together; and *Dipus* inclines in the same direction. The ossicles of the **GLIRES DUPLICIDENTATI** present a distinct and less specialized type.





3. On the Land-Shells of Taviuni, Fiji Islands, with Descriptions of New Species. By E. A. LIARDET.

[Received December 14, 1875.]

(Plate V.)

The land-shells of Taviuni, one of the Fiji group of islands, are neither conspicuous for the number of their species nor for the beauty of their colouring. They mostly inhabit the coast-lands, and are all minute.

At a slight elevation a moderately large *Helix* (*H. casca*) and a *Bulimus* are common. Some *Helicinae* may also be found, but are rare. *Pupinæ* I have only found at elevations from about five hundred feet and upwards, and mostly under decayed logs. *Partulæ* frequent the underside of the leaves of *Dracæna* and Dilo-trees near the coast. *Partula lirata* is the only one I met with.

But if the want of size or beauty of colouring renders these shells less sought for by the ordinary collector, yet to the naturalist their structure and the habits of their occupants must always be a source of interest.

The natives of Fiji cannot be induced to seek in the dense forests for shells; consequently the only way is for the collector to trust to his own researches. This I did; but the result has fallen far short of my expectations.

Considering the moist temperature, dense vegetation, and mountainous character of the island, all so conducive to the abundant existence of land-mollusca, their scarcity is a matter of surprise. They mostly locate under logs and stones, seldom being exposed to the sun, which, no doubt, accounts for the absence of rich colour in any of the species.

The numerous small shells on the coast-lands are common to most of the islands; and being found sheltered by bark on logs and in the decaying husks of old cocoa-nuts, it may be inferred that they have frequently been transported from island to island—and though in some cases destroyed by a subsidence, have again, since the uprising, once more colonized the coast. The island of Taviuni would seem to establish this inference; for it is only at a height of some five hundred feet that *Pupinæ* and the larger species of *Bulimus*, *Helix*, and *Helicina* are found. Now coral-indications show this island to have been submerged to that level; I would therefore conclude that the last-mentioned shells are the true representatives of the molluscan fauna of that part of the former continent whose peaks are now the islands of Fiji.

In preparing the following descriptions of species believed to be new I have to acknowledge the assistance I have received from Mr. Henry Adams.

1. NANINA? TAVIUNIENSIS, sp. nov. (Plate V. figs. 1, 1a, b.)

Shell globose, minutely perforated, of a light brown colour, smooth

and highly polished; whorls 5, convex; spire obtuse; suture impressed; aperture nearly vertical, roundly lunate; columella short, excavated, white, with a callous curved tooth near the base.

Animal very active. I observed it on one occasion, when interrupted in progression, lift its tail high, as in figure 1*a*, and shake it vigorously.

*Hab.* Islands of Taviuni and Gamia, Fiji. Rare. (Coll. Liardet.)

2. *NANINA?* *VITRININA*, sp. nov. (Plate V. figs. 2, 2*a*.)

Shell yellow, thin, translucent, perforated, discoidal; whorls  $4\frac{1}{4}$ , last subangulated, the others slightly convex; beneath shining and well rounded; aperture slightly oblique, lunate; suture marginate; peristome thin; columellar lip slightly expanded over perforation. Animal black, with mantle covering two thirds of the shell, which it cannot enter at first.

Found in moist situations under logs, in this respect resembling *Vitrina*. (Coll. Liardet.)

3. *NANINA?* *RAMSAYI*, sp. nov. (Plate V. fig. 3.)

Shell similar to *N.?* *vitrinina*. When the animal is out I can detect no difference.

Animal red; a protuberance on the back rests against the shell anteriorly. It progresses by raising its head, extending the body, and placing the posterior part of the foot down in the form of an arch, lands its body gradually from the head; and this arch thus appears to recede until the caudal extremity is reached. Like *N.?* *vitrinina*, it cannot at first recede into its shell; and like *Vitrina strangei* of Australia, it leaves mucus in its track of a brick-red colour.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

4. *HELIX* *PRINCEI*, sp. nov. (Plate V. figs. 4, 4*a*.)

Shell very small, depressed, with wide and perspective umbilicus; colour dark brown; whorls 3, prominently costated; suture deeply impressed; aperture round.

*Note.*—This is the only Fijian shell I have seen resembling any of the Australian *Helices*.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

5. *HELIX* *PINNOCKI*, sp. nov. (Plate V. figs. 5, 5*a*.)

Shell conoid, perforate; colour a horny yellow; convex beneath; whorls 6, spirally striated, the last carinated, smooth beneath; aperture oblique, roundly lunate; columellar lip slightly expanded over perforation.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

6. *HELIX* *BARKASI*, sp. nov. (Plate V. fig. 6.)

Shell minute, trochiform, very minutely perforated, colour golden horny; whorls  $5\frac{1}{2}$ , convex, roughly and irregularly striated, trans-

versely ribbed, last whorl acutely carinated; beneath slightly convex; striæ radiating from the perforation; aperture oblique and triangular.

*Hab.* Taviuni, Fiji. A scarce shell. (Coll. Liardet.)

7. *HELIX CLAYI*, sp. nov. (Plate V. fig. 7.)

Shell minute, turbate, minutely perforate, of a golden horny colour; spire obtuse; whorls 5, convex, last slightly carinate, very finely, closely, and regularly striated; beneath smooth and shining; aperture oblique, roundly lunate.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

8. *LAMELLARIA PERFORATA*, sp. nov. (Plate V. figs. 8, 8 a.)

Shell small, acute, polished, dark brown colour; epidermis thin; whorls  $5\frac{1}{2}$ , convex, spirally striate, with a white apertural lamina; aperture oblique, pyriform; columellar lip white, projecting from the base of the shell, expanding slightly over region of umbilicus; outer lip impressed and of a deep purple tint.

This shell is found embedded in the bark of dead logs.

*Note.*—The animal has the tips of the eye-pedicels bulbous.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

9. *DIPLOMMATINA TAVIENSIS*, sp. nov. (Plate V. figs. 9, 9 a.)

Shell with the penultimate whorl contracted in front, leaving the previous one and lip of the aperture joining regularly costated; lip double; aperture circular and entire.

Animal with two tentacles, short and cylindrical, with an active arched motion, as in *Helicina*. Eyes situated at the base of tentacles inside.

*Hab.* Taviuni, Fiji. (Coll. Liardet.)

10. *LAGOCHEILUS HISPIDUS*, sp. nov. (Plate V. figs. 10, 10 a.)

Shell small, bulimiform, hispid, of a brown colour; whorls  $5\frac{1}{2}$ , spirally costate; aperture circular.

Very rare.

*Hab.* Gamia, Fiji. (Coll. Liardet.)

11. *OMPHALATROPIS VITIENSIS*, sp. n. (Plate V. figs. 11, 11 a.)

Shell bulimiform, acute; colour brown or yellow; whorls 5, last convex, with a keel round the base of the shell encircling the umbilicus, and terminating in a tongue-shaped process at the base of the aperture; epidermis thin; aperture pyriform; lip thickened.

*Hab.* Islets off Taviuni, Fiji. (Coll. Liardet.)

EXPLANATION OF PLATE V.

- |  |   |
|--|---|
| Fig. 1, 1a, b. <i>Nanina? taviuniensis</i> . | Fig. 7. <i>Helix clayi</i> .              |
| 2, 2a. <i>Nanina vitrinina</i> .             | 8, 8a. <i>Lamellaria perforata</i> .      |
| 3. <i>Nanina ramsayi</i> .                   | 9, 9a. <i>Diplommatina taviuniensis</i> . |
| 4, 4a. <i>Helix princei</i> .                | 10, 10a. <i>Lagocheilus hispidus</i> .    |
| 5, 5a. <i>Helix pinnocki</i> .               | 11, 11a. <i>Omphalotropis vitiensis</i> . |
| 6. <i>Helix barkasi</i> .                    |   |

## 4. Notes on the Rails of the Argentine Republic.

By W. H. HUDSON, C.M.Z.S.

[Received December 19, 1875.]

The Carau or Courlan (*Aramus scolopaceus*) has been called "an abnormal relative of the Rails at the most;" but in habits and appearance it is certainly near akin to them.

The beak of this bird is nearly 5 inches long, straight, and of an iron hardness; the tip is slightly bent to one side, the lower mandible somewhat more than the upper. The tongue extends to the extremity of the beak; at the end it is of a horny toughness, and frayed or split into filaments. This beak is a most effective instrument in opening shells; for where mollusks abound the Courlan subsists exclusively on them, so that the margins of the streams which this bird frequents are strewn with innumerable shells lying open and emptied of their contents.

Every shell has an angular piece, half an inch long, broken from the edge of one valve. Mussels and clams close their shells so tightly that it would perhaps be impossible for a bird to insert his beak, however knife-like in shape and hardness, between the valves in order to force them open; therefore I believe the *Aramus* first feels the shell with his foot whilst wading, then with quick dexterity strikes his beak into it before it closes, and so conveys it to the shore. It would be most difficult for the bird to lift the closed shell from the water and carry it to land; but supposing it could do this, and afterwards succeeded in drilling a hole through it with its beak, the hole thus made would have jagged edges, and be irregular in shape; but it is, as I have said, angular and with a clean edge, showing that the bird had just thrust his beak half an inch or an inch between the valves, then forced them open, breaking the piece out during the process, and probably keeping the shell steady by pressing on it with the feet.

By day the *Aramus* is a dull bird, concealing itself in dense reed-beds in streams and marshes. When driven up he rises laboriously, the legs dangling down, and mounts vertically to a considerable height. He flies high, the wings curved upward and violently flapped at irregular intervals; descending, he drops suddenly to the earth, the wings motionless, pointing up, and the body swaying from side to side, so that the bird presents the appearance of a falling parachute. On smooth ground he walks faster than a man, striking out his feet in a stately manner and jerking the tail, and runs rapidly ten or twelve yards before rising. At the approach of night he becomes active, uttering long clear piercing cries many times repeated, and heard distinctly two miles away. These cries are most melancholy, and, together with its mourning plumage and recluse habits, have won for the *Aramus* several pretty vernacular names. He is called the "Lamenting Bird" and the "Crazy Widow," but is more familiarly known as the "Carau."

Near sunset the Caraus leave the reed-beds and begin to ascend

the streams and visit their favourite fishing-sites. They are very active at night, retiring again at the approach of morning, and sometimes spend the day perched on trees.

As the breeding-season draws near they become exceedingly clamorous, making the marshes resound day and night with their long wailing cries. The nest is built amongst the rushes, and contains ten or twelve eggs, large for the bird, slightly elliptical, sparsely marked with large blotches of pale brown and purple, the whole egg having a cloudy appearance. When the nest is approached, the parent birds utter sharp angry notes as they walk about at a distance from the intruder. Young and old birds live in company till the following spring.

The Carau is more nocturnal than the Rails, and, having a far more powerful flight, takes to wing more readily: in general appearance, and in its gestures and motions when on the ground and when rising, it closely resembles them.

The Jacana (*Parra jacana*), arrives from the north in Buenos Ayres early in October, coming singly or in small parties. In their migration they appear to follow the course of the Plata; and, though some individuals are found breeding inland, they are for the most part confined to the littoral marshes.

The Jacanas journey by very easy stages, frequently alighting to rest by the way; for they are so incapable of sustained flight that boys on the pampas occasionally take them, pursuing them on horseback till the birds drop down exhausted. I believe the migratory Rails travel in the same way—a matter not easily determined, as they migrate by night; but they are feeble-winged creatures, and when driven to rise flutter away as if wounded. I have observed the Jacanas migrating by day, but would not for this reason affirm that they do not journey by night, since the Bartram's Sandpiper and other species journey both day and night.

The Jacana flies swiftly, in a straight line and close to the surface: the wings flutter rapidly; and there are frequent intervals of gliding. When rising it presents a most novel appearance, as the lovely pale green of the wings is quite concealed when the bird is at rest; the beauty of its flight is thus greatly enhanced by the sudden display of a hue so rare and delicate. At a distance from the beholder, and in a strong sunshine, the wings appear of a shining golden yellow. Not only when flying does the Jacana make a display of its beautiful wings; without rising it has a way of exhibiting them, appearing to delight as much in them as the Cockatoo does in its crest or the Peacock in its train. When several of these birds live in company, occasionally they all in one moment leave their feeding, and with quick excited notes, and clustering together in a close group, go through a singular and pretty performance, all together holding their wings outstretched and agitated, some with a rapid fluttering, others a slow-moving leisurely motion like that of a butterfly sunning itself. The performance over, the birds peaceably scatter again. I have never observed Jacanas fighting.

Soon after coming they pair, and build a simple nest with few

materials, usually on the floating weeds; the eggs are four, in shape like Snipes' eggs, and have deep-brown spots on a pale yellowish-brown ground. During incubation the male keeps guard at some distance from the nest, and utters a warning cry at the approach of an intruder; the female instantly flies from the nest, but in rising renders herself very conspicuous. When the nest is approached the parent birds hover about, occasionally fluttering as if wounded, all the time keeping up a clamour of hurried angry notes somewhat resembling the barking cries of the Black-collared Stilt.

The Jacana has always appeared to me strictly diurnal in its habits.

Some of our Rails and Rail-like birds I will pass over, either because I have not learnt their habits or have failed to discover any thing interesting in them not known already, as in the case of our two species of *Fulica*.

I will mention, in passing, that the Bartram's Sandpiper (*Actiturus bartramius*), judging purely from its habits, is a near relation of the Rails. This species, I believe, has not had a place assigned it in the Argentine avifauna—a strange oversight; for it is one of our commonest birds.

I will now give a brief account of *Rallus rhytirhynchus*, of *Porzana erythrops*, and of that king of Rails the *Aramides ipecaha*.

The Black Rail (*Rallus rhytirhynchus*) abounds everywhere in the La-Plata region where reeds and rushes grow. They are always apparently as abundant in winter as in summer; this fact has surprised me greatly, since I know this species to be migratory, their unmistakable cries being heard overhead every night in spring and autumn, when they are performing their distant journeys. Probably all the birds frequenting the inland marshes on the south-western pampas migrate north in winter; and all those inhabiting the shores of the La Plata and the Atlantic sea-board, where there is abundant shelter and a higher temperature, remain all the year. On the Rio Negro of Patagonia the Black Rails are resident; but the winter of that region is mild; moreover the wide expanse of barren waterless country lying between the Rio Negro and the moist pampas region would make migration from the former place impossible to such a feeble flyer. Of this instinct we know at least that it is hereditary; and it is hard to believe that from every one of the reed-beds distributed over the vast country inhabited by the Black Rail a little contingent of migrants is drawn away annually to winter elsewhere, leaving a larger number behind. Such a difference of habits cannot possibly exist amongst individuals of a species in one locality; but differences, in the migratory as in other instincts, great as the one I have mentioned, are found in *races* inhabiting widely separated regions.

It is difficult to flush the Black Rails; they rise in a weak fluttering manner, the legs dangling down, and after flying forty or fifty yards drop again into the reeds. Their language is interesting. When alarmed the bird repeats, at short intervals, a note almost painful from its excessive sharpness; it utters it standing on a low branch or other elevation, but well masked by reeds and bushes, and incessantly bobbing its head, jerking its tail, and briskly turning

from side to side. It has at such times a very sprightly appearance, whilst the long tricoloured beak, the blood-red eye, and vermilion legs admirably contrasting with the fine dark plumage, give it some claims to beauty. At other times it has a hollow call-note with a puzzling ventriloquism in the sound; this note is sometimes repeated at brief intervals for an hour at a time; and whilst uttering it the bird stands, as usual, on a slight eminence, but in a listless attitude, and without any of the nods and becks and other frisky gestures. It has also a kind of song, frequently heard; the common people fancy it resembles the distant braying of an ass; hence the vernacular name "Burrito," by which the bird is known in the Plata. It is heard occasionally in the day, but oftenest in the evening, and is a confused performance, uttered without pause, and composed of several long shrill notes, modulated and mingled with others hollow and booming. These notes can be heard a thousand yards away; but far or near they always sound remote.

I can say little of *Porzana erythroptis*, called with us "Gallinetita," or Little Hen, though it visits Buenos Ayres annually, breeds, and is abundant there. In language and habits it is like a Coot, and is often seen on land, and feeding principally as it swims about in a jerky manner amongst the floating weeds. It appears in October, migrating exclusively, I think, by night; and after the autumnal departure an individual is rarely seen. By day they are shy and retiring, but scatter abroad in the evening, frequently uttering their strange hollow cry, called "witch-laughter" by superstitious people, and resembling a sudden burst of hysterical laughter, the notes beginning loud and long, becoming brief and hurried as they die away.

The *Aramides ipecaha*, called in Buenos Ayres "Gallineta," is a most interesting bird. Without any brilliant tints, there is something so pleasing to the eye in the various hues of its plumage—light brown and drab-colour, blue, grey, buff, and black—all these colours so harmoniously disposed (the effect heightened by the yellow beak, golden-red eye, and vermilion legs), that I do not know a handsomer waterfowl.

They are found as far south as the thirty-fifth parallel of latitude, and are most abundant along the marshy borders of the Plata, frequenting the vast reed-beds and forests of water-loving *Erythrina crista-galli*. When they are not persecuted they are bold pugnacious birds, coming out of the reeds by day and attacking the domestic poultry about the houses and even in the streets of the villages situated on the borders of their marshy haunts. But when compelled to place Man on the list of their enemies, it is a difficult matter to get a sight of one; for, like all birds that rise laboriously, they are vigilant to excess, and keep themselves so well concealed that one may pass through their haunts every day of the year, and the *Ipicaha* still be to him no more than a "wandering voice." But even persecution does not entirely obliterate a certain inquisitive boldness that is one of the strongest traits of their character. Usually they roam singly in quest of food, but have reunions in the evening and occasionally during the day, especially in gloomy weather.

Where there are forests, and on misty or rainy days, they stray to a distance from the reeds. They walk with an easy and somewhat stately grace, jerking up the tail, Rail-like, at every stride, and run with a velocity no man can equal. Occasionally they perch on trees, and are fond of strutting to and fro on a horizontal branch.

When surprised on the open ground the Ipecaha lies close, like a Tinamou, refusing to rise until almost trodden upon. It springs up with a loud-sounding whirr, rushes violently through the air, till, gaining the reeds, it glides a few yards and then drops: its flight is thus precisely like that of the Tinamou, and is more sounding and violent than that of the Grouse or Partridge. On spying an intruder it immediately utters a powerful cry, in strength and intonation not unlike that of the Peafowl. This note of alarm is answered by other birds at a distance as they hastily advance to the spot where the warning was sounded. The cry is repeated at irregular intervals, first on one hand, then on the other, as the birds change their position to dog the intruder's steps and inspect him from the reeds. I have surprised parties of them in an open space, and shot one or more; but no sooner had the survivors gained their refuge than they turned about to watch and follow me, sounding their powerful alarm the whole time. I have frequently been followed half a mile through the rushes by them, and, by lying close and mimicking their cries, have always succeeded in drawing them about me.

But the Ipecaha's loudest notes of alarm are weak compared with the cries he utters at other times, when, untroubled with a strange presence, he pours out his soul in screams and shrieks that amaze the listener with their unparalleled power. These screams, in all their changes and modulations, have a resemblance to the human voice, but of the human voice exerted to its utmost pitch, and expressive of agony, frenzy, and despair. A long piercing shriek, astonishing for its strength and vehemence, is succeeded by a lower note, as if in the first one the creature had well-nigh exhausted itself. The double scream is repeated several times; then follow other sounds, resembling, as they rise and fall, half-suppressed cries of pain and moans of anguish. Suddenly the unearthly shrieks are renewed in all their power. This is kept up for some time, several birds screaming in concert; it is renewed at intervals throughout the day, and again at set of sun, when the woods and marshes resound with the extravagant uproar. I have said that several birds unite in screaming; this is invariably the case. I have enjoyed the rare pleasure of witnessing the birds at such times; and the screams then seem a fit accompaniment to their disordered gestures and motions.

A dozen or twenty birds have their place of reunion on a small area of smooth clean ground surrounded by reeds; and by lying well concealed and exercising some patience one is enabled to watch their proceedings. First one bird is heard to utter a loud metallic-sounding note, three times repeated, and somewhat like the call of the Guinea-fowl. It issues from the reeds, and is a note of invitation quickly responded to by other birds on every hand as they all

hurriedly repair to the customary spot. In a few moments, and almost simultaneously, the birds appear, emerging from the reeds and running into the open space, where they all immediately whirl about and begin the exhibition.

Whilst screaming they rush from side to side as if possessed with frenzy, the wings spread and agitated, the beak wide open and raised vertically. I never observed them fight or manifest anger towards each other during these performances; and, knowing the pugnacious spirit of the *Ipicahas*, and how ready they are to seek a quarrel with birds of other species, this at first surprised me; for I was then under the mistaken impression that these gatherings were in some way related to the sexual instinct.

Whilst watching them I also remarked another circumstance. When concealing myself amongst the rushes I have been compelled to place myself so disadvantageously, owing to the wet ground, that any single bird straying accidentally into the open space would have discovered my presence immediately; yet the birds have entered and finished their performance without seeing me; so carried away are they by the emotion that possesses them during these moments. But no sooner has the wild chorus ended than, aware of my presence, they have fled precipitately into the reeds.

How could this curious habit I have described, and which cannot be considered advantageous, have originated? It is simply that this species has a somewhat singular way of giving expression to an instinctive feeling common to all creatures. Many birds and mammals have social gatherings, peaceful like those of the *Ipicaha*; and if seen to fight, these are but playful engagements; for the emotion that calls them together is a joyous one. It manifests itself so variously in different species that a person might easily be led to believe that the displays he observes are, in many instances, inspired by the sexual passion.

The *Ibis melanotis*, the Glossy Ibis, the Black-collared *Himantopus*, and the Spurred-winged Lapwing also hold similar exhibitions. The last-named species has a far more remarkable performance on the ground, aptly called "dancing" by the Argentine peasants; for the birds, in twos and threes, run and whirl about and stand bowing till their beaks touch the ground, all the time regulating their movements to drumming rhythmic notes.

The Chimangos (*Milvago*) frequently have meeting-places where they circle about, sportively quarrelling in the air, then rest, each one on his separate perch; and at intervals one bird utters a long and song-like cry, followed by a succession of short notes, in which all the birds join as in a chorus.

Males and females of many species in which the sexes are always faithful sing and scream together in a jubilant manner at intervals through the day. This habit is most remarkable in the Oven-bird (*Furnarius*): these stand together facing each other, singing their shrill excited song, all the while beating their outspread wings in time with the notes, and each bird taking a part, so that the performance produces the effect of harmony.

The Chajas (*Chauna chavaria*) also sing in concert, "counting the hours," as the Gauchas say; for they sing about nine o'clock in the evening and again just before dawn.

Still more remarkable is the habit in the Scissor-tail (*Milvulus tyrannus*); for these birds are not gregarious, and yet once a day they rise up and, hurrying from tree to tree, summon each other to a general gathering; then, mounting with sharp chirping notes, they precipitate themselves violently downwards from a great height, their long tails opening and closing, their zigzag flight accompanied with impetuous "whetting" and "grinding" notes.

The Tinamous unite in small coveys and play, running about in circles, rapidly doubling and suddenly crouching as if to conceal themselves.

Tyrant-birds and Thrushes chase each other screaming through the air and amongst the trees. Hard-billed singing-birds sing in concert on trees and bushes, and sometimes pursue each other and fight all the time they are singing. Some Ducks fight mock battles on the water. The habit is different in the Chiloe Widgeon (*Mareca chilensis*); for this Duck has an easy and powerful flight. In small flocks they rise until they become mere specks in the sky; at that vast height they hover, all the time singing their shrill notes, and close and separate and close again; and every time they close they slap each other so smartly with their wings that the blows can sometimes be heard when the birds have quite vanished from sight.

Many mammals also have meetings and rejoice together, some species even having set performances; but the habit is less noticeable in them, as they are not so impressionable by nature as birds, and are also less buoyant in their motions, and less garrulous.

In all the instances I have given, the sexual passion is in no way concerned; for these gatherings and displays take place at all seasons of the year, and are in some cases less frequent during the season of courtship. It is impossible to doubt that the cause is simply the natural gladness felt by all sentient beings at times, when hunger is satisfied and they are free from the restraints imposed by other emotions. It is to a great extent an associate feeling, and, in species accustomed to meet and to indulge in it with frequency, is instantaneously communicated from one to the other. Every shepherd and herdsman on the pampas is familiar with the fits of joy that seize his domestic or semi-domestic cattle. Thus a lamb in a flock will suddenly spring up two or three times in quick succession, coming down on his four feet together; and instantly his companions become possessed with a joyous contagion, and, breaking away from their dams, they fly off in pursuit. Suddenly they all stop and group themselves together; but in a few moments another lamb springs up and bounds away, and the chase is renewed.

It is not to be wondered at that some species should have not only a definite and unchangeable manner of manifesting their joyousness, but should give it such extravagant expressions as, for example, the Ipecaha does, whilst in others it shows itself in the most subdued manner or not at all; for some animals are incapable of ex-

pressing even feelings so violent as pain, fear, anger, and solicitude for their young. But that the feeling exists at times in all I am pretty sure, even in so melancholy a creature as the Heron.

Probably the concert-screaming of Foxes and Monkeys and many other animals, the pretty "showing-off" of Jacanas and other birds, and the aerial vagaries of Snipes, accompanied by peculiar sounds called "bleating" or "drumming," and a hundred more strange performances are due to the same cause.

## 5. On the African Rhinoceroses.

By the Hon. W. H. DRUMMOND.

[Received December 20, 1875.]

I believe that at present naturalists have arrived at no decided conclusions as to the number of species of Rhinoceros inhabiting Africa; and as I have had some practical experience on the subject I beg leave to offer these few remarks for their consideration.

As far as my own experience and the inquiries I have made of natives well acquainted with the facts, and of European travellers and hunters who were equally qualified to offer an opinion, have gone, I believe, in accordance with the recorded opinions of most travellers and sportsmen who have given any attention to the subject, that there are four distinct species; while if *R. oswellii* be not merely a variety of *R. simus*, as I am inclined to think it is, it would follow that there was one more. These I would class as follows:—*R. simus*, the "Mohohu" of the Bechuanas, and the "Umkave" or "Umkombewoquobo" of the Amazulu, Amatabili, and Ama Tonga tribes; *R. keitloa*, the Keitloa of the west, and Umkombe Tovote of the east; *R. bicornis major*, the greater black species, known as the Kulumane on the eastern side, while in South Central Africa (I mean the country north of the Transvaal Republic, and south of the Zambesi) it is, I believe, known as the "Borele;" and *R. bicornis minor*, the small black species, known up to the Limpopo as the "Upetyane," and among the Dutch republics to the north as the "Klin rhinaster." To these must, I suppose, be added *R. oswellii*, or the "Kabaoba," until we are in a position to prove conclusively that it is merely a variety, as I think, for reasons hereafter to be stated, will ultimately prove to be the case.

Of the above, *R. simus* and *R. oswellii* are those generally known as the "white," while *R. keitloa*, *R. bicornis major*, and *R. bicornis minor* are called the "black;" and before proceeding further I should like to say a few words about the nomenclature I have made use of, and which (with the exception of the introduction of what I believe to be a distinct species, which for want of a better name I have called *R. bicornis minor*, the Small Black Rhinoceros or Upetyane) is the nomenclature I believe to be in general use. The distinction, however, of black and white seems to me misleading and misapplied, all Rhinoceroses being of the same colour, namely a peculiar shade

of brown, or, if any difference does exist, it being in *R. bicornis minor* possessing a tinge of red. That to different observers, and in different localities, they do appear to be of different colours (Baldwin mentions a blue kind) is undoubted; but, except any slight variation that may locally exist, from the animal, as in Darwin's theory of protective resemblance, conforming to the prevailing colour of the district it inhabits, all such cases may be referred to outward circumstances, such as the position of the sun, or the kind of mud they may have been rolling in last, and partly, no doubt, to the age and sex of the animal. In exemplification of this, I may mention that I have watched a bull of *R. simus* trotting past me in the full glare of the midday sun, and it has appeared to me almost white; while after following the same animal up, and finding it feeding with the long shadows of evening on it, its colour has then seemed to be, as it really is, a deep brown. It may also be worthy of notice that no system seems to have been pursued in giving the scientific names under which these species are known. *R. simus*, the snub- or square-nosed Rhinoceros, is appropriate enough, as referring to one of its most distinctive points, while *R. oswelli* is named after the gentleman who discovered it; but the term *bicornis*, though no doubt applicable, would be equally so to every one of the five species, and would be most especially so to *R. keitloa*, in which the two horns are of almost equal length, while its present name, *keitloa*, being merely a native and local designation, conveys nothing to those unacquainted with the language.

*R. simus*, the common white Rhinoceros, requires but little description from me, being, as we all know, a well-recognized species. It is the greatest in size, and is remarkable for the length the front horn grows to, as well as its gentle and inoffensive disposition. Its food is, as far as my experience goes, solely grass. The country over which I can personally speak as to its existence, extends from Zululand up to the Limpopo; from there it incontrovertibly reaches the Zambesi; while Speke mentions it in Karagweh, and Andersson between Walwich Bay and Lake Ngami and in Ovampoland. Sir Samuel Baker tells me that he saw at Khartoum a horn "immensely thick at the base, and about  $2\frac{1}{2}$  feet long, which came from the countries west of the Nile;" and though for some reason which he did not state he thinks it was not the horn of a "White Rhinoceros," yet, unless we conclude that a species exists of which we have hitherto heard nothing, it is justifiable to believe it to be a specimen of either *R. simus* or *R. oswelli*; and as the habitat of the latter is distinctly circumscribed, the balance of evidence lies on the side of its having been the former. It may therefore be generally stated, subject to correction, that *R. simus* is common to the south of the Zambesi; and while undoubtedly it exists to the north of it, though not I think in large numbers, it has never been seen in any part of Northern Africa. It is, however, worthy of remembrance that the value of its horn in those parts of Africa where it is rare or not found is great; while to the south, where it is plentiful, the value is comparatively small.

*R. keitloa* is another well-recognized species ; but for the sake of comparison with those killed in other parts of Africa I will mention the average measurements I have noted, and the peculiarities of structure.

	ft.	in.
Length from nose to base of tail, about	11	0
Height at the shoulder . . . . . about	5	0
Circumference . . . . . about	9	0
Average length of the anterior horn. .	1	8
Average length of the posterior horn. .	1	6

In some few cases the posterior horn is a trifle the longer, and in others 4 or 5 inches the shorter. The head is of the same type as that of *R. bicornis major* and *R. bicornis minor*; and the peculiar snout and long prehensile upper lip which characterizes these three species is more marked than in the former, while less so than in the latter. Its food is chiefly, if not solely, the young and tender shoots of various kinds of thorns. In disposition it is decidedly morose and ill-tempered ; but it seldom charges without provocation. Its habitat is a very extended one, though it does not seem to be plentiful anywhere, more than two or three being seldom seen together, and then only at long intervals. I have found it from the Black Umfolosi river in Zululand up to the Limpopo, and the black crosses seen on the map now before us in the country south of the Zambesi show the approximate spots where, to my knowledge, it has been killed. Andersson seems to have met with it to the west ; and it most undoubtedly exists in Abyssinia, specimens which I have examined from that country being now in the British Museum, and a very perfect one in the possession of Mr. Gerrard ; while from the measurements of a pair of horns from a Rhinoceros cow killed by Sir Samuel Baker (the front horn 23 inches, the back  $17\frac{1}{4}$  inches) I should be inclined to believe that it also must have been *R. keitloa*,  $17\frac{1}{4}$  inches being an extremely unusual length for the posterior horn of any other species.

I will next speak of *R. oswelli*, about which, however, much remains to be learned. In conformation, habits, disposition, and food it in no way differs from *R. simus*, except in its horns. This singularity, as is well known, consists in the front horn, which is straight, and even in comparison with *R. simus* unusually long, pointing forward at an acute angle instead of standing erect from the snout, though this angle is very various in different animals, some possessing the peculiarity in the most modified form, while in others it is very marked. The red marks on the map show where I know it to have been met with or killed ; and I have found specimens high up on the east coast, though not exhibiting their characteristic to any great degree. It is, however, by far the most local of any of the species, so much so as to induce me to believe that it is merely local variety, some bull or cow (probably the former) having either from injury or accident of birth possessed a horn similar to that which we now find among its descendants. The fact of the peculiarity varying so greatly in different individuals is, it seems to me,

in favour of this view, and of the interbreeding of *R. simus* and *R. oswelli*; while it is worthy of note that Livingstone mentions having seen somewhere near the Zambesi a "black" Rhinoceros with a horn like that of *R. oswelli*—a statement which proves the possibility of the accidental occurrence of such a peculiarity as the interbreeding of *R. oswelli* and any of the species known as the "black" is too incredible to be taken into serious consideration. It is, however, not possible to settle this point until it can be proved whether *R. simus* and *R. oswelli* do or do not interbreed; and I may therefore pass on to the next species.

I may first observe that in using the word *R. bicornis* for this in common with the next species, I do so under correction, and for the reason that while unable to say with certainty which has been hitherto referred to by different travellers under that name, I think it very probable that both have been so, though they differ so greatly that I cannot but wonder at this being the case, and can only account for it by the fact, which I have myself noticed, that where the one species is rare the other is common, and *vice versa*. I will commence by describing the larger of the two, the one known on the east as the Kulumane, and up to the Zambesi as the Common Black Rhinoceros. This animal does not, I am inclined to believe, on an average exceed *R. keitloa* in size, though I have killed individual specimens larger than any I have seen of the latter; it, however, differs from it in its horns, which, though following the conformation of *R. simus*, never attain to the same size. Their average length in bulls is about 18 inches for the anterior, and 8 inches for the posterior, the circumference of the base of the larger horn being about 18 inches; while in cows, which in all the species have longer and more slender horns, the front one measures 22 inches, and about 16 inches at the base, the back one being about 12 inches in length. It is also worthy of note that the length of the horn in all the black species seldom varies in adults more than 3 or 4 inches, while in both the white a difference of a foot may not uncommonly be found. I have already mentioned when speaking of *R. keitloa* that the species now under discussion possesses, though in a less marked degree, the peculiar snout and upper lip characteristic of the three "black" species; and this leads me to the cause of such a provision of nature. *R. bicornis minor* and *R. keitloa* live, so far as my experience goes, entirely on the leaves and branches of trees; and this remarkable lip acts much in the same manner as the trunk of an Elephant in drawing their food towards their mouths. *R. bicornis major*, however, though living partly (and I should say chiefly) on the same, also consumes, like *R. simus*, large quantities of grass; and therefore its snout possesses the characteristics of both. I have frequently seen them browsing on the grass; but the possession for a few days of a young calf of this species afforded me an unusually good opportunity of studying their habits and favourite food. Its mother had been killed on the banks of the Pongolo by one of my hunters; and the calf had, as is often the case, remained by the carcass during the following night, where we captured it next morning, and after con-

siderable difficulty conveyed it to our camp. The bottom in which it was tethered contained abundance of the rich grass which forms the chief food of *R. simus*; but it did not eat much of it, though even on the first evening it consumed a large quantity of the young shoots and tender leaves of the thorn-branches provided for it, and seemed to be most fond of the hack, or waitabit thorn, turning over the other kinds with its snout and tasting them, and then passing them by to search for the former. On the second evening, however, I noticed it, after returning from water, commence to eat the surrounding grass; and though it did not show so great a relish for it as it did for the thorn-shoots, it ate it, both then and afterwards, in such large quantities as proved that it naturally forms a by no means inconsiderable portion of its food.

In disposition this species much resembles *R. keitloa*—neither often charging without provocation, though they will puff and snort and show a disposition to do so; and it may also be said to be the more gregarious as well as the most common, herds of from five to fifteen being sometimes seen in unusually favoured localities. It undoubtedly exists in all the country S.E. of the Zambesi, being especially plentiful in some parts of Zululand. Whether it or the species I shall next describe under the name of *R. bicornis minor* is the one spoken of by Andersson on the west, I am unable to say, as he gives no measurements, though the head and horns depicted in one of his plates resemble those of the latter. Travellers in Central and Northern Africa speak of *R. bicornis* as existing without giving any details by which it can be identified; and though, for reasons to be hereafter given, I imagine the smaller species is alluded to in Northern Africa, I cannot of course be in any way certain.

The distinctive characteristics of *R. bicornis minor* are very marked. Its average measurements are as follows:—

	ft.	in.
Length from nose to base of tail . . . . .	10	4
Height at the shoulder about . . . . .	4	6
Circumference about . . . . .	8	0
Average length of the anterior horn . . . .	0	10
Average length of the posterior horn ..	0	5

Sometimes specimens are found with the front horn 13 or 14 inches in length, and the posterior in proportion; but they are uncommon. The head is smaller in proportion than that of any other species, while the upper lip protrudes to a greater degree, and the eye is unusually small. Its foot is also smaller in proportion to its body than that of any of the others. Its food is, as I have before said, solely the leaves and branches of thorns; and it is scarcely ever found out of thorn-jungle, though *R. bicornis major* is often found in other coverts. Its disposition is savage and morose to the very last degree. It continually attacks without other provocation than the mere sight of a human being affords; and it will follow the scent of the human foot for some distance. When seen without the observer's proximity being suspected, it is generally heard grumbling and grunting out its

ill temper; and in following its spoor the furrows ploughed up in the ground, and which are more or less made by all the different species, are so common as, when the ground is too hard to enable more than a faint mark to be seen, to prove to the hunter the species he is following. I have never seen more than three (a bull, a cow, and a calf) together. I have found them in considerable numbers from the Black Unfolosi river in Zululand all along the Ubombo range up towards the Limpopo, though as they near that river they become scarce, and I only know of one instance of their being found near the Zambesi. I have, however, no doubt that they existed at one time all over the thorn-country south of the Zambesi, as oral traditions of their ferocity are common among the Dutch hunters; and no doubt their own ill-temper accounts for their being now partially extinct in that district, self-defence on the hunter's part having caused their destruction; while lower down to the south-eastward, where no doubt they were originally more common, they are disappearing more rapidly than any other species. I have seen a considerable number of horns from Abyssinia, and they appear to me to resemble in size and shape those of this species, though perhaps a trifle longer; but until some one will describe the animal to which they belong, it is useless to make guesses which are not founded on sufficient data.

It will be seen from the above remarks how very limited my knowledge of the subject under discussion really is; nor should I have ventured to make them before you this evening had I not felt that it is only by each traveller describing what has actually come within his own observation that such questions as the number of species of any animal on so large a continent as Africa can ultimately be set at rest; and this must be my excuse should you feel that from my slender acquaintance with my subject I have been to any extent occupying your time to-night under false pretences.

6. List of Birds met with in North-eastern Queensland, chiefly at Rockingham Bay. By E. PIERSON RAMSAY, C.M.Z.S.—Part II.\*

[Received December 28, 1875.]

174. *PTILINOPUS SWAINSONII* †.

This species is somewhat rare in the Rockingham-Bay district; a few only were obtained.

175. *LAMPROTRERON SUPERBUS*.

I found this, one of our most beautiful species, tolerably abundant in all the scrub lands of the Herbert river and coast-range. Their note is a broken "coo," prolonged into a rolling guttural sound at the end; they may be heard at least half a mile off. But, owing to the dense nature of the scrubs, the birds are at all times difficult to

\* Continued from P. Z. S. 1875, p. 603.

† Where no references are given, the names are taken from Gould's 'Hand-book.'

obtain, although not rare. The female of this species has undoubtedly been described and figured under the name of *L. cyanovirens*. The young resemble those of *L. swainsonii*, particularly in having narrow yellow margins to the primaries and secondaries, and to the tips of the feathers on the chest and breast; they do not show the forked or split feathers on these parts before the end of the second year, although the green bands on the flanks are conspicuous in the nestling.

176. MEGALOPREPIA MAGNIFICA.

I found this species abundant, and very variable in size.

177. MEGALOPREPIA ASSIMILIS.

Although this bird is so much smaller than the preceding species in all its admeasurements, it should scarcely be considered a distinct species, as it differs in no other way except in size from *M. magnifica*. I have examined numerous examples of both *M. magnifica* and *M. assimilis*, and consider the latter rather the connecting link to *M. puella*. This last species has lately been noted from Cape York, whence I received a fine pair procured there by Mr. J. A. Thorpe.

178. LEUCOMELÆNA NORFOLCIENSIS.

We procured several specimens of this fine and scarce Pigeon. They were found feeding in the same trees (*Acmena* and *Jambosa*) with *Ptilinopus*, *Megaloprepia*, and others.

179. MYRISTICIVORA SPILORRHOA.

During the months from October until the end of April, when they leave, this species is very numerous all over the Rockingham-Bay district. Early in the morning, as soon as it is light enough, they leave their roosting-places in large flocks, and betake themselves to their feeding-grounds, dispersing over the scrubs and among the various species of *Acmena* and *Jambosa* which line the margins of the Herbert river. Towards evening they assemble, and, leaving the feeding-grounds, return to roost on the mangrove islands in Hinchbrook channel, and around the coast and mouths of the rivers, flying a distance of often 40 miles night and morning. The tops of the mangroves on which they roost are literally white with birds; and, notwithstanding the disturbance and havoc committed among them by shooting-parties, they continue to arrive until dark. They breed on these islands, building little or no nest, a few sticks placed so as to prevent the eggs from rolling away being considered sufficient. Young almost fully fledged were brought to me in January; but many at this time were laying their eggs. When freshly killed the concealed portions of the feathers on the body are of a beautiful delicate rosy salmon hue, which soon fades after death.

180. LOPHOLAIMUS ANTARCTICUS.

I once met with a flock flying over some of the dense scrubs of the Herbert river, and also a few on the wing near the township of

Cardwell. They were not considered plentiful in the district. Those obtained about Cape York are considerably less in size, and appear more plentiful in that district.

181. *CHALCOPHAPS CHRYSOCHLORA*.

This pretty Ground-Dove is tolerably plentiful over the whole district. I noticed it frequently close to residences and in gardens within the township.

182. *LEUCOSARCIA PICATA*.

This species is not by any means so plentiful as in the brushes of New South Wales, where the woods resound with its monotonous, deep, and melancholy call. It frequents alike the dry scrubs on the margins of rivers, and those which clothe the damp stony sides of the Sea-view range. Its flesh is highly esteemed, and resembles that of a Quail. The bird is strictly a ground-feeder, only taking to the trees when disturbed, where, perched on some thick branch, it remains motionless until apparently all danger is over. The eggs are two in number, of the usual form, but comparatively small.

183. *PHAPS CHALCOPHTERA*.

We met with this bird rarely, and only on the sterile sandy flats in open forest country beyond the coast range, where numerous species of *Acacia* abound, on the seed of which they feed.

184. *GEOPHAPS SCRIPTA*.

Occasionally found in open forest-country. Met with only in one place, about 30 miles inland. I found it breeding in the Burnett-river district in December 1870. The nest was placed beside a tuft of grass, and consisted of a shallow hole lined with a few blades of dry grass. The eggs were two in number, and of a creamy white.

185. *ERYTHRAUCHÆNA HUMERALIS*.

186. *GEOPELIA TRANQUILLA*.

187. *GEOPELIA PLACIDA*.

I found these species by no means rare. They prefer the open country, and feed on the seeds of the "Grass-tree," *Xanthorrhœa*, and various species of *Acacia* and other leguminous plants abundant in the sandy tracts about Cardwell.

188. *MACROPYGIA PHASIANELLA*.

This fine species, so abundant in the "brushes" of the Richmond and Clarence rivers in New South Wales, is far from being common in the Herbert-river district; I met with a pair on one occasion only. It was quite an unknown species to most of the settlers in those parts.

189. *TALEGALLUS LATHAMI*.

However plentiful this species may have been formerly in the Rockingham-Bay district, it is now very scarce, only one having been obtained

during my visit. They are still plentiful in the New-South-Wales scrubs. I found that two or more females visited the same mound to lay their eggs in; and when this is the case the mound is often twice as large as an ordinary mound. It seems probable that several individuals assist in scratching the mound together, when a space often 50 yards in diameter (on level ground) is found cleared of almost every fallen leaf and twig. The mounds are often 6 feet in height, and 12 to 14 wide at the base; sometimes they are more conical. The central portion consists of decayed leaves mixed with fine débris, the next of coarser and less rotted materials; and the outside is a mass of recently gathered leaves, sticks, and twigs not showing signs of decay. In opening the nest these are easily removed, and must be carefully pushed backwards over the sides, beginning at the top. Having cleared these, and obtained plenty of room, remove the semidecayed strata; and below it, where the fermentation has begun, in a mass of light fine leaf-mould will be found the eggs placed with the *thin end downwards*, often in a circle, with three or four in the centre, about 6 inches apart. At one side, where the eggs have been first laid, they will probably be found more or less incubated; but in the centre, where the eggs are placed last, quite fresh; and if only one pair of birds have laid in the mound, about twelve to eighteen eggs will be the complement, and will be found arranged as described above. On the other hand, if several females resort to the same nest, the regularity will be greatly interfered with, and two or three eggs in different stages of development will be found close to one another, some quite fresh, others within a few days of being hatched. There are usually ten eggs in the first layer, five or six in the second, three or four only in the centre. I found that the females return every second day to lay, but never succeeded in ascertaining which of the parent birds opens the nest. The aborigines informed me that the male bird always performs this office; and I usually found my black boys very correct in their statements of this kind. After robbing a nest it is necessary to replace the different layers as they are found; if the lowermost is too much mixed up with the others, or the top tumbled into the excavations made in the bottom one, the birds will invariably forsake the mound; so that I found it always necessary to carefully replace the different layers as I found them. It is not so with the *Megapodius tumulus*, which does not seem to care how much the mound is tumbled about, so that there is sufficient débris left to burrow in; and, indeed, should there not be, they quietly set to work and scratch it together again. The mounds of the *Tallegallus* are seldom found on a great incline when a level spot can be obtained. They frequently bring the débris from a considerable distance; and in one instance on the Richmond river I noticed a place where about a cartload had been scratched through a shallow part of a creek 3 or 4 inches deep in water, and up the other side of the bank to the mound, which was over 40 yards distant. The débris is *always thrown behind them*. The greatest number of eggs taken from one mound at one time was thirty-six. This was a very old

mound, and resorted to by several individuals. The eggs vary much in size, and in shape from almost round to a long oval, or pointed at the thin end; their usual form is an oval slightly smaller at one end. The shell is very thin, minutely granulated, and snow-white in colour. They are of a very delicate flavour, resembling in taste those of the Plovers.

#### 190. MEGAPODIUS TUMULUS.

This Mound-raiser is very plentiful north after passing Port Denison; I found it also in tolerable numbers as far south as the Pioneer river. They are strictly confined to the dense scrubs, and seldom, if ever, seen elsewhere. Their noisy cackling at night frequently disturbed us when encamped near one of their favourite resorts; and during the day their hoarse note at once betrays their presence. On the Herbert river they are not much sought after as an article of food either by the natives or whites; for as their eggs are esteemed a delicacy the birds themselves are not much molested. I examined several nests in March; and although it was not the regular breeding-season, yet fresh eggs were obtained, and newly hatched young were found singly here and there throughout the denser parts of the brushes. Some of the mounds were very ruthlessly destroyed by the whites, and scattered over the ground. This, however, did not cause the birds to forsake the place; and out of one large mound, which had been very roughly handled, two new ones were formed, about 10 yards apart, on the base of the old one, which was so matted and interlaced with roots from the neighbouring trees that it appeared to me a marvel how the birds could burrow into it the great length they did; and having once laid their eggs there, how ever the young birds found their way out through the maze of roots is still a mystery. Once out, however, and their wings dry, they are able to take care of themselves, but remain about the mounds for a day or so, as if waiting for some of their companions; but in less than a week from the day they are hatched they may frequently be seen at least a quarter of a mile away, and well able to fly about. I met one little fellow, only 5·5 inches in total length, fully a mile away from the nearest mound; he flew up and settled in a tree, about 20 feet from the ground. The wings and feet were remarkably developed for so small a bird, which could scarcely be more than four weeks old. Upon more than one occasion I have seen the birds busy at their mound, or feeding near it, but was never so fortunate as to meet with them in the act of burrowing. The largest mound I met with was about 50 feet in length, 10 in height, and 14 feet in width at the base, 8 or 10 on the summit. It seemed to be more like several mounds combined; and certainly more than two pairs of birds frequented it. While stationed gun in hand watching for Cassowaries (*Casuaris australis*), I noticed on one occasion five birds arrive at this mound in company; they came very close to me, making a chuckling noise jerked out from their throat, and not unlike that of a domestic fowl when driven from its nest, but not so loud. Usually only a pair are met with together. Their flight is

heavy; and they do not readily take wing, unless pursued by a dog, when they rise with a considerable flapping to the most convenient branch, where they are easily approached and shot. Their flesh is dark, rank, and tough.

The young, about 5 inches in length, are of a dull brown, ashy brown on the sides of the face, neck, and mantle, and on the abdomen of a lighter ashy brown, rufous brown on the flanks, and brown washed with rufous on the breast; the back, rump, and tail of a rich rufous brown; primaries dark brown; interscapular region and upper wing-coverts dark brown, tipped with light rufous; the secondaries and scapulars freckled, and margined on the outer web with light rufous; the outer series of secondary-coverts and outer scapulars barred and freckled with the same colour; iris dark brown; feet yellow. Total length 5·5 inches, bill ·45, wing 4·5, tarsus 1 inch, tail a tuft of down about 1 inch in length.

191. *TURNIX VARIUS*.

192. *TURNIX PYRRHOTHORAX*.

193. *TURNIX VELOX*.

I met with these three species occasionally. They were looked upon as scarce birds in the Herbert-river district. *T. varius* prefers the more open forest land; the other two I found on the margins of the open grass-flats, and in the vicinity of water-holes and lagoons &c.

194. *SYNOÏCUS AUSTRALIS*.

195. *EXCALFACTORIA AUSTRALIS*.

I found both species plentiful in the swampy parts of the grass-beds, and on grassy ridges generally throughout the district, and obtained young a few days old of *S. australis* in March.

196. *DROMAIUS NOVÆ-HOLLANDIÆ*.

Emus were not plentiful, and so hunted that they are only found now in the unfrequented parts of the district. I met their tracks only on one occasion on the inland side of the range, in the basin drained by the Herbert river.

197. *CASUARIUS AUSTRALIS*.

One of the chief objects of my visit to Rockingham Bay was to become acquainted with the habits of this noble bird. In 1867 I had sent my collector, Edward Spalding, to this district for this purpose, but with very poor results. While in Brisbane on my way up I purchased by telegram a fine young living specimen, the first that had been obtained and reared, and ultimately succeeded in bringing it alive to Sydney and shipping it to the Society, where I am glad to hear it arrived safely\*. I found also that several very young Cassowaries had been obtained, and, for the first time, a nest and eggs had been found. This was great news; and I need not relate how I made

\* See P. Z. S. 1875, p. 469.—ED.

all haste to the Herbert-river Police Camp, where I was most hospitably entertained and welcomed by Inspector Johnstone, who was the first to rediscover and bring under the notice of others the existence of this remarkable species. I found Inspector Johnstone a true sportsman, as well as an ardent lover of Nature, a zealous and energetic naturalist, and a careful observer. I am indebted to this gentleman for much valuable information respecting the manners and customs of the aborigines, and notes on the habits of many birds and animals new to me, and especially for information on the present species.

The Australian Cassowary is a denizen of the dense dark scrubs scattered over the district of Rockingham Bay, and extending as far north as the Endeavour river. It was tolerably plentiful only a few years ago even in the neighbourhood of Cardwell; but since the advent of sugar-planters &c. on the Herbert river and adjacent creeks, these fine birds have been most ruthlessly shot down and destroyed for the sake of their skins, several of which I saw used for hearth-rugs and door-mats. Formerly they were easily enough procured; but latterly so wary have they become, and their numbers so decreased, that it is only with the greatest amount of patience even a stray shot can be obtained. I know of no bird so wary and timid; and although their fresh tracks may be plentiful enough, and easily found in the soft mud on the sides of the creeks, or under their favourite feeding-trees, yet the birds themselves are seldom now seen. During the day they remain in the most dense parts of the scrubs, wandering about the sides of the watercourses and creeks, diving in through the bushes and vines at the slightest noise. Towards evening and early in the morning they usually visit their favourite feeding-trees, such as the native figs, Leichardt-tree (*S. leichardti*), and various species of *Aemena*, *Jambosa*, *Davidsonia*, &c.; they appear to be particularly fond of the astringent fruit of the Leichardt-trees and of a species of *Maranta*, which produced bunches of large seed-pods filled with juicy pulp, resembling in appearance the inside of a ripe passion-fruit (*Passiflora edulis*). Fruits and berries of all kinds are eagerly sought after; the tame semiadult bird which I had the pleasure of forwarding to the Society (1875) became so fond of the fruit of the Cape-Mulberry that he would allow no one to come near the tree he had taken possession of. This bird has frequently devoured at a time as much as 3 quarts of "Loquats" (fruit of *Eriobotria japonica*), and several fair-sized oranges whole, besides its usual amount of bread per diem (about 3 pounds). In nature, I found that in the afternoons they frequently came out and walked along the scrubs, or along the side of the river or creeks, and swallowed large quantities of pebbles and small rough-edged stones. In confinement, plantains and sweet potatoes (in large pieces, which they can swallow whole) are a favourite food, while nothing seems to come amiss to them—grasshoppers, spiders, earth-worms, cockroaches, caterpillars of all kinds, dough, and even raw meat. They ascertain the flavour of their diet by first taking it up in the tip of their bill and giving it a slight pinch; and if not suitable,

they throw it aside. I found they invariably refused *green Loquats*, but always picked them up in the bill first to try them. In confinement they become very tame, and may be allowed to walk about the place without restraint, coming when called, or more often running after and following any one who is accustomed to feed them. If disappointed or teased, they not unfrequently "show fight" by bristling up their feathers, and kicking out sideways or in front with force sufficient to knock a strong man down—a feat I have witnessed on more than one occasion. These birds are very powerful, and dangerous to approach when wounded. On more than one occasion a wounded bird has caused a naturalist to take to a tree; the sharp nail of the inner toe is a most dangerous weapon, quite equal to the claw of a large Kangaroo, and capable of doing quite as much execution.

I found the Cassowaries to be excellent swimmers, and frequently tracked them across a good-sized creek or river. On Hinchinbrook Island, situated about  $1\frac{1}{2}$  mile from the mainland, they have been frequently met with; and I have myself heard them calling at night and early in the morning as I passed up the channel, at a distance of at least 2 miles from them. Mr. Johnstone informs me he met with one swimming across a river of considerable width during his explorations while on the "North-east-Coast Exploring-Expedition." Their note, most usually emitted by the male, is a series of harsh guttural prolonged croakings quickly repeated, and continued for about 3 minutes; it is very loud, and may be detected across the water at a distance of at least 3 miles on a still night. I have listened to it resounding through the scrubs at a distance of  $1\frac{1}{2}$  mile on land, and then thought it close and one of the most unearthly noises I ever heard. They breed during the months of August and September. The first nest procured was found by some of Inspector Johnstone's black troopers, from whom Mr. Miller, a settler on the Herbert river, purchased some of the eggs. One which he kindly presented to me is of the *light-green* variety mentioned hereafter. The nest consists of a depression among the fallen leaves and débris with which the ground in the scrubs is covered, with the addition of a few more dry leaves. The place selected is always in the most dense part, and well concealed by entangled masses of vegetation. The eggs were five in number in the only two instances recorded; and in both cases one of the eggs in each set differed from the other, being of a light-green colour, and having a much smoother shell. The others all have a rough shell, covered rather sparingly with irregular raised patches of dark but bright green on a lighter-green and smooth ground. In the pale (No. 1) variety these raisings on the shell are closer together, and not so well developed; in both varieties they are more thinly spread over the central portion than at the ends. On the whole they closely resemble the eggs of *Casuaris bennettii*, in which similar variations are noticeable; but they are larger, and of a greater diameter, being greatest in the middle. I am indebted to Inspector Robert Johnstone for the fine series of the eggs of this species which at present grace my collection.

The following are measurements of some of the specimens of the eggs of both species :—

*Casuarium australis.*

	Length in inches.	×	Width in inches.
No. 1. Light-green smooth shell ..	5.33	×	3.73
No. 2. Dark-green rough shell . . .	5.3	×	3.88

*Casuarium bennettii.*

No. 1. Light-green smooth shell ..	5.65	×	3.54
No. 2. Light-green rough shell ..	5.32	×	3.31
No. 3. Light-green rough shell ..	5.34	×	3.4
No. 4. Dark-green rough shell . . .	5.2	×	3.32

The young of *Casuarium australis* are of a dull rusty brown, the feathers having frequently a blackish shaft-stripe, giving to the back a streaked appearance. After the first year the plumage takes a deeper lighter brown hue, and black feathers begin to appear mixed with brown, some being party-coloured. After the second season, at the age of 18 to 24 months, the black feathers predominate, and the helmet, which has hitherto been undeveloped, more like the shield of a coot (*Fulica*), begins to show a *keel* or *ridge* in the centre, which rapidly increases in height. The skin round the head, on which still remain a few brownish hair-like feathers, begins to become wrinkled and coloured, varying from bluish-green to orange on the lower part, and bright blue on the sides of the neck, the wattles becoming carmine. The helmet still remains comparatively small and undeveloped long after the wattles and naked parts of the neck become coloured. I believe that the helmet does not attain its full size until the fourth or fifth year at least. In traversing the scrubs the head is carried low to the ground, and the vines and branches of trees striking the helmet slide over it on to the back. Otherwise in the dense vine-scrubs bordering the Herbert river and elsewhere progress would be greatly impeded; but as it is, the Cassowaries traverse the scrubs with wonderful speed, jumping over fallen trees and logs when in the way. A young bird (the identical specimen, I believe, forwarded by his Excellency the Marquis of Normanby to the Society), while in the possession of Inspector Johnstone, during my visit succeeded in jumping out of its yard over a fence more than 6 feet in height. I measured the fence, and found it 6 feet 6 inches to the top rail, on which its feet-marks were plainly visible; the length of the yard was only 12 × 12 ft. I found the adult Cassowaries in full moult in March; but the new feathers had not all made their appearance in May. During these months specimens in confinement were remarkably irritable and frequently sulky, even refusing their food (which they invariably do when unwell), and were at times very spiteful, even attacking their keepers; but strangers chiefly come in for a share of their dislike. At all times I have noticed they are very fond of bathing; the semiadult bird before alluded to, which I forwarded to the Society, was remarkable

in this respect, and might frequently be seen waiting at the pump in the yard until some one came for water, when he would sit down quietly under a copious shower, stretching out his neck and ruffling his feathers up to allow the water to reach the skin. They do not like any exposure, and always endeavour to get out of the sun. In the wild state they seldom leave the scrubs, and certainly never do so in the heat of the day unless hard pressed; but on the whole they are remarkably hardy, and bear confinement well. In February last (1875) I purchased four fine young birds about 6 months old, which were obtained from some settlers in the Herbert-river district; these also I forwarded to England during the same month.

7. Description d'un nouveau Cerf tacheté du pays d'Ussuri méridional, *Cervus dybowskii*. Par L. TACZANOWSKI, C.M.Z.S.

[Received December 17, 1875.]

En 1868, le Capitaine Przewalski a observé pour la première fois des cerfs tachetés dans ce pays, et dit dans son ouvrage imprimé en russe en 1870, que ces animaux abondent dans les grands forêts des côtes de la mer du Japon et de la région des affluents de l'Ussuri, en indiquant la rivière Tina pour limite septentrionale de la distribution de ce ruminant, de sorte qu'il n'en trouve point dans la région centrale du cours de l'Ussuri. M. Przewalski l'a nommé *C. axis*, Erxl. (?), et dit ensuite qu'il y a aussi dans ce pays un second cerf tacheté d'une taille intermédiaire entre le précédent et le cerf commun; et que sa peau d'été ne diffère en rien de celle de son *C. axis*, mais en hiver elle est d'un gris foncé, surtout au dos, où le poil est presque noir avec des taches blanchâtres à peine distinctes. Il a vu plusieurs fois des individus de cette espèce, sans pouvoir s'en procurer.

Le Dr. Dybowski vient de me fournir cinq peaux de ce cerf, parmi lesquelles il y a quatre mâles de différents âges (deux qui ont atteint le développement entier, un jeune à dagues simples, un d'âge intermédiaire) et une femelle. Ces cerfs me paraissent appartenir à cette dernière forme, celle plus forte du Cap. Przewalski, et tous ces exemplaires ont leur robe d'hiver. L'espèce paraît être inédite; je propose donc de le nommer *C. dybowskii*, en l'honneur de mon ami, zoologiste plein de mérite, dont le séjour de dix ans dans la Sibérie orientale a sensiblement augmenté les connaissances de la faune de ce pays, si curieux et si insuffisamment exploré en faits d'histoire naturelle.

Ce cerf est d'une taille plus forte que celle du daim (*C. dama*) et beaucoup plus petite que celle du cerf commun.

Les bois sont élevés et minces, moins penchés que ceux du *C. elaphus*, et moins recourbés sur les côtés, à trois andouillers simples, dont le basilaire et le suivant sont dirigés en avant un peu obliquement sur les côtés et légèrement courbés, et le troisième dirigé vers le milieu et très peu en arrière; ces embranchements sont médiocres, et pres-

que égaux entre eux ; le prolongement du tronc principal est plus long que les branches précédentes, vertical, légèrement courbé vers le milieu. Le premier andouiller basal prend naissance beaucoup plus haut que celui du cerf commun (l'axe de cette branche est à 4 centim. de la couronne), le deuxième est plus éloigné du précédent que du troisième (19 et 17 centim.). Sur la face supérieure de la partie du tronc comprise entre les deux premiers andouillers se trouve une assez forte



Skull and horns of *Cervus dybowski*.

carène, et cette partie est considérablement plus haute que large ; l'anneau basal est étroit. La rugosité surtout dans la moitié basale est assez forte. Les appendices osseux servant de base aux bois sont très-élevés (5 centim.).

Le nez est nu ; les fosses lacrymales profondes. La crinière est abondante au cou et entre les épaules, et se prolonge d'une manière distincte jusqu'à la naissance de la queue ; tout le cou est garni de poils longs. La queue est beaucoup plus courte que dans le *C. axis*, garnie de longs poils, qui forment une touffe dépassant l'extrémité caudale de 22 centim.

La couleur générale des animaux adultes en pelage d'hiver ressemble à celle d'un chevreuil (*C. capreolus*) d'hiver, c'est-à-dire qu'elle est formée d'un semis d'une multitude de petites stries fauves sur un fond gris brunâtre; chaque poil est gris, rembruni vers le haut avec un large anneau fauve à une certaine distance du sommet, qui est noirâtre. Sur ce fond à couleur de chevreuil, il y a sur la partie postérieure du corps des taches blanchâtres, peu distinctes. Le fauve roussâtre prédomine sur les côtés du cou, tandis qu'en dessous le fond principal est brunâtre, varié de fauve. La crinière est rousse sur la nuque, ensuite elle devient brune variée de roussâtre; elle est distincte par une nuance beaucoup plus foncée dans toute la longueur du dos. Le museau est gris, piqué de nombreuses stries fauves blanchâtres, cette couleur passe graduellement au roux sur le front; il y a une tache blanche, pure, cordiforme sur le devant du menton. La face dorsale des oreilles est roussâtre; l'interne est blanche ainsi que le bord externe de la face dorsale dans sa moitié inférieure. La queue est plus ou moins rousse en dessus avec un mélange d'un petit nombre de poils noirs, et blanche en dessous. Il y a aussi un espace blanc au pourtour des fesses, couvert par une grande tache caractéristique noire. Le ventre est gris brunâtre presque uniforme avec un peu de blanchâtre au milieu et du blanc pur dans la partie postérieure. Les jambes sont fauves roussâtres avec une large raie brune le long de la face antérieure, et une tache blanche arrondie sur le côté externe au-dessous du talon dans les jambes postérieures.

Le jeune mâle à dague simple et un autre à ce qu'il paraît de deux ou trois ans, sont en général plus roux sur un fond brun plus foncé; le roux prend un ton ferrugineux bien intense le long de la crinière dans toute la longueur du corps. Les taches blanchâtres sont beaucoup plus prononcées, mais elle paraissent être plus restreintes. La couleur roussâtre des jambes est plus vive, avec la raie dorsale brune plus foncée.

*Dimensions :*

	centim.
Hauteur des bois . . . . .	58
Distance entre les bois à la base . . . . .	9·5
„ „ extrémités de la branche principale . . . . .	43·5
Longueur du 1 <sup>r</sup> andouiller . . . . .	15
„ du 2 <sup>e</sup> „ . . . . .	15·5
„ du 3 <sup>e</sup> „ . . . . .	14·5
„ du sommet du tronc principal . . . . .	24
„ de l'oreille . . . . .	16
„ de la queue . . . . .	12
„ „ avec la touffe . . . . .	34
Jambe antérieure jusqu'au poing . . . . .	38
Tarse . . . . .	48

8. Revision of the Lepidopterous Genus *Teracolus*, with Descriptions of the new Species. By ARTHUR GARDINER BUTLER, F.L.S., F.Z.S.

[Received December 8, 1875.]

(Plates VI. & VII.)

The Butterflies treated of in the present paper, although admitted by all to be very pretty, are by no means favourite objects of study with the lepidopterist.

Whenever a genus is composed of striking and, at the same time, sharply defined species, plenty of entomologists are always ready to work at it; but when, as in the present instance, there is some difficulty in ascertaining the amount of variation obtaining in the different species, it will be found that lepidopterists are not unfrequently content to catalogue all doubtful forms as varieties of known species, often giving to the world a false view of their geographical distribution, and thus hindering instead of advancing science.

The genus *Teracolus* was first founded by Swainson, in his 'Zoological Illustrations,' for the reception of his *T. subfasciatus*. But a few years since I extended it for the reception of all the insects formerly constituting the genera *Idmais* and *Callosune*, there being no reason, but that afforded by colour, why they should ever have been kept separate.

Until quite recently I was unable, from lack of adequate material, to attempt a revision of this very difficult group; but the kindness of Mr. E. C. Buxton, in presenting to the Museum his valuable collection of African "Orange-tips," has at length put me into a fair position to work out the whole of the African species.

In order to make the present paper more complete, Mr. F. Moore has very generously lent me the whole of his Indian specimens, thus enabling me to avoid errors in determining the Asiatic species—our deficiencies in Syrian forms being also partially met by the assistance of my friend R. Meldola, who has put into my hands several species collected by the late Mr. J. K. Lord.

It would be easy to show that the present genus contains but few, if any, very sharply defined species. It is not improbable that, when we know the Butterflies of East Africa, Arabia, Syria, and Persia more thoroughly, we shall be able to show an unbroken gradation from one end of the group to the other. At present we get a nearly perfect transitional series from *T. subfasciatus* to *T. ione*, thence through *T. halimede* to *T. fausta*, *calais*, and allies, on the one hand, and to *T. eupompe* and allies on the other; from the latter we can run on, almost without a break, through *T. eucharis* to *T. interruptus*, and thence to *T. evippe*.

If the plan of "lumping" species were to be adopted in this genus, every year would probably decrease instead of adding to their num-



1.



2.



3.



4.



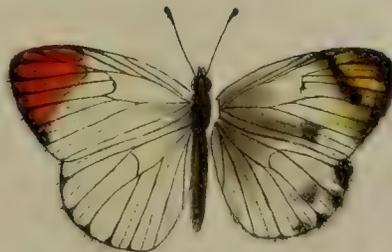
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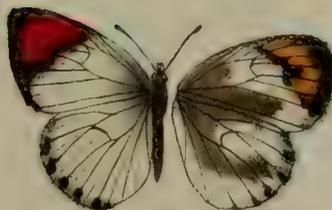
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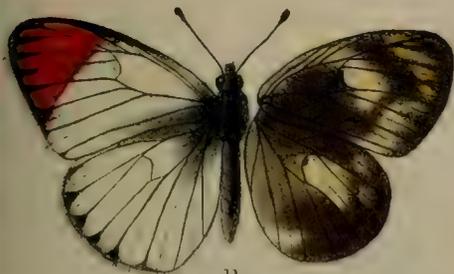
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10.



11.

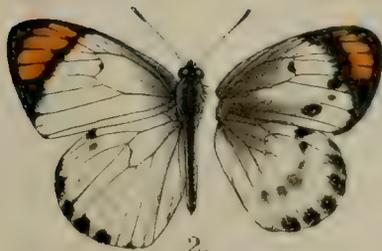


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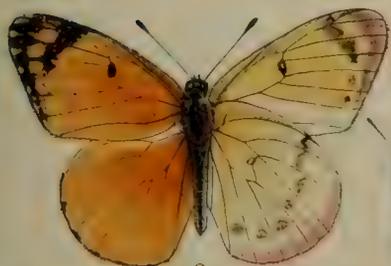
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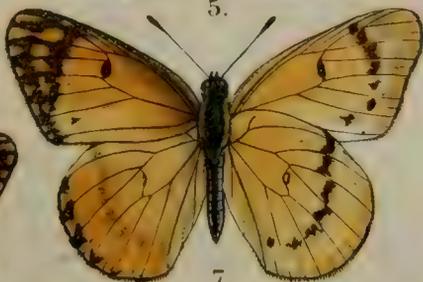
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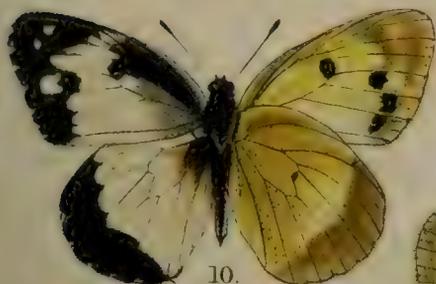
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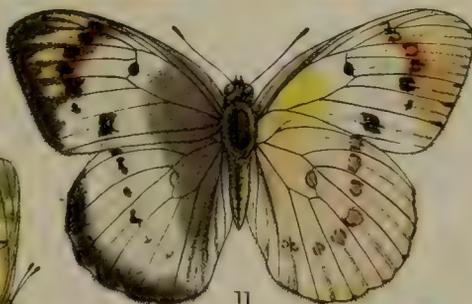
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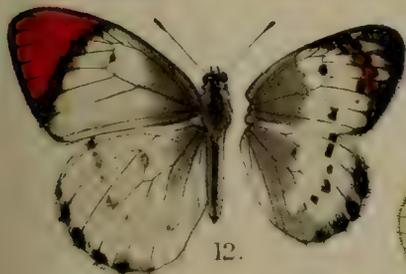
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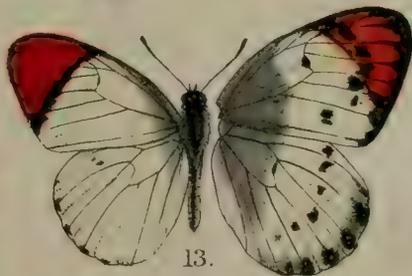
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15.



14.



16.



ber, until eventually we should be compelled to recognize but one species in the genus, a consummation certainly not to be desired. At present nobody doubts the existence of numerous species. Kirby's Catalogue, which gives what is styled "the broad view," inasmuch as it allows almost unlimited latitude for variation, enumerates 14 species under *Idmais*, 4 under *Teracolus*, and 53 under *Callosune*, 71 in all\*. It being, therefore, impossible to be certain, without careful breeding from the egg, of the limits of any species in this genus, I have taken the only course open to me, and have described all the forms which seemed, in both sexes, to present constant distinctive characters, or which differed sufficiently, as single specimens, to warrant the belief that they were not varieties of known species.

1. *Wings sulphur-yellow or white, the apex of primaries dark, and traversed in both sexes by pale spots: wings of male below nearly uniform in tint, sometimes with a few black spots, of female more or less tinted with buff, the disk crossed by an irregular series of dark spots. Teracolus, Swainson.*

1 a. *Wings of male uniformly yellow, apical patch of primaries black internally; apical spots confluent; wings below greenish white; apex of primaries and secondaries reticulated with pale greyish brown. T. subfasciatus, Swainson.*

#### 1. TERACOLUS SUBFASCIATUS.

*Teracolus subfasciatus*, Swainson, Zool. Ill. Ins. ii. pl. 115 (1823).

*Anthocharis subfasciata*, Boisduval, Sp. Gén. Léop. i. p. 567. n. 12 (1836).

*Ptychopteryx bohemani*, Wallengren, Lep. Rhop. Caffr. p. 18 (1857).

Damara Land (*Trimen*).

B.M.

1 b. *A black streak on inner margin of primaries, broad in the male, and uniting with a broad black outer marginal border. T. eris, Klug.*

#### 2. TERACOLUS ERIS.

*Pontia eris*, Klug, Symb. Phys. pl. 6. figs. 15, 16 (1829).

*Pieris eris*, Boisduval, Sp. Gén. Léop. i. p. 514. n. 111 (1836).

*Anthocharis eris*, Reiche, Ferret & Galinier, Voy. Abyss. Ent. p. 460, pl. 31. figs. 1-3 (1849).

*Idmais eris*, Kirby, Syn. Cat. p. 499. n. 12 (1871).

♂ ♀, Ambriz (*J. J. Monteiro*); ♂ ♀, S. Africa (*E. C. Buxton*).

B.M.

The ground-colour of the wings of the female is either white, as in the male, or bright sulphur-yellow.

\* It should be observed that several species admitted in the above-mentioned Catalogue are referred by Mr. Kirby to *Pieris*.

1 c. No black streak on inner margin of primaries. *T. fatma*.

### 3. TERACOLUS FATMA.

*Idmais fatma*, Felder, Reise der Nov. Lep. ii. p. 189. n. 185, pl. 25. fig. 3 (1865).

*Idmais eris*, var., Kirby, Syn. Cat. p. 499. n. 12 (1871).

Kordofan.

This species is smaller than *T. eris*, has the external area of primaries tawny, the discal spots disconnected, and no marginal spots on secondaries. I have seen a specimen in Mr. Druce's collection.

### 4. TERACOLUS COLIAGENES.

*Euchloë coliagenes*, Butler, Ann. & Mag. Nat. Hist. ser. 3, vol. xx. p. 216, pl. 4. figs. 4, 5 (1867).

*Callosune coliagenes*, Kirby, Syn. Cat. p. 500. n. 4 (1871).

White Nile (*Petherick*).

Type, B.M.

Precisely like the *T.-fausta* group in pattern, but of a sulphur-yellow colour.

2. *Wings sulphur-yellow, white, or pale ochreous; below with transverse bands across the disk of secondaries.*

2 a. Wings yellow, markings above much like the *T.-fausta* group.

### 5. TERACOLUS PROTOMEDIA.

*Pontia protomedia*, Klug, Symb. Phys. pl. 8. figs. 13, 14 (1829).

*Pieris protomedia*, Boisduval, Sp. Gén. Lép. i. p. 509. n. 105 (1836).

*Teracolus protomedia*, Kirby, Syn. Cat. p. 500. n. 4 (1871).

♂ ♀, White Nile (*Petherick*).

B.M.

The plumule of this species is, as might be expected, like that of the other species of *Teracolus*.

### 6. TERACOLUS AMELIA.

*Idmais amelia*, Lucas, Rev. Zool. p. 427 (1852).

Senegal.

Allied to the preceding species.

2 b. Wings above pale ochreous and white.

### 7. TERACOLUS VELLEDA.

*Idmais vellea*, Lucas, Rev. Zool. p. 428 (1852).

Abyssinia.

Intermediate between *T. amelia* and *T. vesta*.

### 8. TERACOLUS VESTA.

*Idmais vesta*, Reiche, Ferret & Galinier, Voy. Abyss. p. 463, pl. 31. figs. 7, 8 (1849).

Caffraria (*Becker*), S. Africa (*E. C. Buxton*).

B.M.

### 9. TERACOLUS HEWITSONII.

*Idmais hewitsonii*, Kirby, Syn. Cat. p. 498. n. 4 (1871).

*Idmais chrysonome*, Doubleday & Hewitson, Gen. Diurn. Lep. pl. 7. fig. 5 (1847).

*Idmais vesta*, Trimen, Rhop. Afr. Austr. i. p. 62. n. 41 (1862).

Congo (*A. Curror*). Type, B.M.

#### 10. TERACOLUS CHRYSNOME.

*Pontia chrysonome*, Klug, Symb. Phys. pl. 7. figs. 9-11 (1829).

*Idmais chrysonome*, Boisduval, Sp. Gén. Léop. i. p. 585. n. 1 (1836).

Congo (*A. Curror*). B.M.

2c. Wings above white; primaries with large purplish crimson apical patch, crossed by a black line.

#### 11. TERACOLUS PHOLOË.

*Anthopsyche pholoë*, Wallengren, Wien. ent. Monatschr. iv. p. 35. n. 6 (1860).

*Callosune pholoë*, Kirby, Syn. Cat. p. 504. n. 44 (1871).

Lake Ngami.

#### 12. TERACOLUS AMINA.

*Anthocharis amina*, Hewitson, Exot. Butt. iii. Anth. pl. 1. figs. 1-3 (1866).

*Callosune amina*, Kirby, Syn. Cat. p. 500. n. 1 (1871).

Between Natal and Delagoa Bay (*E. O. Buxton*). B.M.

#### 13. TERACOLUS CELIMENE.

*Anthocharis celimene*, Lucas, Rev. Zool. p. 426 (1852).

*Callosune celimene*, Kirby, Syn. Cat. p. 504. n. 48 (1871).

Abyssinia.

The three preceding species seem to be nearly allied; and since Hewitson gives the Zambesi as the locality of his type, I feel rather doubtful of their being all distinct.

3. *Wings of the male with purple apex, externally and sometimes internally bordered with black; females with white-spotted or orange tips; secondaries below generally with traces of a transverse oblique brown or blackish line, sometimes obsolete.*

3a. Primaries of male above without black internal limitation of the apical patch; secondaries above and below uniformly white: apical patch of female with a violet gloss.

#### 14. TERACOLUS REGINA.

*Anthocharis regina*, Trimen, Trans. Ent. Soc. ser. 3, i. p. 520. n. 1 (1863).

*Callosune regina*, Kirby, Syn. Cat. p. 500. n. 7 (1871).

Damara Land.

Type, B.M.

- 3b. Primaries of male with apical patch redder in tint and broader ; secondaries with the veins slightly blackish, and terminating in well-marked black spots.

15. TERACOLUS HETÆRA.

♂, *Callosune hetæra*, Gerstaecker, in Van der Decken's Reisen in Ost-Afrika, p. 365. n. 7, taf. xv. fig. 2 (1873).

Endara.

This species is larger than *T. regina*, and in the marginal spots of secondaries approaches *T. ione* and allies.

- 3c. Primaries of male above without black internal limitation of the apical patch ; secondaries black-veined ; below whitish, with base of costa yellowish, black veins, and an oblique, ill-defined, dotted transverse line : female with apical patch of primaries orange, crossed by black spots ; secondaries white, with marginal blackish spots ; below pinkish ochraceous, with a well-marked, spotted, red-brown, angulated, oblique transverse streak.

16. TERACOLUS PHLEGYAS.

*Anthocharis phlegyas*, Butler, P. Z. S. 1865, p. 431, pl. 25. figs. 3, 3a (1865).

*Callosune phlegyas*, Kirby, Syn. Cat. p. 500. n. 5 (1871).

White Nile (*Petherick*).

Type, B.M.

It is possible that this may be the species represented by Reiche (Ferret & Gal. Voy. Abyss. pl. 30) as a variety of *A. ione* ; only it is there represented with a black internal limitation of the apical patch, and with no trace of a cross bar on the under surface of the secondaries.

- 3d. Like the preceding, excepting that the violet apical patch of the male and the orange patch of the female are both larger ; secondaries of male below whitish, with base of costa indistinctly ochraceous, veins below not black : female with outer limitation of apical patch almost obliterated by the orange colouring, the black spots small ; secondaries white, with the marginal spots small ; below very pale brown with the apical area and a well-marked discocellular spot white ; the brown area reticulated with slightly darker hatchings, and limited by an oblique whity-brown streak (not angulated). *T. buxtoni*.

17. TERACOLUS BUXTONI.

*Teracolus buxtoni*, n. sp., supra.

♂ ♀, Between Natal and Delagoa Bay (*E. C. Buxton*).

Type, B.M.

This is probably the South-African representative of *T. phlegyas*.

- 3e. Size of the preceding two species ; violet apical patch of the male bordered on both sides with black ; secondaries below and apex of primaries with a distinct pink tinge ; costa of secondaries

yellowish towards base; a well-marked oblique brown streak: apical patch of female above black, spotted with white; base dusky; apex below sordid yellowish, crossed by black-and-white spots; secondaries sordid yellowish, reticulated with grey; a black-and-white spot at end of cell; base of costa yellowish; an oblique brown streak as in the male.

#### 18. TERACOLUS JOBINA.

♂ ♀, *Euchloë jobina*, Butler, Cist. Ent. i. p. 14. n. 2 (1869).

*Callosune jobina*, Kirby, Syst. Cat. p. 504. n. 49 (1871).

♂, *Teracolus jobina*, Butler, Lep. Exot. pl. xliii. fig. 3 (1872).

♂ ♀, Natal (*E. C. Buxton*).

B.M

The violet patch contains from five to six divisions: in the type in Mr. Druce's collection there are five, the two upper ones being very minute, and all of them being distinctly separated; one example of the three males presented by Mr. Buxton has six divisions, separated only by the black nervures.

3f. Violet apical patch of the male bordered on both sides with black; internal vein and apical two thirds of remaining veins beyond cell of primaries black; basal area and internal two fifths of secondaries dusted with grey; internal area of primaries tinted with sulphur yellow; secondaries with black veins, terminating in black marginal spots: below, the apex of primaries and the secondaries tinted with pink, the latter with an oblique *dotted* line (composed of four to five small brown spots); base of costa ochraceous. Female with the apical patch orange, bordered with black and crossed by black spots, or black crossed by five white spots: secondaries below pinkish grey or yellowish, reticulated with pale brown, crossed by an oblique brown streak, and with brown outer borders; base of costa sometimes ochreous.

#### 19. TERACOLUS JALONE.

♂, *Euchloë jalone*, Butler, Cist. Ent. i. p. 14. n. 1 (1869).

*Callosune jalone*, Kirby, Syn. Cat. p. 500. n. 6 (1871).

*Teracolus jalone* (part.), Butler, Lep. Exot. p. 116 (1872).

*Anthocharis ione* (sic), Lucas, Lep. Exot. pl. 37. fig. 4 (1835).

♂ ♀, *Anthocharis ione*, Hopffer in Peters's Reise n. Mossamb. Zool. v. p. 357, pl. 21. figs. 1-6 (1862).

♂, White Nile, Coll. Druce, E. Africa?

B.M.

The characters of the females are taken from Hopffer's figures.

3g. Nearly allied to the preceding; violet apical patch of male much larger, more broadly black-bordered; internal vein and apical half of remaining veins beyond cell of primaries, and all the veins of secondaries, black; basal third of primaries and base of secondaries dusted with black, black marginal spots; apical area of primaries and whole of secondaries below cream-coloured; primaries with black dot at end of cell, a black squamose spot

on the margin of the apical area within the lower discoidal interspace, and two marginal spots terminating the first and second median branches; secondaries with the base of costa orange; a black discocellular dot; a broad oblique black bar, interrupted by the nervures from costa to third median, a spot on second median interspace, a dot on first median, and a spot on interno-median interspace, all black. Female with the apical patch orange, bordered with black, and crossed by a broad lunulated black band, or black spotted with yellow; secondaries below either pinkish grey, with a broad, tapering, oblique brown streak, or yellow with a subangulated macular black streak (as in the male); with costa orange, and outer border broadly brown. *T. imperator*.

#### 20. TERACOLUS IMPERATOR.

*Anthocharis ione*, Reiche, in Ferret & Galinier, Voy. Abyss. pl. 30. figs. 1, 2, 5-7 (1849).

*Callosune ione* (part.), Kirby, Syn. Cat. p. 500 (1871).

*Teracolus jobina* (part.), Butler, Lep. Exot. p. 116 (1872).

♂, Senegal (*E. C. Buxton*).

Type, B.M.

3*h*. Violet apical patch of male very widely bordered with black; internal vein of primaries white, remaining veins partly black; base densely dusted with grey; veins of secondaries frequently black, but not so distinctly as in the two preceding forms, with terminal black spots; apex of primaries and the whole of secondaries below cream-coloured, with veins dusky; nervures terminating in black dots; black discocellular dots; secondaries below with a black subcostal spot (not a transverse bar). Female with the apical patch orange, bordered with black and crossed by black spots, or black with three decreasing white spots; secondaries below lemon-yellow, partially reticulated with brown, crossed by an oblique brown streak, and two brown spots on first median and interno-median interspaces; discocellular spots well marked.

#### 21. TERACOLUS IONE.

*Pieris ione*, Godart, Enc. Méth. ix. p. 140. n. 74 (1819).

*Anthocharis ione* (part.), Boisduval, Sp. Gén. Lép. i. p. 515 (1836).

*Callosune ione* (part.), Kirby, Syn. Cat. p. 500. n. 3 (1871).

*Anthocharis erone*, Angas, Kaffirs Illustrated, pl. 30. fig. 3 (1849).

Var. *Anthopsyche speciosa*, Wallengren, Kongl. Svenska Vetensk. Akad. Handl. p. 16 (1857).

♂ ♀, Natal (*Becker, Argent, Burrows, E. C. Buxton*). B.M.

A small male, agreeing with Wallengren's description, is amongst the specimens presented by Mr. Buxton.

3*i*. Violet patch of the male only represented by two spots; under surface of secondaries yellow.

#### 22. TERACOLUS EUNOMA.

*Pieris eunoma*, Hopffer, Ber. Verh. Ak. Berl. p. 640. n. 2 (1855);

Peters, Reise n. Mossamb. Zool. v. p. 353, pl. 23. figs. 1, 2 (1862).

Mozambique.

4. *Wings of male above uniformly sulphur-yellow, with the apex of primaries and a spot at end of cell black; secondaries below yellow, with an interrupted oblique black streak: female pale sulphur-yellow, almost white, with the outer margins broadly black; a black discocellular spot in primaries; secondaries below lemon-yellow, with an angulated black streak.*

23. TERACOLUS MANANHARI.

*Pieris mananhari*, Ward, Ent. Mo. Mag. vi. p. 224 (1870); Afr. Lep. pl. ii. figs. 1-4 (1873).

*Teracolus mananhari*, Kirby, Syn. Cat. p. 500. n. 2 (1871).

Madagascar.

This extraordinary species is clearly related to the *T. ione* group, but it is very dissimilar from all the species in the genus.

5. *Wings white, more or less clouded with orange; primaries of the males with grey apical border and black veins.*

5 a. *Wings of male grey at base; orange area restricted and pale.*

24. TERACOLUS HALIMEDE.

*Pontia halimede*, Klug, Symb. Phys. pl. 7. figs. 12-15 (1829).

*Pieris halimede*, Boisduval, Sp. Gén. Léop. i. p. 526. n. 129 (1836).

*Idmais halimede*, Kirby, Syn. Cat. p. 499. n. 13 (1871).

*Anthocharis leo*, Butler, Ann. Nat. Hist. ser. 3, vol. xvi. p. 397 (1865).

White Nile (*Petherick*).

B.M

- 5 b. *Wings of male almost entirely covered with deep orange.*

25. TERACOLUS PLEIONE.

*Pontia pleione*, Klug, Symb. Phys. pl. 8. figs. 7, 8 (1829).

*Terias pleione*, Boisduval, Sp. Gén. Léop. i. p. 672. n. 33 (1836).

*Idmais pleione*, Kirby, Syn. Cat. p. 499. n. 14 (1871).

*Idmais miriam*, Felder, Reise der Nov. Lep. ser. 2, p. 190. n. 186 pl. 27. figs. 3, 4 (1865).

*Teracolus chrysomela*, Butler, Cist. Ent. p. 244 (1874).

White Nile (*Petherick*).

B.M.

This species is much deeper in colour than Klug represents it to be in his figure; its affinities seem about equally balanced between the two groups, of which *T. fausta* and *T. eupompe* may be considered as typical, the male nearly resembling the former, the female more closely approaching the latter.

The succeeding six species, constituting my Section 6, might perhaps be separated generically from *Teracolus*, inasmuch as the males have an embossed spot on the internal area of primaries near

the base; they could not constitute the genus *Idmais* even in a restricted sense, inasmuch as Boisduval indicates *I. calais* as his type, thus:—

“Nous avons donné primitivement à ce genre le nom de *Calais*, en prenant comme générique le nom de l'espèce la plus connue; mais comme ce changement de nom spécifique en nom générique n'est pas sans inconvénients, nous lui avons substitué celui d'*Idmais*.”

For my part I see little utility in distinguishing a group so manifestly intermediate between the *T. halimede* and *Calais* groups, more especially since the structural distinction is confined to one sex.

6. *Wings entirely orange or white above, with black discocellular spots in primaries, and a maculated black border, expanding in primaries towards the costa, and more or less enclosing a series of orange or white spots.*

26. TERACOLUS FAUSTA.

*Papilio fausta*, Olivier, Voy. dans l'Emp. Oth., L'Egypte et la Perse, Atlas, pl. 33. figs. 4 *a*, *b* (1801).

*Pieris fausta*, Godart, Enc. Méth. ix. p. 132. n. 41 (1819).

*Pontia fausta*, Klug, Symb. Phys. pl. 8. figs. 9–12 (1829).

*Idmais fausta*, Boisduval, Sp. Gén. Léop. i. p. 586. n. 2 (1836).

♂ ♀, Baghdad (*W. K. Loftus*).

B.M.

Mr. Moore has this species from N.W. India.

27. TERACOLUS FAUSTINA.

*Idmais faustina*, Felder, Reise der Nov. Lep. ii. p. 190. n. 187, (1865).

—?

The colouring of the underside differs from any thing that I have seen; the spots on the disk being lutescent or orange.

28. TERACOLUS ROSACEUS, n. sp. (Plate VII. fig. 6.)

♂. Wings above precisely like dark females of *T. fausta*, excepting that the secondaries have a white patch above the subcostal nervure, and the marginal black spots are linear: wings below pale creamy yellow; primaries with the discocellular spot small, lunate, black, with light centre; apical border rosy, bounded within by six ill-defined spots of the ground-colour, limited by an inner series of decreasing spots, the upper four rusty, the lower two minute and black; secondaries with a pale-centred buff discocellular spot; seven discal spots in a J-shaped series, the first brown, the remainder buff-coloured; outer border rosy; body below creamy-white. Expanse of wings 1 inch 9 lines.

Akote.

Type, coll. F. Moore.

The succeeding species is nearly allied, but seems to me to be distinct.

29. TERACOLUS ORIENS, n. sp. (Plate VII. fig. 7.)

♂. Wings above precisely like dark females of *T. fausta*, ex-

cepting that the secondaries have a white patch above the subcostal nervure: wings below pale yellowish white, slightly rosy towards the base; primaries with the discocellular spot small, elliptical, black, with white centre; apical border pale reddish-orange, bounded within by six ill-defined yellowish spots, limited by an inner series of seven decreasing spots, the upper five rusty-brown, the lower two black; secondaries with a pale-centred rusty discocellular spot; seven discal spots in an irregular arched series, all rusty; outer border pale reddish orange, diffused internally; body below creamy-white. Expanse of wings 1 inch 8 lines.

♀. Altogether paler; primaries with the costa and base cinereous; discocellular spot small, as in the male; apical border dark brown, enclosing six spots internally and seven externally; secondaries with six large subquadrate marginal dark brown spots: wings below creamy sulphur-yellow, rather darker towards the base and on the outer margins; otherwise as in the male. Expanse of wings 2 inches.

♂, Kalka, foot of Himalayas (*Boys*, B.M.). ♀, Kattywar (coll. Moore).

### 30. TERACOLUS SOLARIS, n. sp.

♂. Wings above like dark females of *T. fausta*, but altogether of a deeper orange-colour, with the costa of primaries ash-coloured, and the discocellular spot much larger; secondaries with a white patch above subcostal: wings below pale creamy yellow, deeper towards the base, the markings as in the preceding species. Expanse of wings 2 inches 2 lines.

♂ var. Wings above paler in tint; ash-coloured costa of primaries darker; markings below rather paler. Expanse of wings 1 inch  $1\frac{1}{2}$  lines.

♂, Scinde? (B.M.); ♂ var., N.W. India (coll. F. Moore).

Wallace labelled this as his *Idmais fulvia*; but it is quite distinct.

### 31. TERACOLUS FULVIA.

♂, *Idmais fulvia*, Wallace, Trans. Ent. Soc. ser. 3, vol. iv. p. 392. n. 5, pl. 9. fig. 5 (1867).

*Idmais tripuncta*, Butler, Proc. Zool. Soc. p. 221, pl. 17. fig. 9 (1868).

♂ ♀, N. W. India.

Type, coll. Moore.

The female is white instead of orange.

7. *Closely allied to the preceding group; wings pale salmon-colour or white above, with broad black-brown outer borders, intersected by spots of the ground-colour; wings below coloured much as in Colias. Idmais, Boisid. Type I. calais.*

### 32. TERACOLUS VESTALIS, n. sp. (Plate VII. fig. 10.)

♂ ♀. Size of the preceding group of species: white above, with a broad irregular external black border; two white spots placed obliquely below the apex of primaries, and a third much larger on second median interspace; a large black spot at the end of the cell;

the subcostal area, discoidal cell (excepting its inferior angle), and the base of interno-median area black-brown, somewhat diffused in the male: wings below sulphur-yellow, the male with the internal area of primaries white, the female with the disk white; the male slightly tinted on outer border of primaries, and over the whole of secondaries, with ochraceous; minute marginal black dots at the terminations of the nervures; primaries with a large black spot, with a squamose yellow centre at end of cell; three black spots near outer margin, below the median branches; secondaries with a blackish sub-apical costal spot; a minute blackish annular dot at end of cell; outer border of upperside visible through the wing; entire wing sprinkled with black scales. Expanse of wings, ♂ 2 inches, ♀ 1 inch 11 lines.

♂, Scinde (*Le Mesurier*); ♀, Agra, N.W. Punjab. Coll. Moore.

### 33. TERACOLUS PUELLARIS, n. sp.

♂ ♀. Allied to the preceding, but considerably smaller; outer border in the male narrower; basal area of primaries and base of secondaries grey, irrorated with brown: wings below sulphur-yellow, the internal area white; black spots near outer margin of primaries placed more irregularly, the lower of the three extending downwards and expanding upon the inner margin; subapical costal spot of secondaries ill-defined. Expanse of wings, ♂ 1 inch 5 lines, ♀ 1 inch 6 lines.

♂, Punjab, Wuzeerabad (*Hearsay*, B.M.); ♀, Scinde (coll. F. Moore).

This may possibly be a dwarfed form of the preceding species; but I think not.

### 34. TERACOLUS OCHREIPENNIS, n. sp.

♂ ♀. Above like the preceding species, white, with black irregular outer border, marked in the primaries with three white spots, black discocellular spot, and grey base: below, however, it differs in having the primaries with the outer border pale ochreous; secondaries entirely pale ochreous or buff. Expanse of wings, ♂ 1 inch 4 to 5 lines, ♀ 1 inch 6 to 8 lines.

♂, India; ♂ ♀, Punjab; ♀, Scinde; ♀ var., N. India.

Colls. Moore and B.M.

The three preceding species have been considered by some Lepidopterists females of n. 37, which has been confounded with the *Phisadia* of Godart.

### 35. TERACOLUS PHISADIA.

♂. *Pieris phisadia*, Godart, Enc. Méth. ix. p. 132. n. 40 (1819).  
*Idmais phisadia*, Boisduval, Sp. Gén. Léop. i. p. 587. n. 3 (1836).

♂ ♀. *Pontia arne*, Klug, Symb. Phys. pl. 7. figs. 1-4 (1829).

♂. *Idmais arne*, Boisduval, Sp. Gén. Léop. i. pl. 19. fig. 2 (1836).

Senegal.

B.M

This species has the primaries pale pinkish salmon-colour, and the secondaries white; the female is, according to Klug's figure, yellow.

## 36. TERACOLUS ZOË.

*Anthocharis zoë*, Grandidier, Rev. Zool. p. 272 (1867).

*Callosune zoë*, Kirby, Syn. Cat. p. 504. n. 51 (1871).

Madagascar.

This species seems to me to be closely allied to the preceding; Kirby, however, refers it to *Callosune*, whilst he places *T. phisadia* in the genus *Idmais*.

I am pleased to find a typical *Idmais* described as an *Anthocharis* by a man who, inasmuch as he worked but little at the Lepidoptera, was obliged, when he did so, to examine into their structure, because it is a confirmation of my own conviction that *Idmais* does not differ *structurally* from the group *Callosune*, hitherto regarded as a distinct genus by many Lepidopterists.

## 37. TERACOLUS PROTRACTUS, n. sp.

♂ ♀. Wings above rosy salmon-colour, the base, costa of primaries, abdominal area of secondaries, and five to seven decreasing spots on the outer border of primaries ashen-grey; a broad black-brown outer border, paler, and occupying nearly half the wing in the secondaries of the female: wings below sordid pale buff; primaries with the base of costa and cell sulphur-yellow; outer border greyish, owing to the semitransparency of the wing; a black spot at end of cell, and three below median branches, the lowest one bifid; secondaries with the external area greyish, as in the primaries. Expanse of wings, ♂ 1 inch 8 to 9 lines, ♀ 1 inch 7 to 9 lines.

♂, Punjab (coll. B.M.); ♀, Punjab (coll. F. Moore).

## 38. TERACOLUS MODESTUS, n. sp.

♂. Very like *T. amata*, pale pinky salmon-colour, grey at base; the outer border broadly black-brown, upon primaries very feebly sinuated internally between the median branches, barely enclosing a spot of the ground-colour on interno-median interspace, and marked by an oblique slightly inarched series of three subapical points of the same colour, upon secondaries bordered internally by four minute points of the ground-colour, limited by black dots and surrounded with grey; costal area black-brown, broader in the male than the female, and on the primaries dusted in front with grey: wings of the male below yellow as in *T. amata*, with similar markings, but the spots at end of cells very minute and ill-defined: the female, which is paler above than the male, is slightly tinted with grey below; two or three extremely ill-defined ochreous spots beyond the cell of primaries and bounding the usual pale yellow spots of the disk; fringe feebly pink; secondaries with a discal series of five ochreous spots, and a pale-centred ochraceous discocellular spot. Expanse of wings 1 inch 7 lines, ♀ 1 inch 5 lines.

Ceylon (*Templeton*).

♂ ♀, type, B.M.

A white variety of the female occurs, not differing on the under surface.

## 39. TERACOLUS AMATA.

*Papilio amata*, Fabricius, Syst. Ent. p. 476. n. 143 (1775).

*Idmais amata*, Butler, Fabr. Cat. p. 217. n. 1 (1869).

*Papilio calais* (part), Cramer, Pap. Exot. iv. pl. 351, A-D (1782), bad figures.

♂ ♀, Kurnool; ♂ ♀, Balasore; ♂, Bombay; ♀, Madras; ♂, Deccan; ♀, Coromandel. Colls. F. Moore and B.M.

The last two of the examples quoted above are in the Museum collection: the species is the size of *T. calais* (the female sometimes larger); it is much like *T. dynamene*; but the outline of the marginal border is much less irregular, and the colouring of the underside clear, the female only showing more or less strongly defined transverse discal spots. A white female from Kurnool is in Mr. Moore's collection; it has the markings of the underside better defined than usual in the typical female.

## 40. TERACOLUS CYPRÆA.

*Papilio cypræa*, Fabricius, Ent. Syst. iii. p. 203. n. 634 (1793).

♂ ♀, Bombay (8 examples). Coll. F. Moore.

This species is considerably larger than *T. calais*, the figure of which Fabricius quotes for it; the male measures 1 inch 8 lines to 2 inches 1 line, and the female 1 inch 11 lines to 2 inches 2 lines. It is easily distinguished from *T. calais* on the underside by the absence of the orange spot on disk of primaries, and by its deeper coloration; from the preceding species *T. amata* it is easily distinguished by its more elongated primaries, deeper coloration below, and the more irregular outer border of the primaries, the enclosed spot on interno-median interspace being much broader.

There is a white female in the collection of the British Museum; it is smaller than typical females, and the ground-colour on the under surface is paler.

## 41. TERACOLUS DYNAMENE.

*Pontia dynamene*, Klug, Symb. Phys. pl. 6 figs. 15, 16 (1829).

*Idmais dynamene*, Boisduval, Sp. Gén. Léop. i. p. 588. n. 5 (1836).

♂, N. India (B.M.); ♂ ♀, Scinde and Agra; ♂, Kattywur; ♀, Punjab (coll. F. Moore).

This species is frequently confounded with *T. amata* in collections. It is, however characterized by a much less rounded outer margin to the primaries, paler and more greyish coloration, the abdominal half of secondaries distinctly grey in the male, the inner edge of the external border of primaries more irregular even than in *T. cypræa*, the greener coloration of the under surface, the paler female, which has a distinct orange blotch (cut by the median nervure and its first two branches) on the under surface of the primaries, as in *T. calais*, and in the greater prominence of the pale marginal internervular lituræ on the upper surface.

## 42. TERACOLUS CARNIFER, n. sp. (Plate VII. figs. 8, 9.)

♂. Allied to the preceding species, but smaller, and of a clearer

and brighter colour, the costa of primaries, base, and abdominal area of secondaries much less strongly suffused with grey; the black discocellular spot of primaries more conical in shape; the outer blackish border terminating abruptly upon the first median branch, the margin alone being black; the black spot on interno-median area smaller and not connected with the outer border; six discal spots of the ground-colour running in a curved series through the centre of the border, the first four large, placed in pairs, the last two small and well separated; six submarginal smaller spots, the two at apex elongated; secondaries with five large diamond-shaped brown spots at the end of the nervures, the upper three united into an apical marginal band; the last of these spots ill-defined on a grey ground at end of second median branch; the first median and internal nervures also terminate in diamond-shaped grey spots; three small black spots on the disk, above the median nervures; costal area, excepting at apex, broadly black: wings below nearly as in *T. dynamene*, but clearer in colour, with a suffused orange patch over the median nervure. Expanse of wings 1 inch 5 lines.

Mynpuri, N.W. Punjab.

Type, coll. F. Moore.

#### 43. TERACOLUS CALAIS.

*Papilio calais*, Cramer, Pap. Exot. i. pl. 53. figs. c, d (1779).

*Idmais calais*, Trimen, Rhop. Afr. Austr. p. 61. n. 40 (1862).

Congo (*Curror*).

B.M.

This species is of the size and form of *T. amata*, but can readily be distinguished by the orange patch below, which is more strongly developed than in any other species; the female has the disk and external spots of the primaries and the whole of the ground-colour of secondaries whitish. Cramer confounded the African species with the insect from Coromandel, which he figured under the same name in his fourth volume.

8. *Wings white or sulphur-yellow, spotted or banded above with black or grey, the apex of primaries invariably orange in the males, generally black in the females with a central orange, yellow, or white macular band; this band, however, is occasionally absent, leaving the apex wholly black.* Callosune, Doubleday.

8a. Orange apical patch of the male without an internal black edge, interrupted internally on second median interspace by a transverse black spot. Typical form, *T. interruptus*.

#### 44. TERACOLUS SUBFUMOSUS, n. sp. (Plate VI. fig. 3.)

♂. Very like *T. interruptus*, but with no internal blackish streak on the primaries, with the black outer border of the orange patch narrower, the inner spot small; the inferior extremity of the orange patch not enclosed by a black expansion of the border; secondaries with the marginal spots small: primaries below white, the apical area clay-coloured speckled with grey and bordered internally by a dull orange diffused streak; secondaries pale buff, densely irrorated

with grey, the upper half of discoidal cell, the lower half of discoidal interspace, and the centres of the interspaces thence to the costa whitish; nervures terminating in minute black points; costa and apical half of outer margin ochraceous. Expanse of wings 1 inch 6 lines.

♀. Sulphur-yellow or white, base dusky; primaries with a more or less defined (but always pale) grey internal streak; a black point at end of cell; outer margin broadly black, dentate-hastate internally; immediately beyond and touching the points of the denticles an oblique angulated black band (the two sometimes barely distinguishable owing to the expansion of the black points); the spots left between the border and the band and a narrow streak inside the latter orange or sulphur-yellow; secondaries with a series of triangular marginal black spots, a blackish subapical costal spot, and a badly-defined W-shaped marking cut by the third median branch; wings below more deeply coloured than in the male; the cell of primaries tinted with sulphur-yellow; otherwise the same. Expanse of wings 1 inch 4-5 lines.

N.E. of Natal (12 examples, *E. C. Buxton*). Type, B.M.

45. *TERACOLUS LYCORIS*, n. sp. (Plate VI. fig. 6.)

♂. Wings above as in the preceding species; secondaries below sandy whitish, irrorated with grey-brown; a black-and-orange dot at end of cell; a congregation of brown atoms on subcostal interspace near apex, and another on the disk, cut by the third median branch. Expanse of wings 1 inch 5 lines.

♀. Wings above white; base grey; primaries with a more or less defined but always pale grey internal streak, ending in a blackish spot; a black dot at end of cell; apex broadly black, crossed by an ill-defined series of minute squamose orange spots; inner edge of apical patch sometimes bordered with sulphur-yellow; secondaries with a more or less strongly defined series of marginal black spots, the three next to apex largest and sometimes united; a black subapical costal spot, and a larger spot on discoidal interspace, sometimes throwing off a smaller diffused blackish spot on each side: primaries below white, showing the discocellular dot and internal spot of upper surface; apex clay-coloured or sandy, irrorated with grey, and bordered within by an oblique series of four black or brown spots; secondaries clay-coloured or sandy, irrorated with grey; a black spot or black-and-orange point at end of cell; and an angulated series of black or brown discal spots. Expanse of wings 1 inch 4-5 lines.

Between Natal and Delagoa Bay (4 examples, *E. C. Buxton*).

Type, B.M.

This is the *Anthopsyche eucharis* of Wallengren, but not of Fabricius.

46. *TERACOLUS FLAMINIA*, n. sp. (Plate VI. fig. 1.)

♂. Like *T. subfumosus* above, but the primaries with a more or less defined dusky spot on interno-median interspace, sometimes

connected by a greyish internal streak with the base; secondaries with the marginal spots occasionally larger, and a dusky ill-defined spot on the second median interspace: primaries below with the apical area dull lemon-yellow, bounded internally by an angulated brown line, followed by and edging a broad orange streak; secondaries sandy whitish, irrorated sparsely with brown, a congregation of brown scales on the costa near apex, and an ill-defined streak across the median branches; costa at base orange, a black and orange point at end of cell. Expanse of wings 1 inch 4-7 lines.

♀. Sulphur-yellow above, base slightly greyish, internal area of primaries grey, darkest at base and in a spot beyond the middle, where it terminates; outer margin bordered by brown triangular connected spots, the apices of the nervures also brown; a narrow angulated discal brown streak halfway between the cell and apex; a minute black point at end of cell; secondaries with a marginal series of brown spots, a lunular subapical spot on subcostal interspace; a squamose brown discal streak across the median branches: wings below with the base of primaries yellow and the secondaries slightly darker; otherwise as in the male. Expanse of wings 1 inch 3 lines.

Between Natal and Delagoa Bay (4 examples, *E. C. Buxton*).

Type, B.M.

This is a well-marked little species, easily distinguished by the coloration of the under surface.

#### 47. TERACOLUS LYÆUS, n. sp. (Plate VI. fig. 2.)

♂. Wings above white, base greyish black, base of costa, head, palpi, and prothorax pinkish; centre of costa of primaries markedly black; apex orange, sharply cut, with lilacine reflections; outer border to first median branch black, strongly sinuated between the veins, whose apices are also black; a well-defined rounded black spot, touching the third median branch, upon the second median interspace; fringe, excepting at external angle, rosy; an ill-defined internal pale grey streak, slightly darker at its extremity; secondaries with a marginal series of black spots, more or less triangular; fringe rosy at anal angle: primaries below with the apical area chrome-yellow, irrorated with grey and cut by an angulated orange streak; fringe and costa as above; secondaries rosy, irrorated with grey; a dusky subapical spot, and a second on second median interspace; an orange-and-black discocellular point; costa deep orange. Expanse of wings 1 inch 4 lines.

♀. White above, with the apex of primaries yellow and the costa rosy; base yellow, irrorated with grey; primaries with apical markings, as in the preceding species, but broader; a greyish ill-defined internal streak, terminating in a brown spot; secondaries with a marginal series of large brown spots, a brown subapical spot, and a W-shaped discal marking cut by the third median branch: wings below as in the male, but rather paler. Expanse of wings 1 inch 4 lines.

Between Natal and Delagoa Bay (3 examples, *E. C. Buxton*).

Type, B.M.

48. *TERACOLUS FRIGA*, n. sp. (Plate VI. fig. 5.)

♂, ♀. White above, the female slightly tinted with sulphur-yellow towards the base; base blackish grey; primaries with the apex orange; costa of the male broadly black in the centre; outer margin black, dentate-hastate, the apices of the nervures black, male with the usual black spot on the orange, the female with the angulated black streak; a black internal spot indicating the termination of a greyish streak (dimly visible in the female only); secondaries with a marginal series of conical black spots united in the female; an ill-defined W-shaped marking touching the third marginal spot: primaries below white; a black dot at end of cell; apex in the male broadly dull reddish, becoming greyish externally and crossed by a scarcely visible angulated grey streak; costa and apex of the female ochreous, irrorated with grey; a subapical angulated brown streak; base and subcostal area sulphur-yellow; secondaries of the male sordid white, irrorated with blackish; the costa deep orange; two subapical ochreous spots; an orange-bordered black dot at end of cell; secondaries of the female sandy, becoming whitish towards the centre, densely irrorated with purplish brown; two subapical brown spots; costa orange; a black-and-orange dot at end of cell. Expanse of wings ♂ 1 inch 5 lines, ♀ 1 inch 4 lines.

N.E. of Natal (*E. C. Buxton*).

Type, B.M.

49. *TERACOLUS GALATHINUS*, n. sp.

♂. Above like *T. interruptus*, excepting that there is a submarginal zigzag grey streak from the radial to the internal nervure of secondaries: primaries below white; a black discocellular point; apical area reddish orange, with a subapical diffused yellow spot; fringe rosy; secondaries rosy, irrorated with brown; a subapical brown spot, and a discal brown streak across the median branches; costa deep orange; a black-and-orange dot at end of cell. Expanse of wings 1 inch 6 lines.

♀. White, with the subapical and subbasal areas yellow, base grey; primaries with the costa and fringe rosy; a black discocellular spot; a broad blackish internal streak terminating in a black spot; apex broadly black, sometimes crossed by a curved series of cuneiform yellow spots; secondaries with a marginal series of conical black spots; an irregular discal black streak; apex yellowish: primaries below white, the basal and costal areas sulphur-yellow: a black point at end of cell; apical area clay-coloured, reddish externally, and bounded within by a brown angulated streak bordered with dull reddish orange; secondaries as in the male, but darker. Expanse of wings 1 inch 4 lines.

N.E. of Natal (1 ♂, 6 ♀, *E. C. Buxton*).

Type, B.M.

50. *TERACOLUS INTERRUPTUS*.

♂, ♀ *Teracolus interruptus*, Butler, P. Z. S. p. 724 (1871); Lep. Exot. p. 115, pl. xliii. figs. 1, 2 (1872).

♂ ♀, Loanda (*coll. R. Meldola*); ♂, Angola (*E. C. Buxton*).

B.M.

I have compared our example with male specimens given to me by Mr. Ansell, from Kinsembo, and find no difference.

51. *TERACOLUS LUCULLUS*. (Plate VI. fig. 4.)

♂. Above very like the preceding species, but the internal streak of primaries more defined, the base and costa of secondaries blackish, terminating near apex in a black costal spot; marginal spots of secondaries more distinctly separated: wings below white, primaries with the apical area sulphur-yellow, covered internally by a broad orange patch (not so broad as in *T. interruptus*), through the centre of which runs an angulated grey streak; a black point at end of cell; a blackish spot on internal area; secondaries tinted with pale sulphur-yellow at apex; basal half of costa orange, a blackish sub-apical costal spot; a black-and-orange dot at end of cell; an angulated brown marking on the disk, cut by the third median branch; a marginal series of black dots terminating the nervures. Expanse of wings 1 inch 5 lines.

♀, *Teracolus loandicus* (in part), Butler, P. Z. S. p. 724 (1871); Lep. Exot. p. 91, pl. xxxiv. fig. 9 (1872).

♂, Ambriz, October 1872 (*J. J. Monteiro, B.M.*); ♀, Loanda (*coll. R. Meldola*).

I have no doubt that I made a mistake in referring the above female to my *T. loandicus*, the differences between it and the female of *T. interruptus* being precisely parallel to the differences between the two males. *T. loandicus* will come into another section, in which the females have the marginal spots of secondaries rather small, the orange patch of primaries curved and not extending beyond the limiting streak, and an interrupted angular streak from costa to internal area of secondaries.

52. *TERACOLUS GELASINUS*, n. sp.

♂. Nearly allied to *T. interruptus*, but readily distinguished by the absence of the internal streak of primaries and the small marginal spots of secondaries: wings below white, the nervures terminating in black dots, all the wings with black dots at the end of the cells; primaries with the apex broadly sulphur-yellow, bounded internally by a rather narrow orange band, on which are a few dusky scales; sometimes a small dusky spot near inner margin beyond the middle; secondaries speckled with brown, with the basal third of costa orange, sometimes a small dusky spot on second median interspace. Expanse of wings 1 inch 4-7 lines.

♂. Quanza, August 1872; ♂, Ambriz, October 1872 (*J. J. Monteiro*).  
Type, B.M.

53. *TERACOLUS ANTIGONE*.

*Anthocharis antigone*, Boisduval, Sp. Gén. Léop. i. p. 572. n. 19 (1836).

*Callosune antigone*, Kirby, Syn. Cat. p. 502. n. 21 (1871).

*Anthocharis phlegetonia*, Boisduval, Sp. Gén. Léop. i. p. 576. n. 25 (1836).

*Callosune phlegetonia*, Kirby, Syn. Cat. p. 503. n. 30 (1871).

West Africa.

B.M.

The *Anthocharis phlegetonia* of Wallengren and the *A. achina* of Lucas are distinct species.

54. TERACOLUS EIONE.

*Anthocharis eione*, Boisduval, Sp. Gén. Léop. i. p. 578. n. 29 (1836).

*Callosune eione*, Kirby, Syn. Cat. p. 503. n. 35 (1871).

Var. *Anthopsyche phlegetonia*, Wallengren, Lep. Rhop. Caffr. p. 13 (1857).

♂ ♀, S. Africa (*E. C. Buxton*); ♀, Zoolu (*Sir A. Smith*). B.M.

55. TERACOLUS STYGIA.

*Anthopsyche stygia*, Felder, Reise der Nov. Lep. ii. p. 188. n. 183 (1865).

*Callosune stygia*, Kirby, Syn. Cat. p. 503. n. 31 (1871).

Bogos.

Allied to *T. eione*.

56. TERACOLUS ISAURA.

*Anthocharis isaura*, Lucas, Rev. Zool. p. 424 (1852).

*Callosune isaura*, Kirby, Syn. Cat. p. 503. n. 38 (1871).

Abyssinia.

57. TERACOLUS DALILA.

*Anthopsyche dalila*, Felder, Reise der Nov. Lep. ii. p. 188. n. 184 ("1865").

*Callosune dalila*, Kirby, Syn. Cat. p. 503. n. 32 (1871).

Bogos.

58. TERACOLUS DAIRA.

♂ ♀, *Pontia दौरा*, Klug, Symb. Phys. pl. 8. figs. 1-4 (1829).

*Anthocharis दौरा*, Boisduval, Sp. Gén. Léop. i. p. 579. n. 30 (1836).

*Callosune दौरा*, Kirby, Syn. Cat. p. 503. n. 34 (1871).

♂ ♀, White Nile (*Petherick*).

B.M.

8 b. Orange apical patch with or without a black edge, but not interrupted internally in the male by black spots.

59. TERACOLUS GLYCERA, n. sp.

♂. Wings above white, with an oblique slightly incurved orange apical patch on primaries; centre of costa and outer margin black, the latter dentate-sinuate; a greyish internal streak terminating in a blackish spot; secondaries with the base and costal area near apex grey; a marginal series of triangular black spots, and, touching them,

a submarginal grey streak : wings below white ; primaries with the discoidal cell bright sulphur-yellow, a black dot at the end of it ; apex pale lemon-yellow, bounded internally by an orange streak ; a dusky spot on internal area ; secondaries with the base of costa orange ; a black-and-orange dot at end of cell ; a dusky streak across the median branches. Expanse of wings 1 inch 6 lines.

Africa ?

Type, coll. B.M.

60. TERACOLUS PALLENE.

*Anthocharis pallene*, Hopffer, Ber. Verh. Ak. Berl. p. 640. n. 4 (1855) ; Peters's Reise n. Mossamb. Zool. v. p. 358, pl. 23. figs. 7, 8 (1862).

*Callosune pallene*, Kirby, Syn. Cat. p. 504. n. 50 (1871).

Mozambique.

61. TERACOLUS NOUNA.

*Anthocharis nouna*, Lucas, Expl. Alg. Zool. iii. p. 350. n. 14, pl. 1. fig. 2 (1849).

*Callosune nouna*, Kirby, Syn. Cat. p. 503. n. 39 (1871).

Algeria.

62. TERACOLUS LIAGORE.

*Pontia liagore*, Klug, Symb. Phys. pl. 6. figs. 5-8 (1829).

*Anthocharis liagore*, Boisduval, Sp. Gén. Léop. i. p. 580. n. 33 (1836).

*Callosune liagore*, Kirby, Syn. Cat. p. 503. n. 42 (1871).

Arabia.

63. TERACOLUS EPHYIA.

*Pontia ephyia*, Klug, Symb. Phys. pl. 6. figs. 9, 10 (1829).

*Anthocharis ephyia*, Boisduval, Sp. Gén. Léop. i. p. 580. n. 32 (1836).

*Callosune ephyia*, Kirby, Syn. Cat. p. 503. n. 40 (1871).

Arabia.

64. TERACOLUS LAIS, n. sp.

♂. Like the preceding species, but whiter, the orange patch of primaries much more oblique and consequently shorter, not extending below the third median branch, but bordered internally by a broader blackish band ; primaries with a well-defined discocellular spot : below, the secondaries have a black-and-orange dot at end of cell, the base of costa orange ; the black irrorations scattered all over the wing, Expanse of wings 1 inch 4 lines.

Orange River, S. Africa.

Type, B.M.

65. TERACOLUS HALYATTES, n. sp. (Plate VI. fig. 8.)

♂. Wings above white, primaries with an orange apical patch, more or less excavated internally, enclosed by a black border, and crossed by blackish veins ; base blackish ; a more or less defined

black dot at end of cell; secondaries with small black spots terminating the veins, base blackish: primaries below with the costa rosy brownish; the apical area dull sandy ochraceous, irrorated with brown; a black dot at end of cell; secondaries sandy with a rosy tinge, irrorated with brown; a squamose subapical costal spot, and an ill-defined streak across the median branches, brown; base of costa orange, a black-and-orange dot at end of cell. Expanse of wings 1 inch 2-5 lines.

♀. White or sulphur-yellow above, base grey; primaries with the costa rosy, an internal grey streak, terminating at second third of wing in a transverse irregular blackish litura, which almost meets a spur from the apical area; the latter black, deeply notched internally, enclosing an oblique series of spots, four or five in number, orange, yellow, or white; the inner edge of the apical border bounded with orange in the orange-spotted form, and with an orange tint in the yellow-spotted form: secondaries with the cell and basal half of the interno-median and first median interspaces grey; a more or less defined angulated discal black streak thence to the costa; a marginal series of tolerably large black spots. Primaries below white or pale yellow, the bases broadly sulphur-yellow; apical area sandy or yellowish ochraceous, irrorated with brown and bounded by a pale orange or bright yellow nebulous streak enclosing a macular brown streak; a bisinuate brown litura, cut by the first median branch; a black dot at end of cell: secondaries as in the male, excepting that the subapical spot and discal streak are united into an angulated bar. Expanse of wings 1 inch 5-8 lines.

N.E. of Natal (*E. C. Buxton*).

Type, B.M.

66. *TERACOLUS ITHONUS*, n. sp. (Plate VI. fig. 7.)

♂. Wings above white, blackish at base: primaries with a large triangular reddish-orange apical patch, not excavated, but notched internally, a few brown scales along its inner border; apical portion of costa and outer margin to first median nervule black; the marginal border dentate-sinuate, and throwing off long spurs along the nervures, but not completely separating the apical patch; a minute black dot at end of cell: secondaries with a series of six black marginal dots. Primaries below white, the apical area lemon-yellow, irrorated with grey; a black dot at end of cell: secondaries sandy whitish, strongly reticulated with brown; a black dot at end of cell; base of costa orange. Expanse of wings 1 inch 9 lines.

♀. Very like the females of the preceding species, but with all the black portions of the wing much less pronounced, the grey internal streak of primaries pale and ending in a distinct dark spot (not in an irregular transverse litura); the apical spots larger; the undersides of secondaries more evidently brown-speckled. Expanse of wings 1 inch 5-8 lines.

N.E. of Natal (4 examples, *E. C. Buxton*).

Type, B.M.

67. *TERACOLUS HARMONIDES*, n. sp.

♂. Like a small example of the preceding species above, but the

marginal dots of secondaries still smaller: primaries below with the apical area sandy reticulated with grey, with pale rosy borders, and an oblique inner transverse grey line composed of three grey spots: secondaries rosy whitish reticulated with grey; a black dot at end of cell; the base of costa orange. Expanse of wings 1 inch 6 lines.

♀. White above, the base greyish; primaries with the costa greyish, black towards apex; apical area orange; outer border rather broadly black, deeply sinuated internally, extending to first median nervule; a subapical oblique irregular black streak, united to the outer border by black lines on the nervures (thus producing five subapical spots, the second minute); a black dot at end of cell; a grey internal streak terminating in a blackish spot: secondaries with the abdominal area greyish; six decreasing greyish-brown marginal spots, very large at apex; a dusky subcostal spot towards apex; a dusky oblique irregular marking on the disk and touching the third and fourth marginal spots. Primaries below white, the base pale yellowish; a black dot at end of cell; a grey internal line, terminating in a large black spot; apical area sandy, speckled with brown, becoming orange internally, and crossed by three grey spots: secondaries whity-brown, reticulated with brown; a black dot at end of cell; costa tinted with orange at base. Expanse of wings 1 inch 5 lines.

Between Natal and Delagoa Bay (*E. C. Buxton*). Type, B.M.

68. *TERACOLUS HIPPOCRENE*, n. sp.

♂. Also like *T. ithonus* above, but the marginal spots of secondaries larger and the base more heavily blackened: primaries below white, the apical area lemon-yellow, becoming paler externally; a black dot at end of cell: secondaries creamy white; the veins brownish; abdominal half of the wings speckled with brown; base of costa bright golden orange; a black-and-orange dot at end of cell. Expanse of wings 1 inch 6 lines.

♀. White, the apical area stramineous, with the black and grey markings as in *T. ithonus*, excepting that the internal grey streak is narrower: secondaries with basal and abdominal areas greyish; a marginal series of grey spots; an ill-defined W-shaped marking on the disk, cut by the third median branch. Wings below white: primaries with a black dot at end of cell; apex creamy yellowish speckled with brown, stramineous externally, and crossed obliquely by four brown spots: secondaries creamy, speckled with brown hatchings, which congregate as spots on the costa near apex and upon the centre of the disk; a black dot at end of cell. Expanse of wings 1 inch 7 lines.

Between Natal and Delagoa Bay (*E. C. Buxton*). Type, B.M.

69. *TERACOLUS IGNIFER*, n. sp.

♂. Wings above white, the base blackish: primaries with the apical half of costa and the outer margin to first median branch black, the apical fork of the subcostal, external two fifths of the radials, half the third median, external third of the second median,

and apex of the first median nervule black; apical area broadly deep orange (almost vermilion), its internal edge bordered indistinctly by black atoms; a black dot at end of cell: secondaries with the apices of the nervures black, a marginal series of grey spots terminating the nervures. Primaries below white; apical area creamy orange, becoming clear and bright internally, crossed obliquely by a few brown scales, and speckled with brown towards apex: secondaries creamy whitish, with a feeble pink tint, densely reticulated, excepting just beyond the cell, with brown; a black-and-orange dot at end of cell, base of costa orange. Expanse of wings 2 inches.

♀. Very like the female of *T. halyattes*, but much larger, the apical spots of primaries above larger, the secondaries below with a clear patch beyond end of cell, as in the male. Expanse of wings 1 inch 9 lines.

Var. ♂. Apical area of primaries below uniformly pinkish; the secondaries also much more pink. Female with the internal streak of primaries above expanded into a broad irregular blackish patch. Expanse of wings, ♂ 1 inch 8 lines to 2 inches, ♀ 1 inch 9 lines.

♂, Zoolu (*Sir A. Smith*); ♂ ♀, S. Africa (12 specimens, *E. C. Buxton*). Type, B.M.

This is probably Trimen's *Anthocharis antevippe*, but not Boisduval's.

#### 70. TERACOLUS CASTUS.

♂. *Callosune casta*, Gerstaecker, Van der Decken's Reisen in Ost-Afrika, 3. Abth. ii. p. 365. n. 6, pl. xv. figs. 1, 1a (1873).

Lake "Jipe," E. Africa.

Allied to *T. deidamia*.

#### 71. TERACOLUS SIMPLEX, n. sp.

♂. Wings above white: primaries with a very oblique triangular orange apical patch, bordered narrowly on its costal and external edges with pale brown; a minute black dot at end of cell. Primaries below white, with the apical area ochraceous, indistinctly speckled with brown; a black dot at end of cell: secondaries pale rosy whitish, reticulated with reddish brown; base of costa reddish; a pale-yellow-and-black dot at end of cell; a few brown atoms congregated below the costa near apex. Expanse of wings 1 inch 10 lines.

D'Urban (*Capt. Shelley*).

Type, B.M.

This species is readily distinguished by the absence of grey scaling at the base, the indistinctness of the outer border of the primaries, and the very oblique inner edge of the orange apical patch.

#### 72. TERACOLUS DEIDAMIA.

*Anthopsyche deidamia*, Wallengren, Wien. ent. Monatschr. iv. p. 35. n. 7 (1860).

*Callosune deidamia*, Kirby, Syn. Cat. p. 503. n. 41 (1871).

♂, 2 examples, Zoolu (*Sir A. Smith*).

B.M.

## 73. TERACOLUS ZERA.

*Anthocharis zera*, Lucas, Rev. Zool. p. 423 (1852).*Callosune zera*, Kirby, Syn. Cat. p. 502. n. 20 (1871).

Abyssinia.

Closely allied to *T. antevippe*, but the orange apical patch with a black internal margin.

## 74. TERACOLUS ANTEVIPPE.

*Anthocharis antevippe*, Boisduval, Sp. Gén. Lép. i. p. 572. n. 18, pl. 18. fig. 3 (1836).♂ ♀, White Nile (*Petherick*), ♂, Senegal.

B.M.

## 75. TERACOLUS HELLE.

♂. Nearly allied to *T. antevippe*, but the base of primaries broadly grey; outer black border of primaries twice the width; costa, excepting at base, distinctly black; orange patch of primaries below more restricted: terminations of veins in secondaries less distinctly black. Expanse of wing 1 inch 11 lines.♀. Primaries rounded at apex; basal area of wings considerably darker than in *T. antevippe*, marginal spots of secondaries larger: primaries below with the transverse grey subapical streak almost obsolete; secondaries considerably whiter. Expanse of wings 1 inch 8 lines.White Nile (*Petherick*).

Type, B.M.

Possibly a variety of *T. antevippe*, but quite distinct in appearance. Until all these species have been bred, it will be necessary to regard all the dissimilar and apparently constant forms as different species.

## 76. TERACOLUS HYPERIDES.

Allied to *T. antevippe*; the male, however, differs in the narrow, squamose, black, internal edging to the orange-patch, and in the presence of a grey internal streak in primaries; the nervures of secondaries on underside not noticeably black-tipped; the orange of costa confined to the base, and the spot at end of cell smaller. The female also has the apical area of primaries distinctly orange, with a broad brown patch covering the base of discoidal cell and extending to beyond second third of internal area; the abdominal area of secondaries brownish, the angulated band more distinct: wings below altogether paler; primaries with a greyish internal streak, terminating in a large black spot; secondaries yellow instead of orange-tinted; the veins not black, angulated band less distinct. Expanse of wings ♂ 1 inch 9 lines, ♀ 1 inch 8 lines.N.E. of Natal (3 specimens, *E. C. Buxton*).

Type, B.M.

## 77. TERACOLUS ACHINE.

♀. *Papilio achine*, Cramer, Pap. Exot. iv. pl. 338. figs. E, F (1782).  
*Pieris achine*? Godart, Enc. Méth. ix. p. 122. n. 14 (1819).S. Africa (4 examples, *E. C. Buxton*).

B.M.

The male differs from the *T. achine* of Hübner in having the veins

of secondaries below black and no marking on the disk; the female is altogether more heavily coloured.

78. *TERACOLUS EVENINUS*.

♀. *Anthopsyche evenina*, Wallengren, Lep. Rhop. Caffr. p. 12 (1857).

*Anthocharis evenina*, Trimen, Rhop. Afr. Austr. p. 322. n. 216 (1866).

*Callosune evenina*, Trimen, Trans. Ent. Soc. p. 380, pl. 6. fig. 11 (1870).

Orange River, S. Africa (*Janson*); S. Africa (*E. C. Buxton*).

B.M.

Males referred to *T. eveninus* in Mr. Druce's Collection do not differ in character from the other males of this group.

79. *TERACOLUS TRIMENI*, n. sp.

♂ ♀. *Aphrodite achine*, Hübner, Samml. exot. Schmett. ii. pl. 128. figs. 1-4 (1816-36).

♀ var. Apex of primaries black, crossed by five white spots, the angulated band of secondaries approaching at its angle nearer to the outer margin than in Hübner's figure.

♂ ♀, S. Africa (*E. C. Buxton*); ♂, Zoolu, Knysna, and Plettenberg Bay.

Type, B.M.

This species has the wings of the male below white, the veins not being blackened as in *T. achine*. We have five males and two females (both of the albino variety).

80. *TERACOLUS GAVISA*.

*Anthopsyche gavis*, Wallengren, Lep. Rhop. Caffr. p. 323 (1857).

*Anthocharis gavis*, Trimen, Rhop. Afr. Austr. p. 324. n. 218 (1866).

*Callosune gavis*, Kirby, Syn. Cat. p. 502. n. 18 (1871).

♂ ♀, *Anthocharis* —? Angas, Kaff. Ill. pl. 30. figs. 4 and 5 (1849).

♀, *Anthocharis exole* (part), Reiche, Ferr. Gal. Voy. Abyss. Ent. p. 460, pl. 31. figs. 5 and 6 (1849).

♂ ♀, *Anthocharis achine*, Trimen (nec Cramer), Rhop. Afr. Austr. p. 46. n. 29 (1866).

*Anthopsyche roxane*, Felder, Reise der Nov. Lep. ii. p. 187. n. 182 ("1865").

♂ ♀, S. Africa (7 examples, *E. C. Buxton*); ♀, Natal. B.M.

This species is larger than *T. achine*. The male below differs in having a distinct, subapical, diffused, orange spot in primaries, and the secondaries more varied with orange, with the veins black to the base. The female has a broader orange patch above, and the under-side more yellow in tint.

81. *TERACOLUS HERO*, n. sp. (Plate VI. fig. 12.)

♂. Allied to the preceding species, but larger, the vermilion patch at apex not bordered within with black, but with a few marginal

blackish scales; the black veins only crossing its outer area; the internal black streak replaced by a tapering dark grey streak, which disappears just beyond the middle of the internal nervure; marginal spots clearly defined and well separated; secondaries below with the veins white from the base to the middle of the wing and thence grey to the margin. Expanse of wings 2 inches 1 line.

♀. Pale testaceous, the apical spots of primaries stramineous; brown parts of the wing as in *T. gavis* ♀, excepting that the sub-apical band of primaries bounding the apical spots is not irregular externally, and is of more than twice the width; the spot at end of cell is lost in the brown basal patch, and the spots towards anal angle of secondaries are almost lost in the broad marginal border: below the wings are testaceous, the base and apex of primaries and the secondaries with a yellow tint and clouded with pale orange; the veins of external third of primaries are dusky, but on secondaries they are uniform with the ground-colour; the subapical, blackish, oblique streak of primaries is placed much nearer to the apex. Expanse of wings 1 inch 11 lines.

S. Africa (*E. C. Buxton*).

Type, B.M.

I believe the above to be sexes; they have much in common.

#### 82. TERACOLUS OMPHALOIDES, n. sp.

*Anthocharis achine*, Boisduval (nec Cramer), Sp. Gén. Lép. i. p. 574. n. 21 (1836).

This species differs from *T. omphale* in the narrower, black internal stripe of primaries, the obsolete character or absence of the male transverse stripe in the secondaries, and the red tint of the under surface of the latter wings. Expanse of wings, ♂ 1 inch 4–10 lines, ♀ 1 inch 5–10 lines.

♂ ♀, S. Africa (11 examples, *E. C. Buxton*); ♂, Zoolu (*Sir A. Smith*).

Type, B.M.

If it were not for the number of examples which we now possess of this form, I should have been disposed to look upon it as a sport of *T. omphale*.

#### 83. TERACOLUS OMPHALE.

*Pieris omphale*, Godart, Enc. Méth. ix. p. 122. n. 12 (1819).

*Anthochaaris omphale*, Boisduval, Sp. Gén. Lép. i. p. 574. n. 22 (1836).

*Callosune omphale*, Kirby, Syn. Cat. p. 502. n. 23 (1871).

*Anthocharis eurygone*?, Lucas, Rev. Zool. p. 341 (1852).

*Callosune eurygone*, Kirby, Syn. Cat. p. 502. n. 19 (1871).

♂ ♀, N.E. of Natal (13 examples, *E. C. Buxton*).

B.M.

The undersurface of the secondaries in this species is of a greenish white colour, with the usual angular streak and discoidal spot.

#### 84. TERACOLUS EXOLE.

♂. *Anthocharis exole* (part), Reiche, Ferr. Gal. Voy. Abyss. Ent. p. 460, pl. 31. fig. 4 (1849).

*Callosune exole*, Kirby, Syn. Cat. p. 503. n. 27 (1871).

♀. *Anthocharis achine*, Lucas (nec Cramer), Lep. Exot. pl. 37. fig. 2 (1835).

*Anthopsyche acte*, Felder, Reise der Nov. Lep. ii. p. 187. n. 181 ("1865").

♂, Knysna (*Trimen*); ♀, S. Africa (*E. C. Buxton*); Natal and Caffraria. B.M.

Wallengren, in his 'Lep. Rhop. Caffr.,' has confounded this species with *T. omphale*; the two females are much alike. M. Lucas's figure is not quite correctly drawn and is over-coloured; but there is no mistaking the species intended.

#### 85. TERACOLUS SUFFUSUS, n. sp. (Plate VI. fig. 10.)

♀. Very like a small female of *T. omphale*, but the basal area of the primaries grey to costa, the subapical orange spots smaller, and the angular band of secondaries considerably narrower: wings below creamy white; secondaries with a distinct yellowish tint; primaries with a large, subapical curved, orange patch, leaving a narrow, sordid, yellow, apical border; secondaries with an angulated discal streak (its upper half ill defined) testaceous; a black-and-orange spot at end of cell. Expanse of wings 1 inch 4 lines.

Ambriz (*J. J. Monteiro*).

Type, B.M.

This very distinct little species is a link between the *T.-omphale* and *T.-epigone* groups.

#### 86. TERACOLUS HYBRIDUS, n. sp.

♂ ♀. Above like *T. omphale*, below like *T. omphaloides*, but the secondaries of a more rosy tint, such as occurs in *T. theogone*. Expanse of wings, ♂, 1 inch 9 lines, ♀, 1 inch 10 lines.

♂, Plettenberg Bay; ♀, Natal.

Type, B.M.

This may be the result of a cross between *T. omphale* and *T. omphaloides*; it, however, clearly approaches *T. theogone* in the coloration of the under surface. Although species of the same genus are frequently known to make matrimonial mistakes, it is doubtful whether in such cases the females are often fertile.

#### 87. TERACOLUS THEOGONE.

*Anthocharis theogone*, Boisduval, Sp. Gén. Léop. i. p. 575. n. 23 (1836).

*Callosune theogone*, Kirby, Syn. Cat. p. 502. n. 23a (1871).

♂ ♀, S. Africa (5 examples, *E. C. Buxton*); Zoolu (*Sir A. Smith*).

B.M.

The sexes of *T. theogone* were taken *in copulá* by Mr. Buxton.

#### 88. TERACOLUS DELPHINE.

*Anthocharis delphine*, Boisduval, Sp. Gén. Léop. i. p. 577. n. 28 (1836).

*Callosune delphine*, Kirby, Syn. Cat. p. 503. n. 33 (1871).

Sp. ead. ? ♂ ♀, S. Africa.

B.M.

Nobody seems satisfied about the identification of this species; Mr.

Trimen, so far as I understand him, appears to have identified it with ♂ *T. omphaloides* and ♀ *T. gavis*.

#### 89. TERACOLUS PROCNE.

*Anthopsyche procne*, Wallengren, Lep. Rhop. Caffr. p. 323 (1857).

*Anthocharis procne*, Trimén, Rhop. Afr. Austr. p. 323. n. 217 (1866).

*Callosune procne*, Kirby, Syn. Cat. p. 502. n. 17 (1871).

♂ ♀, S. Africa (*E. C. Buxton*).

B.M.

We have a small pair of this species presented by Mr. Buxton, the female of which has the orange subapical band rather narrower than usual.

#### 90. TERACOLUS EPIGONE.

♂. *Anthopsyche epigone* (part), Felder, Reise der Nov. Lep. ii. p. 186. n. 180 (1865).

*Callosune epigone*, Kirby, Syn. Cat. p. 502. n. 25 (1871).

♂, White Nile (*Petherick*); ? ♀, Orange River, S. Africa. B.M.

I am not certain about the female which I have provisionally referred to this species.

#### 91. TERACOLUS LOANDICUS.

♂. *Teracolus loandicus* (part), Butler, P. Z. S. 1871, p. 724 (1871); Lep. Exot. pl. xxxiv. fig. 10 (1872).

♀. Very like *T. procne* ♀; but the oblique black band bounding the curved orange band of primaries extremely narrow, the base of the same wings broadly grey; the internal streak ill-defined, no part of it visible on the underside; the undersurface of all the wings considerably paler. Expanse of wings 1 inch 7 lines.

♂, Kinsembo (*Ansell*); ♀, Ambriz (*Monteiro*).

B.M.

♂ ♀, var. ♂. Altogether less heavily marked; the female scarcely grey at the base, with no trace of the internal streak, and with the orange band broader; angulated streak of secondaries barely indicated, underside paler.

♂ ♀, Quanza, August 1871 (*J. J. Monteiro*).

B.M.

It is possible that this may be distinct; but I am unwilling to name it, from the close resemblance which it bears to typical *T. loandicus*.

#### 92. TERACOLUS EBOREA.

♂. *Papileo eborea* (part), Cramer, Pap. Exot. iv. pl. 552. figs. C, D (1782).

? Africa.

Cramer figures the male of *T. danae* from Coromandel as the female of this species; and (notwithstanding his remarks upon the coloration of the apical patch) I believe he has improved the scarlet of the apical fascia in his male to make it more nearly agree with its supposed female. The species is clearly nearly related to the following, and never came from any part of Asia.

93. *TERACOLUS PSEUDOCALÉ*, n. sp. (Plate VI. fig. 9.)

♂. White above, the base grey; primaries with the apical two-fifths black, enclosing a large, reddish, orange, arched band, divided by the nervures into six parts; a minute black dot at end of cell; secondaries with a marginal series of six large triangular black spots: wings below white, base yellowish; primaries with the apical area creamy yellow, bounded internally by a large, curved, diffused, orange patch, a black dot at end of cell; secondaries with a black-and-orange spot at end of cell. Expanse of wings 1 inch 6–10 lines.

♀. Wings above white, basal two fifths grey, obliquely in primaries, and terminating at second third of internal nervure in a darker grey spot; apical third black, inclosing a curved, orange band, divided by the nervures into five parts; secondaries with well-developed, interrupted, angulated, blackish streak and 5 decreasing, triangular, marginal spots: primaries below nearly as in the male, secondaries pale yellow, with ochreous discal streak and a black dot at end of cell. Expanse of wings 1 inch 5–10 lines.

♂ ♀, S. Africa (*E. C. Buxton*); ♀, Orange River. Type, B.M.

94. *TERACOLUS ANGOLENSIS*, n. sp.

♂. Closely allied to the preceding, but the apical patch wider upon the costa and continued in the form of a tapering costal border nearly to the base; orange patch half as wide again, its inner black border tapering towards the costa; marginal spots of secondaries more pyramidal and consequently separated: wings below destitute of yellow colouring, the diffused orange patch of primaries broader. Expanse of wings 1 inch 9 lines.

♀. Wings above white or yellow, markings as in the preceding species; but the orange band broader, the greyish areas darker, the border and band of secondaries much more pronounced, and the undersurface more uniform in colour. Expanse of wings 1 inch 7–10 lines.

♂, Angola (*E. C. Buxton*); ♂ ♀, Congo (*Curror*). Type, B.M.

I believe Felder to have described the female of this species as *T. epigone* ♀.

95. *TERACOLUS OCALE*.

♀. *Anthocharis ocale*, Boisduval, Sp. Gén. Lép. i. p. 584. n. 37 (1836).

Guinea.

Seems allied to the preceding species.

Sc. Apical patch of the female black, rarely enclosing small orange spots.

96. *TERACOLUS ARETHUSA* (*T. EVIPPE*, var. ?).

♀ *Papilio arethusa*, Drury, Ill. Exot. Ent. ii. pl. 19. figs. 5 and 6 (1773).

*Anthocharis arethusa* ♂, Boisduval, Sp. Gén. Lép. i. p. 582. n. 35 (1836).

*Callosune arethusa*, Kirby, Syn. Cat. p. 504. n. 45 (1871).

*Pieris amyntis*, Godart, Enc. Méth. ix. p. 123. n. 14 (1819).

*Pieris evippe* ♀, Godart, l. c. p. 122. n. 10 (1819).

♂ ♀, Sierra Leone; ♂, Ashanti; S. Africa (*E. C. Buxton*).

Dr. Boisduval attacks M. Godart for considering this the female of *T. evippe*, Linnæus; it is, however, not improbable that it is only a variety of that species, inasmuch as it chiefly differs from it in the possession of a black dot at the end of the discoidal cell; it certainly is the female of the *A. evippe* of Boisduval; the female described by the latter author is not even nearly related to this species, but is probably identical with, or nearly allied to, *T. gavisæ*.

97. TERACOLUS CEBRENE (? = *T. arethusa*, var.).

*Anthocharis cebrene*, Boisduval, Sp. Gén. Lép. i. p. 583. n. 36 (1836).

*Callosune cebrene*, Kirby, Syn. Cat. p. 504. n. 47 (1871).

*Papilio arethusa*, Cramer, Pap. Exot. iii. pl. 210. figs. E, F (1782).

Sierra Leone.

One of our female examples of *T. arethusa* is intermediate between the figures of Drury and Cramer.

98. TERACOLUS EVIPPE.

♂. *Papilio evippe*, Linnæus, Mus. Lud. Ulr. p. 239 (1764); Clerck, Icones, pl. 40. fig. 5 (1764).

*Pieris evippe*, Godart, Enc. Méth. ix. p. 122. n. 10 (1819).

*Anthocharis evippe*, Lucas, Lep. Exot. pl. 37. fig. 1 (1835); Boisduval (part), Sp. Gén. Lép. i. p. 573. n. 20 (1836).

♂ ♀, Sierra Leone (*Foxcroft*).

B.M.

This is probably the rarer form of *T. arethusa*; the males of the two forms are almost identical.

9. *Wings white, the primaries of the male, and generally of the female, with broad carmine apical area; underside with a well-marked discal series of subocellate spots.*

99. TERACOLUS CINERESCENS.

*Teracolus cinerescens*, Butler, Cist. Ent. i. p. 172. n. 53 (1873).

*Anthocharis danae*, Trimen (*nec* Fabr.), Rhop. Afr. Austr. i. p. 44. n. 27 (1862); Hewitson, Gen. Diurn. Lep. pl. 7. fig. 3 (1847).

♂ ♀, Natal, S. Africa (*E. C. Buxton*); Caffraria.

B.M.

Var. *Anthocharis danaë*, Wallengren (*nec* Fabr.), Lep. Rhop. Caffr.

♂ ♀, S. Africa (*E. C. Buxton*).

B.M.

This variety has the basal area of the male less strongly suffused with grey, and the under surface of the secondaries of a creamy colour.

100. TERACOLUS EUPOMPE.

♂ ♀. *Pontia eupompe*, Klug, Symb. Phys. pl. 6. figs. 11-14 (1829).

*Anthocharis eupompe*, Boisduval, Sp. Gén. Léop. i. p. 571. n. 17 (1836).

*Callosune eupompe* (part), Kirby, Syn. Cat. p. 501. n. 13 (1871).

♀. *Papilio evippe*, Cramer (nec Linnæus), Pap. Exot. i. pl. 91. figs. D and E (1779).

*Anthopsyche theopompe*, Felder, Reise der Nov. Lep. ii. p. 183. n. 175 ("1865"); Hopffer, Stett. ent. Zeit. p. 432 (1869).

♂, White Nile (*Petherick*).

B.M.

I have examined both sexes of this species, taken by Mr. J. K. Lord at Akeek (island).

#### 101. TERACOLUS ANTEUPOMPE.

*Anthopsyche anteupompe*, Felder, Reise der Nov. Lep. ii. p. 184. n. 175 (1865).

*Callosune anteupompe*, Kirby, Syn. Cat. p. 501. n. 14 (1871).

Bogos.

#### 102. TERACOLUS ACASTE.

♀. *Pontia acaste*, Klug, Symb. Phys. pl. 7. figs 16, 17 (1829).

*Pieris polycaste*, Boisduval, Sp. Gén. Léop. i. p. 525. n. 127 (1836).

Ambukol.

I much doubt whether this female would not be better placed next to *T. halimede*, of which Klug says it may be a variety; it is, I should say, more probable that it is the female of *T. pleione* than a variety of *T. halimede*.

#### 103. TERACOLUS PSEUDACASTE, n. sp. (Plate VI. fig. 11.)

♂ *Anthocharis* (sic) *eupompe*, Lucas, Lep. Exot. pl. 36. fig. 4 (1835).

Underside like *T. cinerescens*, but without the blackish line across the cell of primaries or the orange costa to secondaries. Expanse 1 inch 9 lines.

♀. Very like Klug's figure of *T. acaste*, but larger and darker, the apical area of primaries greyish brown, crossed by a curved series of whitish lanceolate streaks, bounded on the inside by black spots. Wings below like the male of *T. cinerescens*. Expanse of wings 2 inches.

♂ ♀, White Nile (*Petherick*).

Type, B.M.

This species is a link between the *T. eupompe* and *halimede* groups.

#### 104. TERACOLUS DEDECORA.

*Anthocharis dedecora*, Felder, Reise der Nov. Lep. ii. p. 184. n. 177 ("1865").

*Callosune dedecora*, Kirby, Syn. Cat. p. 502. n. 15 (1871).

♂ ♀, Senegal.

B.M.

The female forms a link between the *T. eupompe* and *antevippe* groups. It is the *Anthocharis eupompe*, var., of Trimen (Rhop. Afr. Austr. p. 46), but it is ticketed "Seneg.," not S. Africa. The long description is taken from an Indian species, there being no African butterfly to which it will apply.

## 105. TERACOLUS WALLENGRENII, n. sp.

*Anthopsyche eupompe*, Wallengren (nec Klug), Lep. Rhop. Caffr.

This species has three varieties, differing chiefly in size; it is easily distinguished from *T. cinerescens* by the narrower black edging of the apical crimson or carmine patch of the male, the much more yellow apical patch of the female, the restriction of the grey colouring to the base of the wings, the small size of the marginal spots of secondaries, and the deep reddish buff colouring of the under surface of the secondaries and apex of primaries below. Expanse of wings, ♂ 1 inch 4 to 11 lines, ♀ 1 inch 5 to 9 lines.

N.E. of Natal (14 specimens, *E. C. Buxton*). Type, B.M.

This has, I suspect, been confounded with the Indian *T. danaë*; the latter, however, is more like *T. cinerescens*, its female having the aspect of a very dark form of *T. dedecora*.

## 106. TERACOLUS DANAË.

*Papilio danaë*, Fabricius, Syst. Ent. p. 476. n. 144 (1775); Donovan, Ins. Ind. pl. 26. fig. 2 (1800).

*Pieris danaë*, Godart, Enc. Méth. ix. p. 124. n. 20 (1819).

*Anthocharis danaë*, Boisduval, Sp. Gén. Léop. 1, p. 570. n. 16 (1836).

*Calosune danaë*, Kirby, Syn. Cat. p. 501. n. 12 (1871).

♂. *Papilio eborea* ♀, Cramer, Pap. Exot. iv. pl. 352. figs. E, F [not C, D], (1782).

♂, Ceylon (*Templeton*, B.M.); Madras, Kurnool, Bombay, Canara, Deccan; ♀, N.W. India (coll. F. Moore).

## 107. TERACOLUS DULCIS, n. sp. (Plate VII. fig. 13.)

♂. Smaller than *T. danaë*, the crimson apical patch narrower and with narrower internal black border; basal grey suffusion not so dark; black marginal spots of secondaries small, and consequently widely separated; wings below altogether paler than in *T. danaë*, the spots fewer and smaller; no black spots at external angle of primaries. Expanse of wings 1 inch 7 to 9 lines.

♀. Differs from the female of *T. danaë* in its altogether paler colour; with darker apical patch, restricted within the angulated transverse postmedian series of black spots, all the black spots much smaller, the marginal spots of secondaries well separated. Expanse of wings 1 inch 6 to 11 lines.

♂ ♀. Kattywur (coll. F. Moore); ♂, N. India (B.M.)

*Var.* The female paler at base of wings, with the disk of secondaries immaculate.

♂ ♀, Scinde.

Coll. F. Moore.

This species generally stands in Indian collections as the *T. eupompe* of Klug.

## 108. TERACOLUS DIRUS, n. sp. (Plate VII. fig. 11.)

♀. Allied to the preceding and to *T. pseudacaste*. Wings above white, the base broadly dark grey; an irregular series of black spots

through the centre of the disk, large and much interrupted in primaries, small, and terminating in the second median interspace in secondaries: primaries with a well-marked black spot at end of cell; apical area and outer border to external angle brown; the inner margin of apical area scarcely extending beyond the angulated upper portion of the discal series of black spots; a subapical curved series of cream-coloured hastate spots, slightly speckled with scarlet externally, and bounded by the black angulated series: secondaries with a brown border, paler at the internervular folds. Primaries below white, the base broadly sulphur yellow, the apical area pale buff; the four uppermost black spots annular, upon a diffused reddish ground, otherwise as above: secondaries pale buffy whitish; the discal spots of secondaries cordiform, carmine, varied with pearly whitish and black; a spot of the same colours at end of cell. Expanse of wings 2 inches 1 line.

Scinde.

Type, coll. F. Moore.

109. *TERACOLUS EBOREOIDES*, n. sp. (Plate VII. fig. 12.)

♂. Above very like Cramer's figure of male *T. eborea*, but blackish at the base; below very like *T. danaë*, but without the reddish tint round the subapical black spots. Expanse of wings 1 inch 11 lines.

♀. Wings above with the basal third brownish grey: primaries with the centre irregularly white; the apical third dark brown, crossed by four triangular orange spots, bounded internally by black spots; a black spot at the end of the cell; a second constricted spot on interno-median interspace and in the middle of the central white area, and a minute point near the external border; the apical area is deeply bisinuate towards external angle, and decreases in width to the angle: secondaries with a decreasing dark brown border from the apex to the anal angle, slightly intersected with whitish on the internervular folds; the area between the grey part and the outer border white; five black discal spots, and a spot at the end of the cell: wings below as in the male, but slightly deeper in colour. Expanse of wings 1 inch 6 lines.

♂ ♀, India (*W. B. Farr*).

Coll. F. Moore.

The above is a very well-marked species.

110. *TERACOLUS SANGUINALIS*, n. sp.

♂. Much like a small example of *T. danaë*, but the primaries more acuminate, the carmine patch rather brighter; the grey colouring confined to the extreme base and costa, not extending into the secondaries; the marginal spots of secondaries better separated and rather smaller. Apical area of primaries below redder; the angulated series of spots larger and redder; the spots upon the margin near external angle small and indistinct: secondaries white, slightly creamy, with the outer border very feebly ochraceous; the spots, which are arranged as in *T. danaë*, are greyish brown; the spot at end of cell reddish, with a narrow brown margin. Expanse of wings 1 inch 6 lines.

♀. Differs from the female of *T. danaë* in its smaller size, more

sulphur-tinted coloration, the regular and much paler basal grey suffusion, which is almost invisible on the secondaries, the much brighter apical carmine patch, the absence of the spot near external angle of primaries, the minute character of the discal spots of secondaries, and the better-defined and narrower outer border; primaries below with the apical area redder, the basal area yellower, and without a terminal grey streak crossing the cell; the black spots smaller: secondaries below distinctly ochraceous, with the discal spots reddish, irrorated with black and grey. Expanse of wings 1 inch 6 lines.

Ceylon (*Stevens*).

Type, B.M.

10. *Wings white, the primaries with the apex dark brown, with central orange patch, more or less separated into distinct spots in the female; underside with a more or less defined series of discal spots in secondaries.*

111. *TERACOLUS PERNOTATUS*, n. sp. (Plate VII. fig. 1.)

♂. White above, with the base pale grey: primaries with a black spot at end of cell; apical area orange, bordered with black-brown, the inner border tapering towards costa; the orange area divided into six parts by the nervures and narrowing to a point behind: secondaries with a black spot on costa and six on outer margin. Below white, the base sulphur-yellow; the cells terminated by black dots; primaries with the apical area greyish, with the orange patch of the upperside dimly visible and bounded externally by four or five almost united red-brown spots in an oblique series: secondaries with a discal arched series of small brown spots; very minute black spots terminating the nervures on outer margin. Expanse of wings 1 inch 6 lines.

♀. White, sometimes tinted with sulphur-yellow; the base pale grey: primaries with a black spot at end of cell; apical area black, with a central nearly straight series of five more or less defined orange spots, only separated by the nervures; three black spots in an oblique series below the median branches, the central one small, the lowest one bifid: secondaries with a curved series of discal spots, black at costa, but gradually fading away towards inner margin; a marginal series of six large spots. Wings below white, the basal area, apical area of primaries, and outer margin of secondaries bright sulphur-yellow; a black spot at the end of the cells, bordered with orange on the secondaries; primaries with an angulated discal series of seven blackish spots: secondaries with a curved discal series of seven sap-green spots; the abdominal and subcostal areas also sometimes irrorated with sap-green. Expanse of wings 1 inch 7 lines.

♂ ♀, Punjab (coll. F. Moore); ♀, Punjab (B.M.).

This species is distinguished by the broad apical patch of the male; the pale grey basal third of the wings, the greyish apical patch below, and the curved discal series of secondaries below.

112. *TERACOLUS FARRINUS*, n. sp. (Plate VII. fig. 2.)

♂. Distinguished from the preceding by the wider apical area

with narrower orange patch, the basal grey scaling darkest on costa, and of a bluish colour; the apical area below lemon-yellow, the spots on its internal border squamose: secondaries above with larger marginal spots; below with the discal spots less strongly defined, and the base not yellow as in the primaries. Expanse of wings 1 inch 8 lines.

♀. Distinguished by the dark brownish grey scaling over basal third, the larger and better-defined black spots, especially those on the disk of secondaries; the under surface of secondaries clouded with greyish. Expanse of wings 1 inch 7 lines.

♂, Kussowlie, N.W. Himalayas; ♂ ♀, India (*Farr*).

Coll. F. Moore.

This species must have been mixed up with Dr. Boisduval's examples of *T. etrida*, since his description of the female agrees with this form alone; it can never, I think, have come from Madras or Pegu.

### 113. TERACOLUS PURUS, n. sp. (Plate VII. figs. 14, 15.)

♂. Distinguished from *T. pernotatus* by its purer white coloration, the base in the male scarcely visibly tinted with grey, but in the female as in the above-mentioned species; the apical area almost black, with a narrow regular slightly curved band of five orange spots; only the uppermost and lowermost of the three discal spots visible in the female, and the three uppermost of the discal series of secondaries; black marginal spots of secondaries better defined, rounded: wings below with the base and apex of primaries sulphur-yellow; the female with the whole of the secondaries, excepting the discoidal interspace, more or less tinted with the same colour; only the two uppermost of the discal spots in the secondaries of the male below visible; in the female they are all present, but smaller. Expanse of wings, ♂ 1 inch 3 to 6 lines, ♀ 1 inch 6 to 8 lines.

♂ ♀, Punjab (type, B.M.); ♂ ♀, Punjab (coll. F. Moore).

We have what I believe to be this species also, marked "India;" but the examples are in bad condition.

### 114. TERACOLUS ETRIDA.

♂. *Anthocharis etrida* (part), Boisduval, Sp. Gén. Lép. i. p. 576. n. 24 (1836).

♀. Like the female of *T. purus*, but rather larger, with the apex more rounded, the primaries above yellowish, the costal and discoidal areas of primaries and outer margin of secondaries below distinctly sulphur-yellow. Expanse of wings 1 inch 7 lines.

♂ ♀, Scinde; ♀, Masuri (*Grote*); ♂, Canara (typical form).

Coll. F. Moore.

The male has the orange patch broad at costa and tapering to near the second median branch; but it is more readily recognized by the coloration of the under surface of the secondaries, which is white, with yellow diffused outer border; a small black dot at end of cell, and two subcostal pale brown spots near apex: the Canara example has the basicostal area of primaries above darker than in the specimens from Scinde; but in other respects it agrees with them

very fairly : the female from Masuri more nearly resembles the male, the spots below being very pale.

115. *TERACOLUS LIMBATUS*, n. sp.

♂. Wings above white : the primaries with the extreme base and the costa dark grey ; an elongate triangular apical patch from costa to external angle, enclosing a slightly curved tapering orange patch, separated into six parts by the nervures ; a minute black dot at end of cell : secondaries with the outer margin bordered by a sinuated brown band. Wings below white, with a black dot at the end of each discoidal cell ; the cell of primaries and the apical area sulphur-yellow ; a subapical oblique brownish streak tapering towards the costa ; apical margin greenish grey. Expanse of wings 1 inch 5 lines.

Ceylon (*Templeton*).

Type, B.M.

This is the most distinct-looking of the local forms of *T. etrida* ; it probably ranges to Madras ; for Boisduval says (in his description of *T. etrida*), "Ailes inférieures avec le bord entrecoupé de points noirs, assez gros, isolés ou réunis en une bande crénelée."

116. *TERACOLUS CASIMIRUS*, n. sp. (Plate VII. fig. 5.)

♂. Wings above white, the base grey, more extended in primaries than in secondaries ; primaries rounded at apex ; the apical area from costa to first median branch black-brown, enclosing a slightly curved orange band, at the end of which is a minute dot of the same colour, the band is divided by the nervures into five parts ; a black dot at the end of the cell : secondaries with four large marginal dark brown spots, and a minute dot of the same colour ; a subapical costal ill-defined brown litura. Primaries below white, the basal two thirds of the cell sulphur-yellow ; apical area pale ochre-yellow, bounded internally by an oblique greyish streak ; a black dot at the end of the cell : secondaries sandy whitish, irrorated with brown ; an arched macular brownish streak from costa to interno-median area (interrupted, as usual, on the discoidal interspace) ; a black and yellow dot at the end of the cell ; outer border yellowish, irrorated with brown atoms. Expanse of wings 1 inch 7 lines.

Bimbur, Cashmere (*Capt. Reed*).

Coll. F. Moore.

117. *TERACOLUS BIMBURA*, Moore. (Plate VII. figs. 3, 4.)

♂. Wings above white, greyish at base : primaries with a triangular orange patch at apex, narrowly bordered with black-brown, the outer border sinuated ; a minute black dot at end of cell : secondaries with four marginal black dots. Primaries below white, the basal three fifths of discoidal cell sulphur-yellow ; apical area greyish stramineous externally, sulphur-yellow internally, bounded within by a well-defined oblique greenish grey bar ; a black dot at the end of the cell : secondaries sandy whitish, basal three fifths densely irrorated with brown, interrupted through the cell and discoidal interspace by a whitish streak, and bounded externally by squamose brown spots ; outer border somewhat yellowish ; a black and yellow dot at the end of the cell. Expanse of wings 1 inch to 1 inch 7 lines.

♀. Apex of primaries above black-brown, crossed by a curved band of five orange divisions, the last of which touches the ground-colour; a black dot on second median interspace; otherwise as in the male. Primaries below with the apical area pale ochraceous, bounded internally by an oblique series of four brown spots, a similar spot at centre of second median interspace, and a second on interno-median interspace touching the first median branch: secondaries sandy throughout, irrorated with brown; discal spots brown; otherwise as in the male. Expanse of wings 1 inch 4 lines.

♂ ♀, Bimbur, Cashmere (*Capt. Reed*); ♂, Bombay (coll. F. Moore); ♂ ♀, N. India (B.M.).

This is a very distinct species, easily recognized by the coloration of the under surface: the examples from Bombay vary much in expanse, the typical male from Bimbur being intermediate and of the same size as the female.

11. *Wings white or sulphur-yellow, the primaries with the apical area broadly golden-orange, bordered externally in the male with black; in the female it is interrupted by an irregular black transverse bar, sometimes separated into distinct spots; in two or three species the males have a few scattered black scales along the inner border of the orange.*

118. TERACOLUS EVAGORE.

*Pontia evagore*, Klug, Symb. Phys. pl. 8. figs. 5, 6 (1829).

*Anthocharis evagore*, Boisduval, Sp. Gén. Léop. i. p. 579. n. 30 (1836).

*Callosune evagore*, Kirby, Syn. Cat. p. 503. n. 36 (1871).

*Anthocharis heuglini*, Felder, Wien. ent. Monatschr. iii. p. 272. n. 20 (1859).

*Anthopsyche heuglini*, Felder, Reise der Nov. Lep. ii. pl. 25. fig. 4 ("1865").

♂, White Nile (*Petherick*).

B.M.

119. TERACOLUS DEMAGORE.

*Anthopsyche demagore*, Felder, Reise der Nov. Lep. ii. p. 186. n. 179 ("1865").

*Callosune demagore*, Kirby, Syn. Cat. p. 503. n. 37 (1871).

♀, White Nile (*Petherick*).

B.M.

120. TERACOLUS CITREUS, n. sp.

♂. Primaries above whitish at base, becoming more and more distinctly sulphur-yellow to beyond the middle; apical area bright golden-orange, with a linear black marginal border: secondaries white, with the outer margin narrowly sulphur-yellow, diffused. Primaries below pale sulphur-yellow, the apical area lemon-yellow, deepest at the margins; three decreasing brown spots placed obliquely between the subcostal branches: secondaries fleshy pink, changing to pale yellow externally, reticulated with brown; several brownish spots beyond the middle; a black dot at end of cell. Expanse of wings 1 inch 4 to 6 lines.

♀. Above like *T. evarne* female, but the black markings more restricted. Primaries below pale yellow, whitish towards external angle; apical area ochraceous, reticulated with grey; blackish spots as above: secondaries pale flesh-colour, yellowish on outer margin, reticulated with dark brown, an arched series of discal yellowish spots crossed by blackish *litræ*; a black-edged white spot at the end of the cell. Expanse of wings 1 inch 6 lines.

♂ ♀, Hor Tamanib (*J. K. Lord*) = *T. evarne* of Walker (nec *Klug*); ♀, White Nile (*Petherick*). B.M.

121. TERACOLUS KEISKAMMA.

*Anthocharis keiskamma*, Trimen, Rhop. Afr. Austr. p. 56. n. 37, pl. 2. figs. 3, 4 (1862-66).

♂ ♀, Keiskamma river (*Trimen*); ♂, S. Africa. B.M.

122. TERACOLUS TOPHA.

*Anthopsyche topha*, Wallengren, Lep. Rhop. Caffr. p. 15 (1857).

♂ ♀, S. Africa. B.M.

This species is intermediate between *T. keiskamma* and *T. auxo*.

123. TERACOLUS XANTHEVARNE, n. sp.

*Anthocharis evarne*, Lucas (nec *Klug*), Lep. Exot. pl. 37. fig. 3 (1835).

♂. Wings above sulphur-yellow, the primaries brightest in colour, with the apical area broadly golden-orange, with rather a narrow sinuated black border from the middle of costa to the first median branch; costa grey: secondaries with small black spots at the ends of the nervures. Wings below lemon-yellow; the primaries sulphur-yellow towards the base; two subapical brownish dots between the subcostal branches: secondaries with a black dot at end of cell. Expanse of wings 1 inch 8 lines.

White Nile (*Petherick*). Type, B.M.

I have also examined a male taken by Mr. Lord at Harkeko.

124. TERACOLUS SYRTINUS, n. sp.

♂. Wings above much as in the preceding species, but the costa blackish brown from base to apex, and the inner edge of the orange patch sprinkled with blackish scales; wings below sulphur-yellow, the apical area lemon-yellow, a minute blackish dot at end of cell in secondaries. Expanse of wings 1 inch 9 lines.

Senegal. Type, B.M.

Intermediate in character between the preceding and *T. auxo*.

125. TERACOLUS AUXO.

*Anthocharis auxo*, Lucas, Rev. Zool. p. 422 (1852).

*Callosune auxo*, Kirby, Syn. Cat. p. 501. n. 11 (1871).

♂ ♀, Natal. B.M.

This is probably the *A. evarne* of Trimen.

## 126. TERACOLUS EVARNE.

*Pontia evarne*, Klug, Symb. Phys. pl. 6. figs. 1-4 (1829).

*Anthocharis evarne*, Boisduval, Sp. Gén. Lép. i. p. 569. n. 15 (1836).

*Callosune evarne* (part), Kirby, Syn. Cat. p. 501. n. 10 (1871).  
Ambukol.

I have never had an opportunity of seeing a genuine *T. evarne*; it is evidently a white-winged species. Entomologists almost invariably represent it in their collections by examples of one or other of the species allied to *T. keiskamma*.

## 127. TERACOLUS EUCHARIS.

♂. *Papilio eucharis*, Fabricius, Syst. Ent. p. 472. n. 127 (1775).

♂ ♀. *Euchloë eucharis*, Butler, Fabr. Cat. p. 215. n. 5 (1869).

*Callosune eucharis*, Kirby, Syn. Cat. p. 500. n. 9 (1871).

*Papilio aurora*, Cramer, Pap. Exot. iv. pl. 299. figs. A-D (1782).

*Pieris titea*, Godart, Enc. Méth. ix. p. 124. n. 21 (1819).

*Pontia titea*, Horsfield, Cat. Lep. E.I. C. p. 141. n. 69 (1829).

♂ ♀, Ceylon (*Templeton*).

B.M.

Mr. Moore has a female from the Deccan.

## 128. TERACOLUS PSEUDEVANTHE, n. sp. (Plate VII. fig. 16.)

♂. Above like *T. eucharis*, but larger; the outer black border beginning at apical three fifths of costa, continued round the outer margin as a rather wide sinuated band to near external angle, and throwing up an irregular projection across the end of first and the middle of the second median interspace; edge of costa and base sprinkled with brown scales: secondaries with four marginal brown dots. Primaries below sordid white, the base sulphur-yellow; apical area lemon-yellow; the outer margin orange, with black dots at the end of the nervures; a transverse sigmoidal postmedian subapical ferruginous streak: secondaries sandy white; a transverse subapical ferruginous dash; an interno-discal transverse macular streak of ochreous speckled with brown; a black-and-yellow dot at end of cell. Expanse of wings 1 inch 11 lines.

♀. Above white, base grey; apical area irregularly black-brown, crossed by four cuneiform orange or white spots; a black dot at end of cell, and a black interno-median spot towards external angle: secondaries with an oblique Z-shaped costal black marking near apex; five large black-brown marginal spots. Primaries below white, with the base sulphur-yellow; apical area sulphur-yellow, becoming ochreous externally, and crossed by a macular brown streak, ending in a black spot; a black spot on interno-median interspace, and a black dot at end of cell; black marginal dots as in the male: secondaries sordid white, reticulated with sap-green; two streaks of the same colour answering to those on the secondaries of the male; outer margin yellow, spotted with sap-green. Expanse of wings 1 inch 9 lines.

♂, India (B.M.); ♂ ♀, Bombay (7 examples), coll. F. Moore.





E.A.Schäfer del

J.Smit lith.

STOMACH OF *MACRUPUS GIGANTEUS*.

M&NHanhart imp



Fig. 1

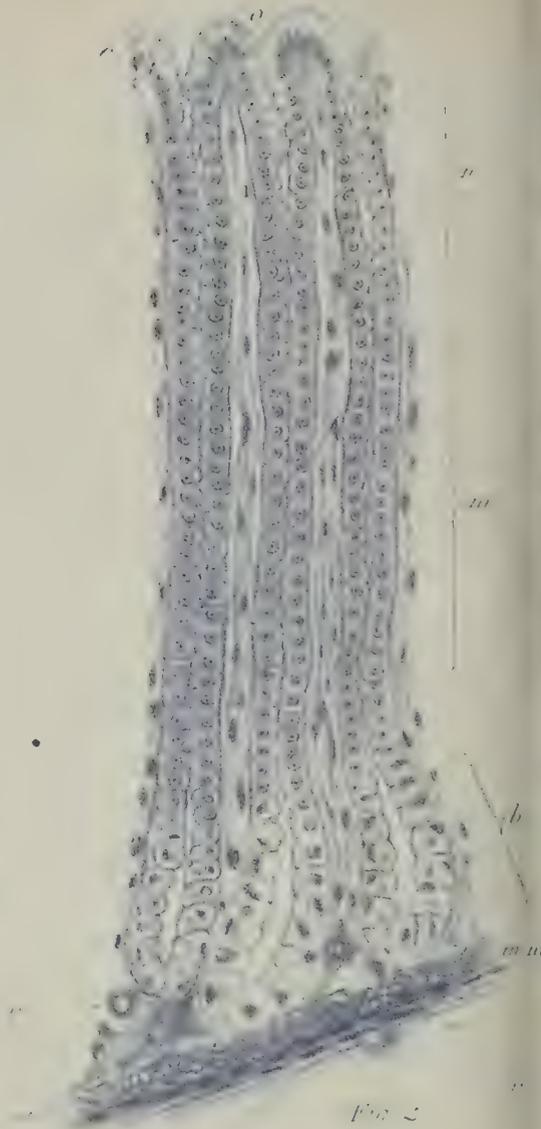
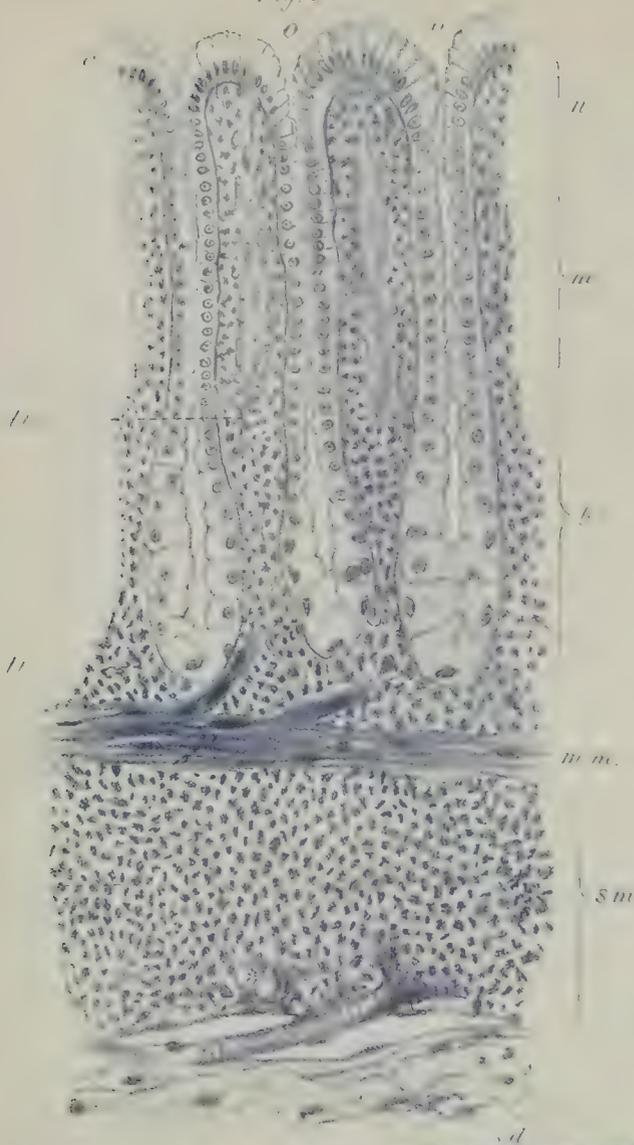


Fig. 2

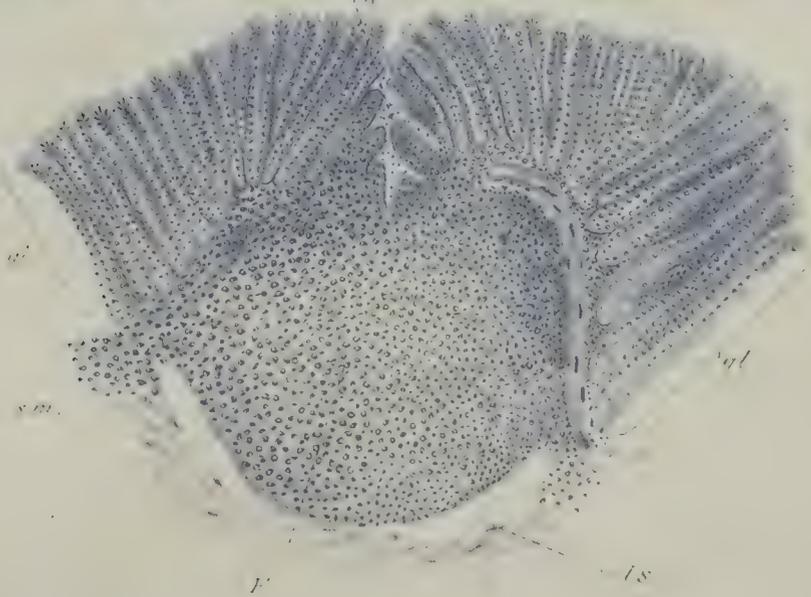


Fig. 4.

E.A. Schafer et D.J. Williams del.

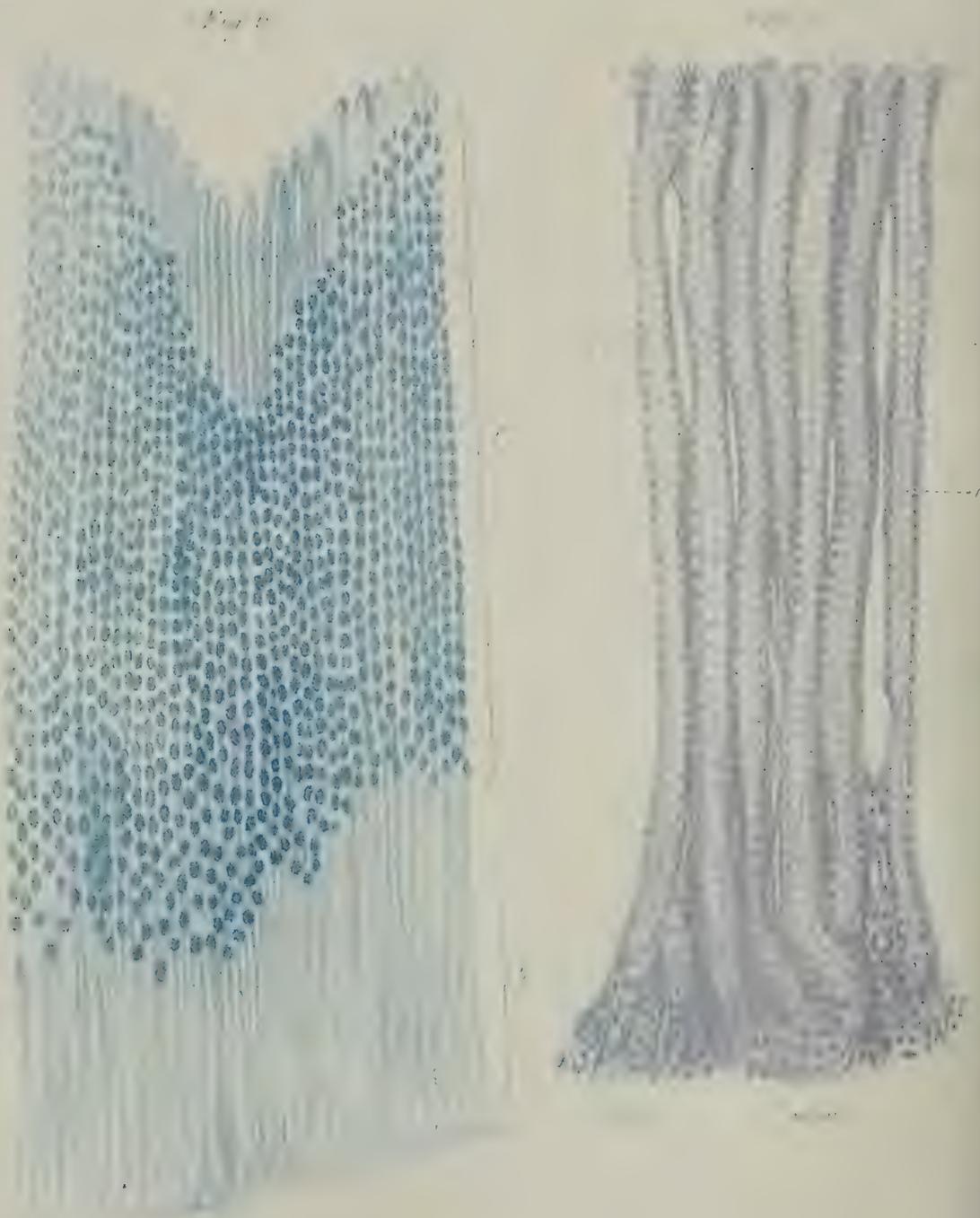
J. Smith. lith.

Figs. 2 & 3 STOMACH OF MACROPUS GIGANTEUS.

Fig 4 STOMACH OF DORCOPSIS LUCTUOSA.

M&N Hanhart imp.





E. Schafer et D.J. Williams del.

J. Smit lith.

*Fig. 5.* STOMACH OF MACROPUS GIGANTEUS.  
*Fig. 6.* STOMACH OF DORCOPSIS LUCTUOSA.



Fig. 9



Fig. 1

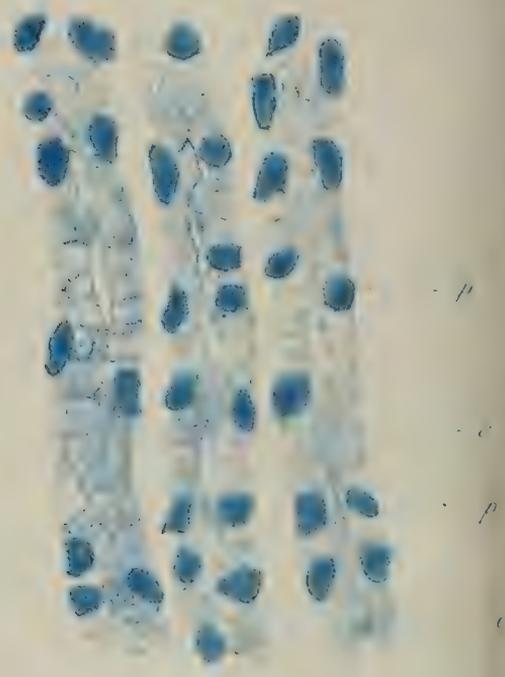
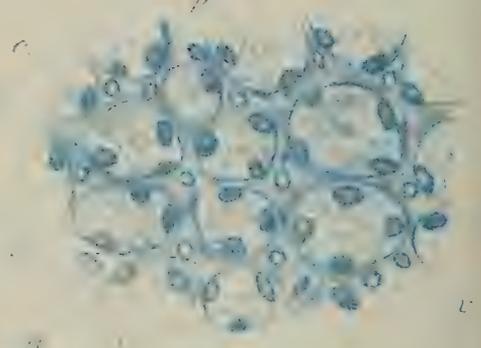


Fig. 10



Fig. 8



E.A. Schafer et D.J. Williams, del.

T. M. H. E.

STOMACH OF DORCOPSIS LUCTUOSA.

M & N Harbart, trap.

The greater size, apical coloration, and markings of the under-surface readily distinguish this species from *T. eucharis*.

12. *Wings of the male with the orange patch narrow, not yellowish, only touching the ground-colour opposite to the end of discoidal cell; apex of primaries below grey-speckled; secondaries creamy whitish, reticulated with brownish green.*

129. TERACOLUS EVANTHE.

*Anthocharis evanthe*, Boisduval, Sp. Gén. Léop. i. p. 567. n. 13 (1836).

*Callosune evanthe*, Kirby, Syn. Cat. p. 500. n. 8 (1871).

S. Africa.

B.M.

*Pieris doxo* of Godart is probably a *Synchloë* allied to *S. suasa*; *Pontia eulimene*, Klug, is an *Ixias*; and *Anthocharis phænon*, Trimen, is described as allied to the latter, therefore probably belongs to the same genus.

EXPLANATION OF THE PLATES.

PLATE VI.

- |   |  |
|---|--|
| Fig. 1. <i>Teracolus flaminia</i> , p. 140. | Fig. 7. <i>Teracolus ithonus</i> , p. 146. |
| 2. — <i>lyceus</i> , p. 141.                | 8. — <i>halyattes</i> , p. 145.            |
| 3. — <i>subfumosus</i> , p. 139.            | 9. — <i>pseudocale</i> , p. 154.           |
| 4. — <i>lucullus</i> , p. 143.              | 10. — <i>suffusus</i> , p. 152.            |
| 5. — <i>friga</i> , p. 142.                 | 11. — <i>pseudacaste</i> , p. 156.         |
| 6. — <i>lycoris</i> , p. 140.               | 12. — <i>hero</i> , p. 150.                |

PLATE VII.

- |   |  |
|---|--|
| Fig. 1. <i>Teracolus pernotatus</i> , p. 159. | Fig. 10. <i>Teracolus vestalis</i> , p. 135. |
| 2. — <i>farrinus</i> , p. 159.                | 11. — <i>dirus</i> , p. 157.                 |
| 3, 4. — <i>bimbura</i> , p. 161.              | 12. — <i>eborcoides</i> , p. 158.            |
| 5. — <i>casimirus</i> , p. 161.               | 13. — <i>dulcis</i> , p. 157.                |
| 6. — <i>rosaceus</i> , p. 134.                | 14, 15. — <i>purus</i> , p. 160.             |
| 7. — <i>oriens</i> , p. 134.                  | 16. — <i>pseudevanthe</i> , p. 164.          |
| 8, 9. — <i>carnifer</i> , p. 138.             |  |

9. On the Structure of the Mucous Membrane of the Stomach in the Kangaroos. By EDWARD A. SCHÄFER, Assistant-Professor of Physiology, and D. JAMES WILLIAMS, Student of Medicine, in University College, London. (Communicated by A. H. GARROD, M.A., F.Z.S., Prosecutor to the Society.)

[Received December 17, 1875.]

(Plates VIII.—XI.)

The observations here recorded have been made upon the stomachs of two Kangaroos belonging to distinct genera. One was that of the great Kangaroo, *Macropus giganteus*; the other of *Dorcopsis luctuosa*, a specimen of which died some months back in the

gardens of the Society. This latter has been described (P. Z. S. 1875, p. 48) by Prof. A. H. Garrod, the Prosector to the Society, to whom we are indebted for the opportunity of examining the organ in question in these animals. Our original object was simply to record in general terms the differences in microscopic structure presented by those parts of the membrane which have a different appearance to the naked eye; but since, in spite of recent researches, our knowledge of the minute structure of the gastric mucous membrane is still confessedly imperfect, it became obvious that it would be necessary to enter upon a minute examination of the several parts; especially as they present very well-marked differences, and, in some cases, peculiarities of structure which tend to elucidate points yet in dispute with regard to the gastric mucous membrane of the higher Mammalia and of Man.

As is well known, the stomach is, in the Kangaroo, a long sacculated organ not unlike the human colon; and the sacculations, as in that, are due to the presence of three longitudinal bands of plain muscular fibre, situate on the exterior underneath the serous membrane and shorter than the rest of the gastric wall, so that this is bulged out at intervals into sacculi separated by constrictions or inward folds of the membranous wall. One of the three bands is placed below along the greater curvature; and it is on either side of this that the sacculi are most marked; there are none at the lesser curvature, nor is the pyloric extremity sacculated at any part of its circumference. Besides the inwardly projecting folds between the sacculi, and which involve all the coats of the stomach, the mucous membrane shows the rugæ ordinarily met with in a stomach not completely distended, and produced by contraction of the muscular coat. There are also in certain parts more minute folds, which would, no doubt, be effaced by complete distention of the organ, and which are probably due to a similar contraction of the muscular layer of the mucous membrane (*muscularis mucosæ*).

In the diagrams of the two stomachs which are here given, and in the accompanying general description, they are for convenience' sake treated as if they were more or less straight organs extending across the body from left to right as in the human subject, whereas in reality they are twisted upon themselves. A detailed description of the form of the marsupial stomach and its relations to other parts is, of course, foreign to the subject of the present paper, and must be sought for in recognized treatises on comparative anatomy\*.

\* The following are the dimensions of the organs as they appear after preservation in spirit:—

	<i>Dorcopsis</i>		<i>Macropus</i>	
	<i>luctuosa.</i>		<i>giganteus.</i>	
	ft.	in.	ft.	in.
Length along lesser curvature.....	1	0	1	8
Length along greater curvature, the sacculations not being taken into account .....	1	7	2	5
Length along greater curvature, reckoning in the sacculations .....	2	10	5	0
Greatest circular measurement .....	0	7	0	7

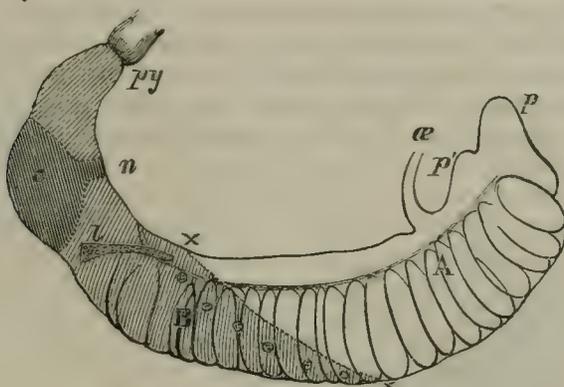
In both cases the stomachs were filled with partially digested food.

*Obvious characters of the Mucous Membrane.*

With the unassisted eye three distinct regions can be detected in the stomachs of both animals, the mucous membrane presenting well-marked differences in feel, appearance, and, as will be presently seen, in microscopic structure. For the most part they are marked off from each other by distinct lines of demarcation; these, however, are more obvious between the first and second regions than between the second and third, although, in the latter case also, especially in *Dorcopsis*, the distinction can be made out even with the naked eye.

In the two species examined these three regions have somewhat different distributions, as is indicated in the accompanying diagrams. Thus, in *Dorcopsis* (Diagram 1) the first or cardiac region (A), which

Diagram 1.

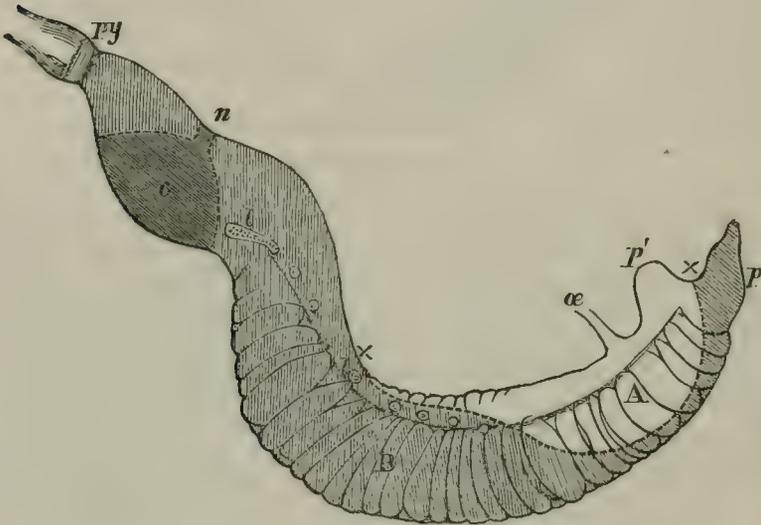
Stomach of *Dorcopsis luctuosa*.

is covered with an epithelium obviously continuous with and similar to that of the gullet, occupies more than a third of the inner surface of the organ, lining the whole of the cardiac fundus, and terminating towards the middle of the stomach by a well-marked line of demarcation (X), which extends from the lesser curvature obliquely downwards and to the left along the anterior and posterior walls to end in the greater curvature about opposite to the opening of the gullet, or a little to the right of that point. Commencing on either side of the cardia two parallel ridges or folds of the mucous membrane (not represented in the diagram) pass for about 3 inches along the lesser curvature, depending into the cavity of the organ. They are little more than half an inch apart, and not quite half an inch in depth; they become less prominent and gradually subside towards their termination. They bring to mind the ridges which are found in a somewhat similar situation in the Ruminant stomach, but they are by no means so strongly muscular. The second region (B) commences at the oblique line above traced out, which separates it from the first or cardiac region, and extends from here to the left, as far as the pylorus, comprehending all the rest of the inner surface of the organ except a circular patch (C) about  $2\frac{1}{2}$  inches in diameter, which occupies the

pyloric fundus. This patch is distinguishable to the unaided eye chiefly by its greater thickness, smoother surface, and by a slight furrowed line which partly encloses it. It shows under the microscope glands differing in character from those of the surrounding region, and is therefore here described as a *third* region of the mucous membrane. But this third region is not entirely confined to the circular patch; for a narrow tract of mucous membrane (*n*) containing similar glands extends from the upper limit of the patch on either side to meet its fellow above at the lesser curvature, thus completing an irregular zone around this part of the stomach.

In *Macropus giganteus* the epithelium of the first region (Diagram 2, A) has a much more limited distribution than in *Dorcopsis*. The tract which it covers is widest in the neighbourhood of the gullet, whence it passes over the front and back of the stomach. Even here it does not extend as far down as the greater curvature; so that the two parts do not meet below. Moreover the left end of the stomach, which terminates in a pouch-like projection (*p*), is not lined by this epithelium, although a second smaller pouch (*p'*), directed upwards and situated nearer the gullet than the first one, receives a lining from it. Both these pouch-like projections are

Diagram 2.

Stomach of *Macropus giganteus*.

present also in *Dorcopsis luctuosa*; but they are both lined with hard epithelium like that of the rest of the cardiac fundus in this animal. Anteriorly the hard epithelium gradually narrows in *Macropus giganteus* until it becomes reduced to a mere strip along the lesser curvature, and eventually ceases altogether about halfway between the two extremities of the stomach. The ridges of mucous membrane which extend towards the right from either side of the cardiac

orifice are only slightly marked in the stomach of *Macropus*. The second region (B) has a greater extent in *Macropus giganteus* than in *Dorcopsis*. It occupies all the rest of the inner surface of the stomach except (as in *Dorcopsis*) a circular patch (C) about 3 inches in diameter, situate at the pyloric fundus, and not marked off from the rest by any well-defined naked-eye appearances except the great thickness of the mucous membrane. But microscopical examination shows that the glands of this patch present material differences from those of the rest of the stomach, whilst resembling those of the corresponding part of the *Dorcopsis* stomach; so that this patch is to be taken as representing the third region in *Macropus* also. The tract *n*, moreover, which passes in *Dorcopsis* over the upper part of the stomach in this place, is also represented in *Macropus*. The second region may be said to commence at the extreme end of the cardiac fundus, where its mucous membrane lines the pouch (*p*) above referred to as not being covered by the hard gullet-epithelium; from here it passes to the right, along the greater curvature of the stomach, gradually narrowing at first, so that opposite the œsophagus it forms a strip only about  $\frac{3}{4}$  of an inch wide, bounded on either side by the epithelium of the first region, but subsequently becoming gradually wider until it extends continuously round the organ.

In both animals the mucous membrane of the second region has here and there insular elevations flattened on the surface and beset all over with small rounded eminences, each with a little pit at its summit as if made with the point of a pin. These elevated patches vary in size, but seem to have a fairly regular distribution (Diagrams 1 and 2, *l*, *l*). Thus in both animals there is a large triangular patch on each wall of the stomach, the base of which is close to the third region of the mucous membrane, while the apex of the triangle extends upwards and to the left towards the lesser curvature. From near the apex a chain of smaller and more circular patches is continued for some distance parallel to the line of demarcation between the first and second regions—in *Dorcopsis*, in fact, as far as the second region extends. As the result of microscopical examination clearly shows, these elevations are owing to accumulations of lymphoid tissue in and beneath the mucous membrane; and they may therefore be termed “lymphoid patches.” They are in many respects analogous to Peyer’s patches of the small intestine.

#### *Microscopical Characters of the Mucous Membrane.*

The results of the microscopical examination of the several regions correspond for the most part in both animals (as might indeed have been expected in genera so closely allied); so that the same description will apply to both. We shall afterwards take the opportunity of pointing out any special peculiarity which may obtain in either. The figures, which have been taken indiscriminately, some from the one animal and some from the other, will, for the most part, serve to illustrate the structure of the corresponding parts in both.

*The Mucous Membrane of the First Region.*—This is covered with a coating of dense stratified epithelium (Plate VIII. fig. 1, *S*) con-

tinuous with that of the gullet, and resembling it in all respects. It is harsh to the feel, and in this respect contrasts strongly with the soft mucous membrane of the second and third regions. It is unnecessary to enter into details of structure as regards this epithelium, since it resembles others of its class, the lowermost cells (*c'*) being rounded or somewhat columnar, the layers above these composed of polyhedral elements with dentated or ridged surfaces, and those above these again swollen and enlarged; finally, most superficial of all are several strata of flattened scaly cells forming a horny layer (*h*) distinguished, both by its somewhat fibrous appearance in section and by its different reactions to staining fluids, from the Malpighian layer or layers upon which it rests. Here and there one or two lymphoid corpuscles are to be seen in between the deeper epithelium-cells. A few papillæ of the mucous membrane project into the deeper parts of the epithelium; but neither an inspection of sections that were made from different parts, nor a careful examination of the surface, could detect any racemose or tubular glands of any sort in the region covered by this epithelium. At the line of demarcation separating it from the glandular portion of the stomach, the surface of the mucous membrane undergoes an abrupt change, perceptible as easily by the unassisted eye and hand as with the aid of the microscope. The manner in which the change takes place is represented in the figure, but will be more readily understood after the structure of the succeeding portion of the stomach has been described. It is sufficient here to mention that all the layers of cells of which the stratified epithelium is composed cease abruptly, with the exception of the deepest layer; this, on the contrary, becomes directly continued into the simple layer of columnar epithelium which covers the whole of the glandular portion, and which sends prolongations into the mouths of the glands.

*The Mucous Membrane of the Second Region.*—This region and the remaining one include the whole of the glandular portion of the organ. The mucous membrane is soft to the feel and of considerable thickness; and its surface is closely dotted with the orifices of the tubular glands (Plate IX. fig. 2), which are densely arranged and pass either vertically or somewhat obliquely through the whole thickness of the membrane (which may, indeed, be stated to be in a large measure composed of them) as far as the muscularis mucosæ (*m. m.*), which, as in man, limits the mucous membrane and separates it from the submucous areolar tissue. Each gland-tube is bounded (or rather may be said to be formed) by a delicate basement membrane, appearing in section as a mere line outside the epithelium of the gland. The tubes are cylindrical for the greater part of their length, but are somewhat enlarged towards the orifice, and also usually swollen out at the bottom (*b*). The surface of the mucous membrane between the orifices of the tubular glands is, as usual, covered by a single layer of characteristic columnar epithelium-cells (*c*), with the attached ends tapering, apparently designed, like the bricks in an arch, to accommodate themselves to the rounded surface to which they are attached; and this epithelium is con-

tinued also into the openings themselves. Tracing it further into the gland, we find the cells, still columnar, less tapering at their fixed extremities; and, moreover, while in the mouths of the glands, as on the general surface, they stand vertical to the basement membrane with their free ends on the same level, in the throat of the glands, on the other hand, they slant upwards, so that they more or less overlap one another (fig. 2, *n*). Further downwards in the tube the cells become gradually shorter, so as to appear quadrangular or cubical in form; at the same time the lumen of the tube becomes much narrowed, and, indeed, in vertical sections of the mucous membrane is in some parts hardly perceptible. These shortly columnar or cubical epithelium-cells occupy the greater part of the length of the tube (*m*). They have each a very distinct round or oval nucleus with one or two nucleoli; and the protoplasm of the cell, which is granular in appearance, becomes stained by logwood, although not nearly so intensely as the nucleus.

Towards the fundus (*b*) of the gland the cells undergo a change. They become gradually larger, and rounded or polyhedral in shape; their outlines become more distinct; and the substance of the cell acquires a clear or very faintly granular aspect, and, moreover, becomes hardly at all stained by logwood. Further, the nuclei, for the most part, have not their usual characteristic vesicular appearance, but in most of the cells (which line, and in some cases almost fill, the fundus) appear as intensely stained, shrunken or compressed bodies, usually situated excentrically in the cell, and not frequently flattened up against the basement membrane. In short, the appearance of these polyhedral cells of the fundus of the gland brings strongly to mind the cells which occupy the alveoli of the salivary gland (submaxillary); and it is not impossible that the clear, swollen-out aspect they present may be due to a cause similar to that to which the salivary cells are believed to owe their characteristic appearance, the presence, namely, within the cells at the time of death of mucus or some similar substance, which swells up on the addition of fluid. Or it may be that the protoplasm of these lowermost cells is younger and less changed than that of the other cells of the gland, and consequently that they are more readily acted upon by reagents, or by the secretion of the gland itself after death, than the rest. At any rate there seems a close analogy between the structure of the deeper parts of these tubular glands and the alveoli of the compound racemose glands. At the same time it must be remembered that some of the latter class of glands, the pancreas for example, do not exhibit the clear, swollen-out cells with excentrically placed nuclei, but their alveolar walls resemble more, on the contrary, the cubical cells of the middle parts of the tubular glands above described; and it is worthy of note that in some parts of the second region of the Kangaroo stomach, those for instance in the neighbourhood of the pylorus, the tubular glands, which are here very long, are lined in the deeper as well as in the middle parts, by cubical or shortly columnar cells which are similar throughout.

The substance of the mucous membrane between the tubular

glands of the second region is in most parts composed of delicate connective tissue with numerous corpuscles, supporting the blood-vessels. Here and there well-defined cleft-like spaces are seen in the sections. These, no doubt, represent the lymphatics which are now known to be so numerous in the gastric mucous membrane\*. They are particularly large and well marked in the neighbourhood of the pylorus (fig. 5).

In some places the interglandular tissue contains a considerable number of lymphoid cells; but this is more particularly the case in the neighbourhood of the lymphoid patches, to the description of which we shall immediately come. Moreover a certain amount of lymphoid tissue may intervene between the bases of the glands and the muscularis mucosæ. This last-named layer consists in most parts of two strata of muscular fibre-cells which cross one another, the inner being circular, the outer longitudinal in direction. From the more superficial or inner stratum bundles of fibre-cells pass up here and there between the glands, towards the surface; but it has not been easy to trace their ultimate destination. Probably they become eventually attached to the basement membrane.

*Structure of Lymphoid Patches.*—These localized elevations or thickenings differ from the rest of the mucous membrane of the second region in the fact that both mucosa and submucosa are largely formed by lymphoid tissue, *i. e.* lymph corpuscles supported by a fine retiform tissue. This (fig. 3) extends in the mucosa towards the surface of the membrane between the glands, and is also found as a distinct stratum at their base. In the submucosa it forms a layer of some thickness immediately underneath the muscularis mucosæ. The lymphoid tissue does not form a uniform layer, but is gathered at intervals into well-marked nodules or follicles (fig. 4), which cause the small rounded elevations already noticed on the surface of the lymphoid patch. Each of these elevations is, it will be remembered, marked with a small central pit (*d*). At the bottom of this the tubular glands fail, and the summit of the follicle is separated from the free surface merely by the layer of columnar epithelium, which itself contains numerous lymph corpuscles between the columnar cells; and these are also to be noticed free within the depression, as if they had emigrated from the subjacent lymphoid nodule. Indeed it may be doubted whether in some instances the covering of epithelium over the summit of the nodule may not be altogether absent; some of the sections obtained appear to show this; but it is possible that it may have become accidentally detached. Below the lymphoid layer of the submucosa is the ordinary connective tissue of that tunic (*s. m*) supporting the larger blood-vessels, nerves, and lymphatics; and at the base of each follicular accumulation there is commonly (as shown in fig. 3) a large lymphatic sinus, into which the follicle partly dips. At other places the lymphoid tissue of the mucosa is separated from that of the submucosa by the layer of muscularis mucosæ (fig. 3, *m. m*); but the latter is wanting opposite the summit of each follicle (fig. 4), and the lymphoid tissue

\* Lovén, Nord. Med. Arkiv, 1873.

of the one blends with that of the other. In this particular, as in most others, the lymphoid patches of the Marsupial stomach exactly resemble the patches of Peyer of the human ileum, only that in the latter the lymphoid follicles occupy more of the mucous membrane and come entirely to the surface, whereas, in the gastric patches in question, the follicles, as well as the remainder of the lymphoid tissue, are surmounted by tubular glands, except at the centre of each, where the surface is pitted in as far as the summit or cupola of the follicle. The glands over these lymphoid patches are somewhat shorter than those which are found in the rest of the mucous membrane of the second region, but entirely agree with them in structure (figs. 3 & 4).

*Transition of the Stratified Epithelium of the First Region into the simple Columnar Epithelium of the Second Region.*—The manner in which this occurs will be readily understood by again referring to fig. 1. Close to the limit between these two regions the stratified epithelium (*S*) of the first is of considerable thickness, nearly as thick, indeed, as the whole mucous membrane of the second. If the lower line of the epithelium be followed, it will be seen that just as it approaches the junction it rises rather abruptly towards the surface, the layers of cells above it being continually less and less numerous until they are reduced to six or eight only. The lowermost columnar cells (*c'*) of the stratified epithelium then become directly continued into the simple columnar epithelium (*c*) of the glandular region, whilst the layers above it cease abruptly, one or two cells often projecting at the edge like bricks from the end of a wall. The tubular glands begin immediately beyond this; the first ones passing down parallel with the ascending line of the stratified epithelium; but they are separated from it by somewhat more of the tissue of the mucosa than they are from one another. This tissue (*i, i*) contains very numerous lymphoid cells, and many are seen also in between the lower cells of the stratified epithelium of the immediate neighbourhood (at *ly*). Transitional forms of epithelium between the scaly stratified and the columnar (as described by Henle at the line of transition of gullet into stomach-epithelium in man) do not occur, but the passage of the one into the other is quite abrupt and effected by the cessation of all the layers of the stratified epithelium except the lowermost.

*Structure of the Second Region, in the neighbourhood of the Pylorus.*—The lining membrane as well as the muscular coat is here very thick, especially in *Macropus giganteus*; and the gland-tubes are correspondingly long (fig. 5). They are not enlarged at the fundus; and the cells of this are similar in appearance to those of the rest of the tube. Numerous bundles of muscular tissue (*m', m'*) pass from the muscularis mucosæ upwards towards the glands. But the most striking feature of the part is the number and size of the lymphatics (*l, l*). These appear in sections as large well-defined clefts in the connective tissue between the glands. The clefts are not merely accidental; for they have a definite wall of flattened nucleated cells, like the commencing lymphatics elsewhere.

Two such clefts of considerable size are seen between the glands in fig. 5; other smaller clefts, also for the most part representing sections of lymphatics, are seen in the interglandular tissue in various parts of the mucous membrane. It will be observed, moreover, that the lymphoid tissue at the base of the glands is more abundant here than in the rest of the second region (fig. 2), with the exception of the lymphoid patches, and that the prolongations of the muscularis mucosæ towards the surface between the glands are more numerous (*m'.m'*).

*The Mucous Membrane of the Third Region.*—This is very thick both in *Dorcopsis luctuosa* and in *Macropus giganteus*, the thickness being as usual due to the length of the gland-tubes. These resemble in many respects the pyloric part of the second region just described; thus they are long straight tubes lined near the orifice with columnar epithelium, and in all the rest of their extent with small cubical or polyhedral cells, which in many parts nearly fill up the tubes. But there is this important difference, that superadded to these and situated outside of them (but still within the basement membrane, which they often cause to bulge outwards) there are, in the middle parts of the length of the gland (figs. 6 & 7), certain other cells of a spheroidal or ovoidal shape and granular appearance. These are what have long been known as peptic cells; since it is believed, although it has not yet been conclusively proved, that they are the source of the pepsin of the gastric juice. They were termed by Rollett\* the delomorphous cells of the gland, whilst the other, more centrally situated, and usually less obvious cells, which are continuous above with the columnar epithelium of the surface, he has termed adelomorphous. For the present it will be better to adhere to the old terminology (*peptic cells*) for the rounded cells, and to term the angular ones, which line the whole tube within them, *central cells*. The glands, moreover, in which the peptic cells occur we may continue to term the peptic glands, and the region of the stomach occupied by them the peptic region, without at the same committing ourselves so far as to maintain that the other portions of the stomach do not also, as some physiologists think, yield pepsin.

To return to the structure of the glands. The spheroidal peptic cells vary in number in different glands, being fewest in the parts of the peptic region which are nearest the boundary between this and the second or general glandular region. It frequently happens that these peptic cells do not reach the fundus (*b*) of the gland, which is not larger in these glands than the rest of the tube, and is occupied exclusively by central cells which resemble the cubical cells of the other glands, but are smaller and more closely packed. The distribution of the peptic cells in the glands is well shown in fig. 6, which is a sketch of part of a vertical section from the middle of the peptic region as seen under a low power. The preparation was stained with aniline blue, according to Heidenhain's directions †; the peptic cells become much more deeply stained by this than the rest

\* Untersuchungen, 1871.

† Arch. f. mikr. Anat. vi. 1870.

of the tissue, and the limit of their distribution can be readily made out. They are seen to be absent near the orifices of the glands, where the tubes are lined with columnar epithelium.

The relation of the peptic cells to the central cells is best seen in the horizontal sections (as in fig. 8, which is taken from the *Dorcopsis* stomach). Here the peptic cells (*p, p*) lie immediately outside the central cells (*c, c*) (which almost fill up the tube, leaving but a very small lumen) and in close contact with them. But in *Macropus* the contact is not so close; for the basement membrane of the gland sends horizontal lamellar projections inwards, partially surrounding the spheroidal cells and separating them more from the central ones.

It can be clearly made out (both in vertical sections showing the glands along their whole length, and in sections carried obliquely across them so that in different parts of the section different levels of the tubes are cut) that the central cells are directly continuous at the neck of the glands with the gradually shortening columnar cells of the gland-mouth, and resemble, therefore, in this respect the cubical cells which line the greater part of the tubes of the second region\*. In general aspect too the central cells resemble those; but they are for the most part, as before mentioned, smaller and more angular and closely packed. This is especially the case at the base of the gland, where the cells almost entirely fill the tube so as to leave little or no lumen (fig. 9).

*Transition between the Second and Third Regions.*—The line of demarcation between these is best marked, as before stated, in *Dorcopsis*, where there is a slight furrow between them, the mucous membrane increasing rapidly in thickness on the peptic side of the furrow. A section across the line and including a part of each region, is shown in fig 10, as seen under a low power in a preparation stained with aniline blue. The glands of the second region become gradually shorter until opposite the bottom of the furrow, where they are shortest; those beyond rapidly increase in length, but exhibit at first exactly the same structure. At about the third or fourth row, however, a few peptic cells become super-added to the others about the middle of the glands; and these increase in number and occupy a greater length of the gland as we proceed further into the third region, until after a few more tubes they are found throughout the greater part of the length of the glands; so that from a study of the mode in which the two kinds of glands pass into one another, as well as from a comparison of their structure, it is clear that the main parts of the glands of both regions are almost precisely similar and will probably have a similar function, and that the only difference of importance lies in the fact of the superaddition of the peptic cells in the glands of the third region—probably implying the superaddition of some other function in these glands. Whether this, as is generally believed, is the elabo-

\* Strictly speaking, these cells are not cubical; for although they appear so when the glands are seen longitudinally, they must of course, as seen in a transverse section of the glands, become narrower towards the lumen; so that the shape of each cell is in reality that of a truncated wedge.

ration of pepsin, we hope that before long the results of some comparative experiments already commenced will enable us to form a definite opinion.

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In the foregoing account we have been induced to enter into what might seem almost unnecessarily minute details with reference to the structure of the gastric mucous membrane in these particular animals, because, as we have already incidentally mentioned, they seemed to us especially well adapted for investigation, partly on account of the well-marked differences between the glands of different regions, combined at the same time as they are with many unmistakable features of similarity, partly on account of the ease and certainty with which the regions can be mapped out, and partly also on account of the simplicity of form of the glands, which renders them easy of observation throughout their whole length.

The identity between the glands of the third region here described and the well-known *peptic glands* of the stomach has been already incidentally noticed, and is sufficiently obvious. It will doubtless also have suggested itself to most of our readers that the glands here described as occupying the second region in the Kangaroo's stomach, and consequently by far the larger portion of the glandular mucous membrane, resemble in most points of structure those which were until the last few years known as the *mucous glands* of the stomach of Man and the higher Mammalia. But the resemblance is more obvious, both as regards situation and structure, in the part of the second region which is near the pylorus, than in the remainder. In the latter the epithelium of the glands presents peculiarities which have not hitherto, it is believed, been noticed in the gastric glands of other animals. These peculiarities are not improbably connected with the nature of the food on which the Kangaroo subsists. Further investigation is necessary to show to what extent they are found in other animals in which the food is similar.

#### DESCRIPTION OF THE PLATES.

##### PLATE VIII.

Fig. 1. Vertical section of the mucous membrane of the stomach of *Macropus giganteus*, carried across the line of junction between the first and second regions. Magnified about 135 diameters. *A*, end of first region or region of stratified epithelium; *B*, commencement of second region; *X*, junction of the two; *S*, stratified epithelium; *p, p*, papillæ of corium rising up into this; *c'*, lowermost columnar cells of the Malpighian layer of the stratified epithelium; *h*, horny layer of ditto; *ly*, lymphoid corpuscles between the cells of the Malpighian layer; *gl*, tubular glands of mucous membrane of second region; *o, o*, their orifices; *c*, columnar epithelium of the surface; *i, i*, interglandular tissue with numerous lymphoid cells; *m, m*, muscularis mucosæ; *v*, blood-vessels cut across.

##### PLATE IX.

Fig. 2. Vertical section of a part of the second region of the mucous membrane, showing three of the tubular glands, of *Macropus giganteus*. Magnified

about 260 diameters. *n*, neck, *m*, middle part, *b*, fundus, *o*, orifices of the glands; *c*, columnar epithelium of the surface continued into the mouths of the glands; *m.m.*, muscularis mucosæ; *v, v*, blood-vessels cut across.

Fig. 3. Vertical section of part of a lymphoid patch, from the stomach of *Macropus giganteus*, showing three of the tubular glands. Magnified about 260 diameters. *o, o*, orifices of the glands; *c*, columnar epithelium of the surface; *n*, neck, *m*, middle part, *b*, base or fundus of the glands; *m.m.*, muscularis mucosæ; *s.m.*, submucosa; *l.t.*, lymphoid tissue.

Fig. 4. Section of a nodule or follicle from lymphoid patch of stomach (*Dorcopsis luctuosa*). Magnified about 60 diameters. *F*, follicle; *d*, depression or pit in the mucosa over the follicle; *gl*, glands of the mucosa with lymphoid tissue between them and at their base; *m.m.*, muscularis mucosæ; *s.m.*, submucous areolar tissue with lymphoid tissue near muscularis mucosæ; *l.s.*, lymphatic sinus at base of follicle.

## PLATE X.

Fig. 5. Vertical section of mucous membrane of second region of stomach near the pylorus (*Macropus giganteus*), showing six of the tubular glands. Magnified about 135 diameters. *c*, columnar epithelium of the surface; *o, o*, orifices of the glands; *l, l*, lymphatic vessels in the interglandular tissue of the mucous membrane; *m', m'*, bundles of plain muscular tissue passing up between the bases of the glands from the muscularis mucosæ, which is not represented in this figure.

Fig. 6. Vertical section of the third or peptic region of stomach (*Dorcopsis luctuosa*). Magnified about 60 diameters. *p*, part of the glands which contain peptic or delomorphous cells; *b*, bases of the glands destitute of these; *m.m.*, muscularis mucosæ.

## PLATE XI.

Fig. 7. Middle part of three tubular glands from vertical section of peptic region of the stomach (*Dorcopsis luctuosa*). Magnified about 260 diameters. *p, p*, peptic cells; *c, c*, central or adelomorphous cells.

Fig. 8. Horizontal section of peptic region at level of middle of the glands (*Dorcopsis luctuosa*). Magnified about 260 diameters. *p, p*, peptic cells, *c, c*, central cells, *b.m.*, basement membrane of glands; *v, v*, capillary blood-vessels cut across in the interglandular tissue.

Fig. 9. Base or fundus of one of the peptic glands, seen to be occupied entirely by the angular central cells (*Dorcopsis*). Magnified about 260 diameters.

Fig. 10. Section across the line of demarkation between the second and third regions of the gastric mucous membrane (*Dorcopsis luctuosa*). Magnified about 60 diameters. *B*, mucous membrane of the second region; *C*, mucous membrane of third or peptic region; *× ×*, depression at the junction between the second and third regions; *p*, parts of the glands of the third region which contain the peptic cells; *m.m.*, muscularis mucosæ.

Figs. 1, 2, 3, 4, and 5 are from preparations which had been coloured with logwood-alum; figs. 6, 7, 8, 9, and 10 from sections stained with aniline blue. In figs. 6 and 10 the outlines of the glands are only roughly indicated.

February 1, 1876.

G. R. Waterhouse, Esq., V.P., in the Chair.

The Secretary read the following extract from a Report by Commander Cookson, R.N., of a visit by H.M.S. "Peterel" to the Galapagos Islands in July 1875, which had been communicated to him by the First Lord of the Admiralty:—

"A notice of these islands would be incomplete without some reference to the Tortoises for which they are so famous, and from whom they derive their name.

"These animals are extinct in Charles Island; and only a very few individuals are supposed to survive on Chatham Island. In Hood, James, and Indefatigable Islands the numbers are so reduced that they are no longer hunted, the few left being in the most inaccessible parts of the islands; and I was assured that a search of a fortnight might not result in finding a single individual on either of these islands. Albemarle and Abingdon are the only remaining islands in which they have ever been found. In parts of Albemarle Island they are still very abundant, especially at the south-east end.

"They are still tolerably numerous near Tagus Cove. Landing a party of twenty-four men about half a mile south-east of Tagus Cove, we found in a few hours thirty tortoises: the three largest weighed respectively 241 lb., 185 lb., and 173 lb.; these, I was told, were as large as they are commonly found now.

"Tagus Cove is a favourite resort of whalers for the purpose of getting Tortoises. The anchorage is perfectly secure; and the custom is for almost the entire crew to be landed until as many Tortoises are secured as can conveniently be taken on board, some whalers going to sea with as many as 100.

"We found a good trail leading from the landing-place (at one of the gullies before mentioned as having pools of fresh water at its mouth) to the ground where the Tortoises are found, a distance of about three miles; quantities of Tortoise shells, and traces of fires showed the numerous camping-grounds.

"Tortoises were never, I believe, very abundant on Abingdon Island; our searching party found four on this island. They were on the high ground; and it was a work of great labour getting them down to the boats. The distance was about four miles; but the ground was exceedingly rugged, and covered with thick brush, through which a trail had to be cut for the entire distance. The largest found on this island weighed 201 lb., and the smallest 135 lb.

"In consequence of the extent of Albemarle Island, and the inaccessibility of many parts of it, I have no doubt these animals are still very numerous on it, and are likely to be so for a long period even at the present rate at which they are destroyed; but I have already shown the havoc made amongst them by the oil-makers. This is the cause of their being nearly extinct on James and Indefatigable

Islands, where they used to be so numerous. Admiral Fitzroy found a party on James Island making oil in 1835.

“In Abingdon Island, where they are not numerous, I believe they are doomed to destruction directly the orchilla-pickers are placed on the island; for a party of sixty or eighty men will soon hunt over this small island, and discover every individual on it. The meat is highly esteemed by the inhabitants; we found it rather tough and stringy; but it makes excellent soup.

“The tameness of the birds on the islands has been frequently noticed; it is certainly very remarkable, especially in Charles and Chatham Islands, which have been so long inhabited; the small birds of all kinds are so tame that they are easily knocked down with a switch; some of the men killed numbers of doves in this manner.

“The rocks at Iguana Cove were thickly covered with the hideous black Iguanas mentioned by Admiral Fitzroy. We found them in numbers at the other places we visited, but nowhere else so numerous or so large in size. Here they were found to weigh from 20 to 22 lb., against 12 to 14 lb. from other localities.”

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Mr. Frederick Selous, Jr., exhibited a series of horns of African Rhinoceroses in illustration of Mr. Drummond's paper read at the last Meeting of the Society.

These horns had been obtained in various localities in eastern Africa, and consisted of the following specimens:—

1. *R. bicornis major* ♂. Shot at Tamasanka, Nov. 19, 1874, about lat. 19° 50' S., long 26° 10' E.

2. *R. bicornis major* ♀. Shot near the river Gwai, September 1873, about lat. 18° 50' S., long. 27° E.

3. *R. keitloa* ♂. Shot on the southern edge of the marshes of the Chebe river, August 28, 1874, about lat. 18° 30' S., long. 4° 50' E.

4. *R. simus* ♀. Shot on the border of the hills between the Gwai and Zambesi rivers, May 1874, about lat. 18° 40' S., long. 26° 30' E.

5. *R. simus* ♀. Shot Oct. 1872, near the river Sech Wechive, north-east of the Matabili country, about lat. 18° 30' S., long. 29° 50' E.

6. *R. simus* ♀: Shot Nov. 15, 1874, about lat. 19° S., long. 26° E.

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Mr. Selater read the following extract from a letter addressed to him by Mr. Albert L. C. Le Sœuf, Hon. Secretary of the Zoological and Acclimatization Society of Melbourne, Australia:—

“I send you the horn of a Deer we have in our gardens, and I shall be much obliged if you can let me know what variety it is.

I cannot find it described anywhere, although I do not doubt it will be familiar to you. The Deer were sent here some years ago by Sir Henry Barkly, from the Mauritius. In appearance it is like the Sambur Deer, but smaller, say about three feet high or rather

under. The colour of the hair is rather lighter than in the Sambur; the ears are not so large. The does breed freely every year with us. We have liberated some in the bush, and given others away."

Mr. Sclater exhibited the horn in question, and said that it appeared to belong to *Cervus rusa*, originally of Java, but which was known to have been introduced thence into the Mauritius many years ago (see Blyth, *Ibis* 1862, p. 92).

Mr. Sclater thought it desirable that the facts of this transportation should be placed upon record, as this Deer might probably become a denizen of Australia, as had been already the case in Mauritius.

The following papers were read:—

1. On the Position of the Anterior Nasal Apertures in  
*Lepidosiren*. By T. H. HUXLEY, Sec. R.S.

[Received January 7, 1876.]

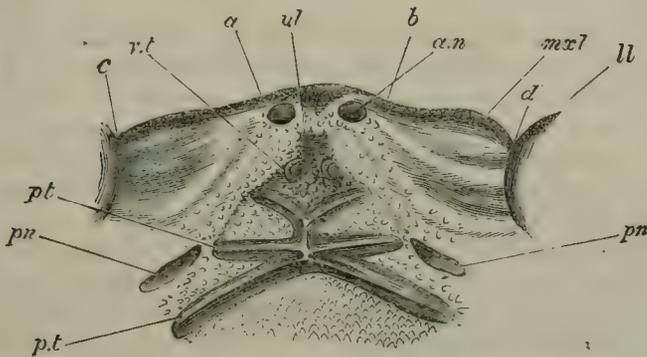
In the course of the discussion which followed my paper on *Ceratodus*, read before the Society on the 4th of January, reference was made to the position of the anterior nasal apertures in *Lepidosiren*; and they were affirmed to be within the mouth, inasmuch as they are situated between the upper and the lower lips.

The anterior nasal apertures correspond with the primitive openings of the olfactory sacs, which, in all known Vertebrata, are invariably developed from the integument of the under aspect of the head, in front of the region which forms the roof of the oral cavity: and, in all the vertebrated animals in which I had specially studied the question, I had found the anterior nasal apertures to be situated in front of the upper lip and therefore outside the mouth. That they should be situated behind, or below, the upper lip, and therefore inside the mouth (so far as the cavity included between the lips may be properly called the mouth), appeared to me to be a singular anomaly, the existence of which, however, I was not prepared to dispute without reexamination of the facts. The point is, in various respects, of so much interest that I have lost no time in making the requisite investigation, with the result of leaving no doubt whatever in my mind that in *Lepidosiren*, as in *Ceratodus*, the anterior nasal apertures are truly outside the mouth, not only in the sense of lying beyond the contour of the mandible, when this is shut against the palate, but in the sense of being situated on the underside of the head in front of the upper lip, and therefore altogether beyond the limits of any permissible definition of the oral cavity.

When the mouth of a *Lepidosiren* (*L. annectens*) is laid open from below, and the palate and the contour of what has hitherto been termed the upper lip (Fig. p. 181, *c a b d*) are displayed, the latter is seen to present a median portion (*a b*) separated by a slight undulation from the two lateral prolongations *c a* and *b d*. The

latter are the edges of the fold which overhang the mandible on each side when the parts are undisturbed. They occupy the maxillary region of the head, and may be termed the *maxillary lips*.

The median portion of the anterior contour (*a b*) does not belong to the lips at all, but corresponds, as is easily seen in a section of the skull, with the anterior extremity of the chondrocranium and the ventral edges of the nasal capsules. The line *a b* is, in fact, the anterior contour of the head; and the pigment-cells of the dorsal integument are here continued onto the ventral face. After a very short distance, however, the integument terminates in a slight, transverse, papillose ridge, which forms the anterior boundary of a shallow median depression; on each side of the hinder part of this depression is one of the vomerine teeth (*v.t.*).



Under view of the fore part of the roof of the mouth and underside of the head of a young specimen of *Lepidosiren annectens* ( $\times 3$ ). *a b*, anterior margin of the head; *a c*, *b d*, right and left maxillary lips; *a.n.*, anterior nasal apertures; *p.n.*, posterior nasal apertures; *u.l.*, premaxillary lip; *v.t.*, vomerine teeth; *p.t.*, palatine teeth.

The anterior nares (*a.n.*) lie immediately behind the anterior contour of the head; and their more prominent posterior lips lie in front of a transverse line drawn through the edge of the papillose ridge. It is obvious that the area included between the anterior contour of the head in front, the median fossa behind, and the anterior nares at the sides, corresponds with the region occupied by the naso-frontal process in the vertebrate embryo and with the homologous large, shield-shaped, naso-frontal integumentary plate in the Rays and Dogfishes. The papillose ridge (*u.l.*) is therefore the middle or premaxillary portion of the upper lip; and if this be so, it follows that the anterior nares in *Lepidosiren* are placed as in Chimæroids and Plagiostomi, on the under aspect of the head and outside the mouth.

I may add that *Lepidosiren* has two upper labial cartilages—one fibro-cartilaginous immediately behind the anterior nasal aperture, and the other behind the posterior nasal aperture. These answer to the upper labial cartilages in *Chimæra* and *Cestracion*.

2. Notes on the Myology of the Limbs of *Moschus moschiferus*. By F. JEFFREY BELL, Exhibitioner of Magdalen College, Oxford. Communicated by Prof. FLOWER, F.R.S., V.P.Z.S.

[Received December 31, 1875.]

By the kindness of Prof. Flower, I have been enabled to dissect the muscles of the fore and hind limbs of *Moschus moschiferus*, an animal which has been lately made the subject of a monograph by Prof. Flower, presented by him to the Society (P. Z. S. March 16th, 1875). The interest of any new facts that can be brought forward concerning this Deer will be evident to all who heard or have read his paper.

In examining the myology of the limbs, I have dissected the corresponding parts in *Cervus virginianus* (kindly sent me by Mr. A. H. Garrod), *Tragulus*, sp. ? (from the store-room of the Royal College of Surgeons of London), and a common Sheep. I have also been able to make comparisons with the myology of the same parts in *Hyomoschus*, thanks to a paper published by M. Chatin in the 'Annales des Sciences Naturelles'\*

Unfortunately, both in the copy of Cuvier's 'Planches de Myologie' which I saw through the kindness of Mr. Garrod, and in that belonging to the Library of the Royal College of Surgeons, there were no plates of the muscles of a sheep, ox, or deer; but a full description of those of the first two can be found in Chauveau's 'Comparative Anatomy of Domesticated Animals,' which is now easily accessible; and for this reason I have thought it unnecessary to describe, at any length, such muscles as offer no important variations from what we find in the Sheep; in the same text-book will also be found all the more common synonyms of the muscles—a most necessary assistance to myologists in the present confused state of nomenclature.

In the hind limb of *Moschus*, as it came into my hands, the femur was removed. The muscles of the humerus are not described in this paper; but the more striking differences are only found in the arrangement of those muscles which send tendons to the digits.

### I. Fore limb.

#### A. Muscles inserted into the metacarpus.

##### α. Anterior face.

- (1) Extensor metacarpi anterior.  
 (2) „ „ „ obliquus.

In the arrangement of these muscles there was no important variation from that which obtains in the same parts in the sheep and deer dissected.

\* "Observations sur la Myologie de l'*Hyomoschus*," *loc. cit.* 5<sup>e</sup> sér. Zoologie et Paléontologie, tom. xv. (1872).

In *Tragulus* a similar arrangement obtains. In *Hyomoschus*, however, Chatin notes three muscles in this region, which he names *extenseur gros*, *extenseur grêle*, and *adducteur*. The *adducteur* appears to be the same as the oblique extensor, so far as one can judge from Chatin's account; he does not, however, note the oblique direction of its tendons, which seems to be universal among the Ungulata, as it is found in *Equus*, *Ovis*, *Cervus*, and *Sus*.

The anterior extensor arises by two heads barely separable from one another, on the outer face of the distal portion of the humerus; and from Chatin's description and figure I am led to suppose that he has divided this, which is really one muscle, into a portion "gros," and a portion "grêle."

The tendon is only double at its distal extremity, where it widens, and becomes bifid, to embrace both sides of the tuberosity of the metacarpus.

### β. Posterior face.

- |     |                            |
|-----|----------------------------|
| (1) | Flexor metacarpi internus. |
| (2) | „ „ obliquus.              |
| (3) | „ „ externus.              |

Here, again, there is no important variation; but we may note that the outer branch of the bifid tendon of the external flexor (3) is inserted into the tuberosity on the external side of the metacarpus, which appears as the proximal end of the fifth metacarpal, united to the rest of the bone in this region, and only represented distally by a short, fine needle of bone; a similar insertion of the tendon was seen in *Cervus virginianus*; in the Sheep the ending is more towards the median line of the metacarpus, while in *Tragulus*, *Hyomoschus*, and the Pig this branch is attached to the head of the entire fifth metacarpal.

## B. Muscles inserted into the phalanges.

### a. Anterior face.

In the arrangement of the tendons of muscles going to the digits, *Moschus* differs not a little from *Cervus virginianus*, or the Pig. In the former, as in the Sheep, we find that there are three muscles having their insertions in the digits, namely:—

- i. Extensor communis, with tendons to the third phalanges of the median digits.
- ii. Extensor digiti interni (tertii).
- iii. „ „ externi (quarti).

Both of these have two branches—one to the second phalanx, and one directed backwards and ending in the plantar cushion—but no tendons going to the lateral digits, although those ending on the plantar surface, as just described, probably represent what remains of them.

*C. virginianus*, in addition to the muscles common to it and the Sheep, possesses an extensor dig. minimi.

In the Pig the digits are all supplied from the common extensor, by its division into four branches; while the extensor dig. interni, further, is inserted into both the internal digits, and the fifth possesses a proper extensor dig. minimi.

Now in *Moschus* each digit is provided with an extensor; but the so-called *common extensor*, as in *Cervus*, sends out only two branches, and these for the median digits, into whose third phalanges they are inserted. The internal extensor is inserted into the first phalanx of the third digit, on its anterior face, and the third phalanx of the second, on its inner face. The external extensor is inserted into the outer sides of the second phalanx of the fourth, and of the third phalanx of the fifth digit. A small *extensor dig. minimi* is also present, and is inserted into its second phalanx, after crossing the extensor of the fourth digit, in the last or distal third of the metacarpus, as in *C. virginianus*, as already described, though not as in the Sheep, where this muscle is absent.

In *Tragulus* the common extensor is inserted only into the median digits; but in *Hyomoschus*, as Chatin says, the arrangement is Porcine; that is, the common extensor is inserted into all four digits.

As in the Sheep and Pig, the extensors of the phalanges arise on the outer side of the radius, and from the external tuberosity of the humerus; their tendons passing together along a deep groove on the outer face of the distal end of the radius, in a strong fibrous sheath, are directed, according to their destination, more or less inwardly along the anterior face of the metacarpus. Separated from these, however, is the tendon of the internal extensor, the fleshy body of which lies on the flattened outer face of the ulna, while the tendon itself, more deep, has a separate carpal sheath; when it has passed through this, it widens, but does not bifurcate till it approaches the distal end of the metacarpus.

### β. Posterior face.

- |                |   |                        |
|----------------|---|------------------------|
| (1) Perforatus | } | flexors of the digits. |
| (2) Perforans  |   |                        |

The short flexor of the fifth digit, which is found in the Pig and *Hyomoschus*, is absent.

In no known Ungulate does the *perforatus* send tendons to the lateral digits, but only to the second phalanx of each median digit. In all members of the group its fleshy portion consists of two masses of muscle, arising beneath the *flexor metacarpi obliquus*, from the internal condyle of the humerus; in the Sheep these two tendons, arising from the two muscular masses, one from each, unite in the metacarpal region, and, more distally, bifurcation occurs; in *Cervus virginianus*, the two tendons remain separate, as also in the Pig and *Hyomoschus*. In *Moschus*, however, there is a certain union of the tendons, by means of a fine slip of tendon running from the inner to the outer branch, in the metacarpal region.

The *perforans*, as in the Horse, Sheep, and Pig, consists of three muscular portions, called by Chauveau epitrochlean, ulnar, and radial,

from each of which a tendon arises; these three tendons unite into one, strong and deeply situated, at the carpus.

In the Sheep and *Cervus*, only two branches are formed by this tendon, one for the third phalanx of each median digit; but in *Moschus*, shortly before reaching the metacarpo-phalangeal region, there is given off from each side a delicate tendon, which is inserted into the third phalanx of the second and fifth digits respectively; while the remainder, scarcely diminished in size, passes through the sheath afforded it by the tendons of the perforatus, shortly after its own bifurcation.

A similar arrangement obtains in *Hyomoschus*, according to Chatin; in the Pig, however, the perforatus is divided into four distinct branches. There are no lumbrical or interosseous muscles, as might be inferred from the structure of the bones of the manus. *Hyomoschus* has one lumbrical and four interossei, as the Pig.

## II. Hind limb.

The femur, as already stated, was removed, so that it was impossible to note the origins of several muscles, as had been done in the fore limb; but I saw nothing to lead me to suppose that there was any variation from that which ordinarily obtains among Ruminants.

On removing the skin and fascia, it was very easy to separate, on the posterior side of the leg, in the tibial region, a large triangular mass of muscle, terminating in a tendon, which seemed to be inserted into the head of the process of the calcaneum, and then to pass on to the digits. Such an appearance is common enough in the hind limbs of Ungulates, and seems to have given rise to Prof. Owen's remark that the gastrocnemius sends a tendon to the digits\*—the fact being, indeed, that the tendon which thus crosses, as described by Owen, over the calcaneum, but which is not inserted into it, is that of the *plantaris* muscle, the arrangement of which was clearly pointed out by Meckel†, in speaking of the Horse:—

“Chez les solipèdes le *plantaire grêle* et le *court fléchisseur commun* sont confondus; ou, si l'on veut, le dernier est avorté. . . . Le tendon du muscle se dirige d'abord au devant de celui du triceps de la jambe [*i. e.* the gastrocnemius and soleus]; arrivé au calcanéum, il se place derrière ce tendon, s'épanouit et s'insère à la grande apophyse de cet os‡; puis il se prolonge en avant.”

By others, again, the soleus has been considered the muscle from which the perforated tendon arises, as Chatin says§:—

“D'après plusieurs auteurs, Stannius entre autres, le soléaire

\* “The chief peculiarity of the flexors of the digits of the hind foot in hoofed quadrupeds is the accession of muscles not so applied in other mammals. Thus the ‘gastrocnemius,’ besides its insertion into the heel-bone, sends a strong tendon along the back of the metatarsal, to the phalanges, where it expands and bifurcates, each division again splitting for the passage of that of the ‘flexor perforans’ before being inserted into the middle phalanges.”—*Anat. of Vertebrates*, vol. iii. p. 46.

† *Anat. Comp.* French ed. vol. vi. p. 442.

‡ It would be more correct to say that at this point the tendon is surrounded by a fibrous cap, inserted into the bone, which it has itself formed.

§ *Loc. cit.*

manque rarement chez les Mammifères ; mais en général, au lieu de contribuer à la formation du tendon d'Achille, il se terminerait par un tendon propre, qui chez les Ruminants, le Cochon, et le Chien, se diviserait pour se rendre aux orteils, de sorte que ce muscle jouerait le rôle d'un court fléchisseur des orteils, outre celui qui lui est ordinaire.

“ Dans l'*Hyæmoschus*, cependant, pas plus que dans le *Cervus mexicanus*, une pareille duplicité de fonction ne saurait être attribuée au soléaire, car le fléchisseur des orteils qui glisse sur la face postérieure du calcanéum, comme sur une poulie de renvoi, en est bien distinct. Cuvier n'indique, d'ailleurs, nullement ce mode de terminaison du soléaire se prolongeant jusqu'aux orteils pour en former le fléchisseur superficiel.”

It may, then, I think, be fairly concluded that the tendon which is perforated in the hind limb of Ungulates, is that which arises from the *plantaris*; and this is the view taken by Prof. Huxley\* and by Mr. Mivart †.

#### A. Muscles inserted into the tarsus.

a. Anterior face. None.

β. Posterior face.

(1) Gastrocnemius.

(2) Soleus.

These two muscles ordinarily unite their tendons before being inserted into the calcaneum, and therefore have been described, chiefly by French anatomists, as in the above quotation from the French edition of Meckel, as one muscle, under the name of the *triceps of the leg*; for the gastrocnemius has two heads. But in *Moschus*, as in *Tragulus*, the tendons of the two muscles are easily separable for their whole extent, but a muscular branch unites their fleshy bodies.

The soleus is present in *Hyomoschus*, but absent in the Pig.

#### B. Muscles inserted into the metatarsus.

a. Anterior face.

(1) Extensor metatarsi internus.

(2) „ „ anterior *sive* medius.

(3) „ „ externus.

The median and internal flexors pass, with the common extensor of the digits and the extensor of the fourth digit, through a highly fibrous tarsal ring. The flexor internus is larger at its origin than in the Sheep; but in both animals, as also in *C. virginianus*, it arises both from the head of the tibia and from the strong ridge on the anterior face of the same bone. Chatin makes the vague observation concerning this muscle, that it is “assez dissemblable chez le *Cervus mexicanus* comparé à l'*Hyæmoschus*.” I observed no variation in its arrangement in *Moschus* from that which obtains in *C. virginianus*; and the only point in which it differs from the arrangement in the

\* Anat. of Vertebrata, p. 56.

† Elementary Anatomy, p. 354.

Pig is, that it terminates on the proximal end of the metatarsal, instead of on the second cuneiform.

The *extensor metatarsi anterior*, and the *extensor digitorum communis* are barely separable in the muscular portions, as in the Sheep, Deer, *Hyomoschus*, and the Pig. The external extensor crosses over the tarsus, in close company with the proper extensors of the fourth and fifth digits; in the Sheep, as might be supposed, and in *C. virginianus*, the proper extensor of the fifth is absent. Save in this particular, there is no variation in the arrangement of this external extensor in Ruminants from that which obtains in the Pig.

β. Posterior face of the metatarsus; no muscles are inserted into it.

### C. Muscles of the digits.

#### a. Anterior face.

- (1) Extensor digiti quinti.
- (2) „ „ quarti.
- (3) „ digitorum communis.
- (4) „ digiti tertii.

(1) The tendon of this muscle is in close proximity to that of the extensor dig. quarti, till it approaches the phalangeal or distal end of the metatarsus, where it widens, separates from it, and is inserted into the third phalanx of the fifth digit. It is absent in *C. virginianus*, as in the Sheep.

(2) This muscle terminates by a broadened strong tendon, on the second phalanx of the fourth digit, as in the Sheep, *Cervus*, *Hyomoschus*, and the Pig.

(3) The *common extensor* has only two branches, which end in the third phalanges of the median digits, as in *Cervus virginianus*; but the same muscle has four branches in *Hyomoschus*, as in the Pig—though only two in *Tragulus*, as in the manus.

(4) In close connexion with the common extensor arises the extensor of the internal digit, which terminates in the second phalanx of the third, and the third phalanx of the second digit. No branch for the second digit was found in *C. virginianus*; but the lateral digits of the pes have no metatarsal bones at all, although there are small metacarpals in the manus.

Chatin notes no internal flexor in *Hyomoschus*, which is strange, as the muscle is found in the Pig and in *Tragulus*, as well as in the Sheep and *Cervus*.

#### β. Posterior face.

- (1) Perforatus.
- (2) Perforans.
- (3) Flexor obliquus.

The *perforatus* muscle has been already spoken of; it only now remains to be added that it has only two branches, as in the manus.

The *perforans*, again, has but two tendons, and those for the median

digits, whereas, it will be remembered that, in the manus, the lateral digits also received tendons from this muscle; but the lateral toes of *Moschus*, in the pes, are much smaller than those in the manus, and the metatarsals are absent, as has been pointed out by Prof. Flower. In *Hyomoschus*, and the Pig, tendons are sent to all four digits.

The tendon of the oblique flexor, after having passed through the strong fibrous sheath found on the inner side of the tarsus, becomes directly afterwards united with that of the perforans; in the Sheep the union takes place somewhat lower down the metatarsus, in *Cervus* at about the same spot.

#### D. Muscles of the pes.

The *pedal* is a small muscle, arising from the inner face of the calcaneum, and attached to the tendon of the common extensor; it has no attachment to the inner extensor as in the Sheep and Deer; nor has it two branches for attachment to the two tendons of the common extensor as in *Hyomoschus* and the Pig. There are no *interosseous* muscles, of which there are four in *Hyomoschus* and the Pig.

#### SUMMARY.

The most interesting points in the foregoing description are those which refer to the arrangement of the tendons inserted into the digits.

i. They are interesting morphologically, as showing what was the arrangement in the common ancestor of the true Cervidæ and of *Moschus*—namely, that the extensor communis digitorum had only *two* tendons, and those for the median digits; for the same character obtains in *Tragulus*; while they offer a further proof of Prof. Flower's positions:—(α) That *Moschus* has close affinities to the true Cervidæ; for this same arrangement seems to be constant throughout the group, although different in *Hyomoschus*\*. (β) That *Moschus* is an older and more generalized form; inasmuch as it still possesses tendons for the lateral digits, arranged in the same manner as in *Tragulus*.

The absence of flexor tendons, arising from the *perforans*, and inserted into the lateral digits of the pes, may cause further stress to be laid on the small size or complete absence of the metatarsals, which is so highly characteristic of the Cervidæ.

ii. They are interesting physiologically, as showing how the Musk-Deer managed to hold on to the rocks and crags of its home by all four toes, in the manner described in Prof. Flower's paper.

It will not, I trust, be long before we know what arrangement obtains in the Reindeer, in *Hydropotes*, and others. I trust that the evidences adduced on the subject of the homology of the perforated tendon of the pes in the Ungulata, may settle this question, so far, at any rate, as the gastrocnemius is concerned.

\* The vagueness of some parts of M. Chatin's description demands a reconsideration of the myology of *Hyomoschus*.





Fig. 1.

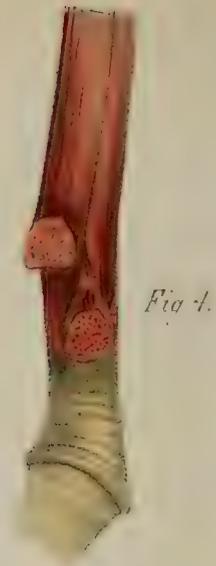


Fig. 4.

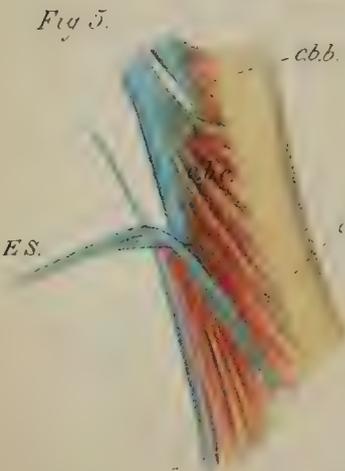


Fig. 5.



Fig. 3.

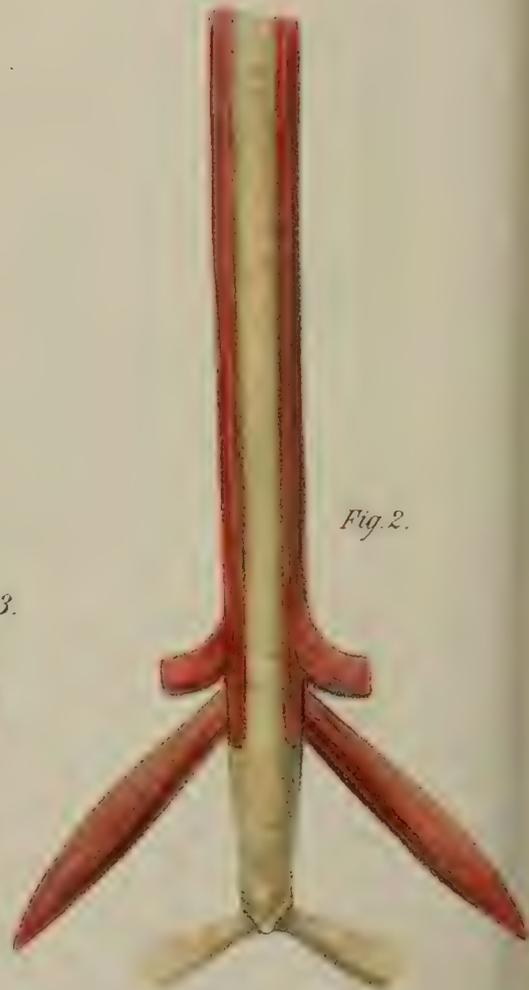
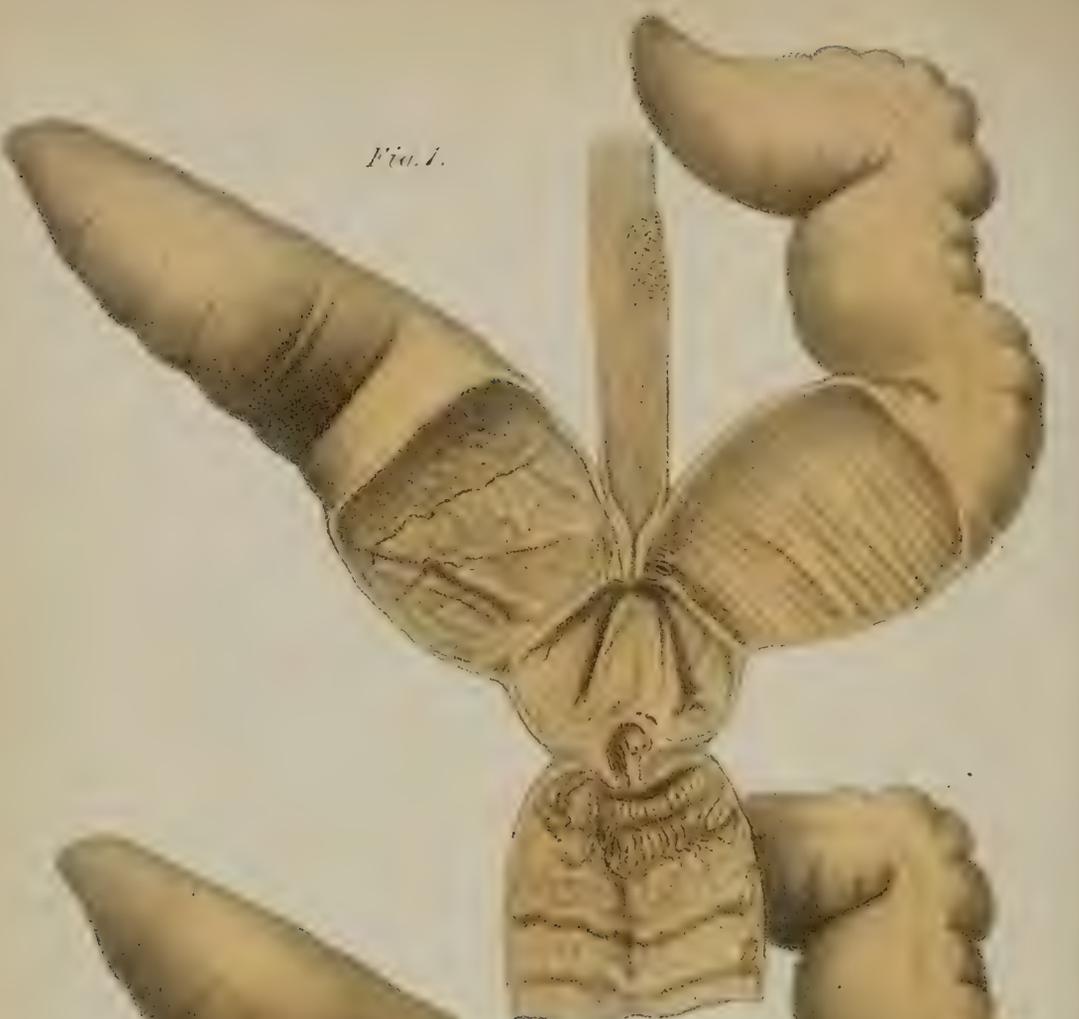


Fig. 2.



*Fig. 1.*



*Fig. 2.*



J.Smit lith.

Harbert 1877

ANATOMY OF CHAUNA DERBIANA.



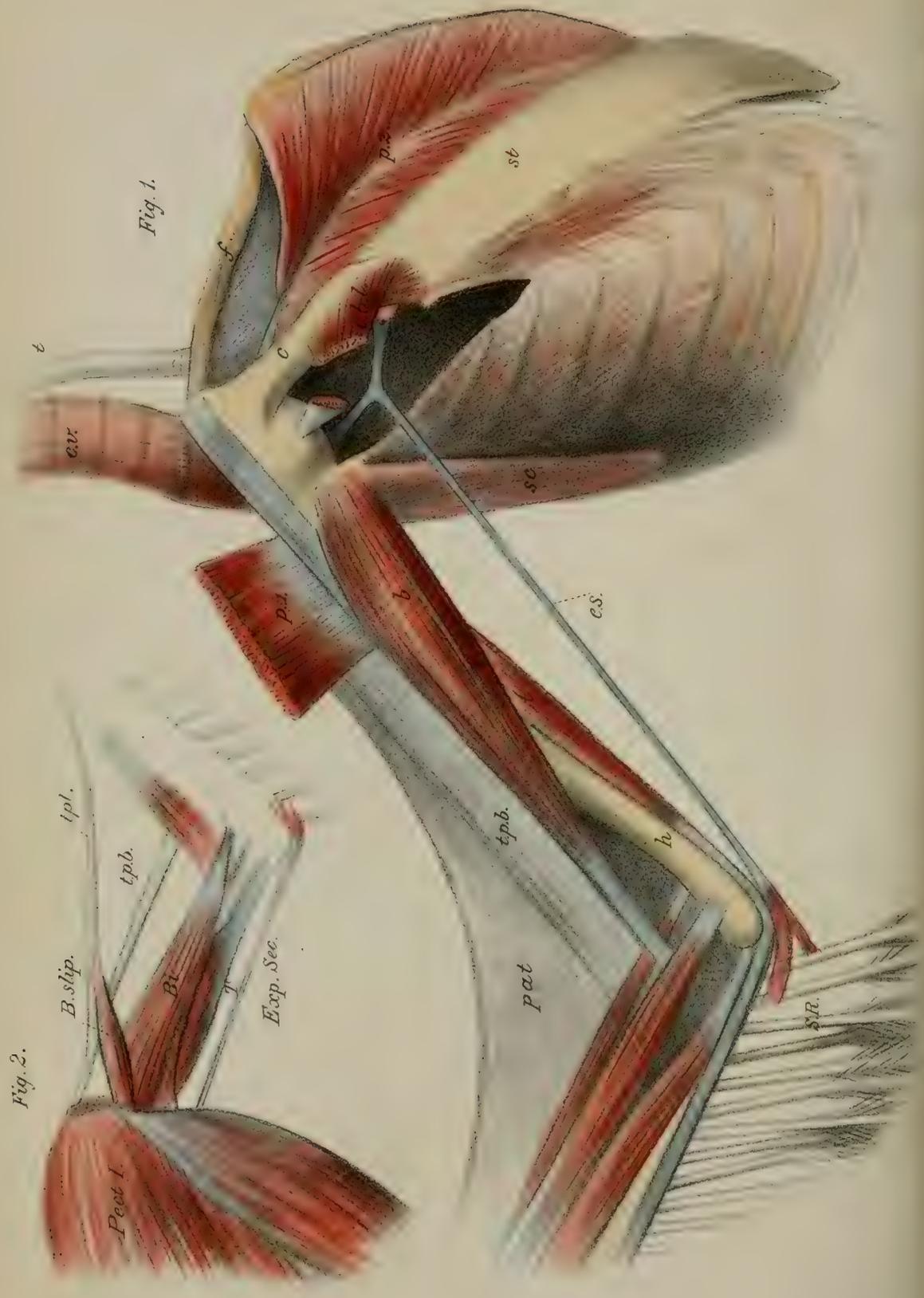






Fig. 1.

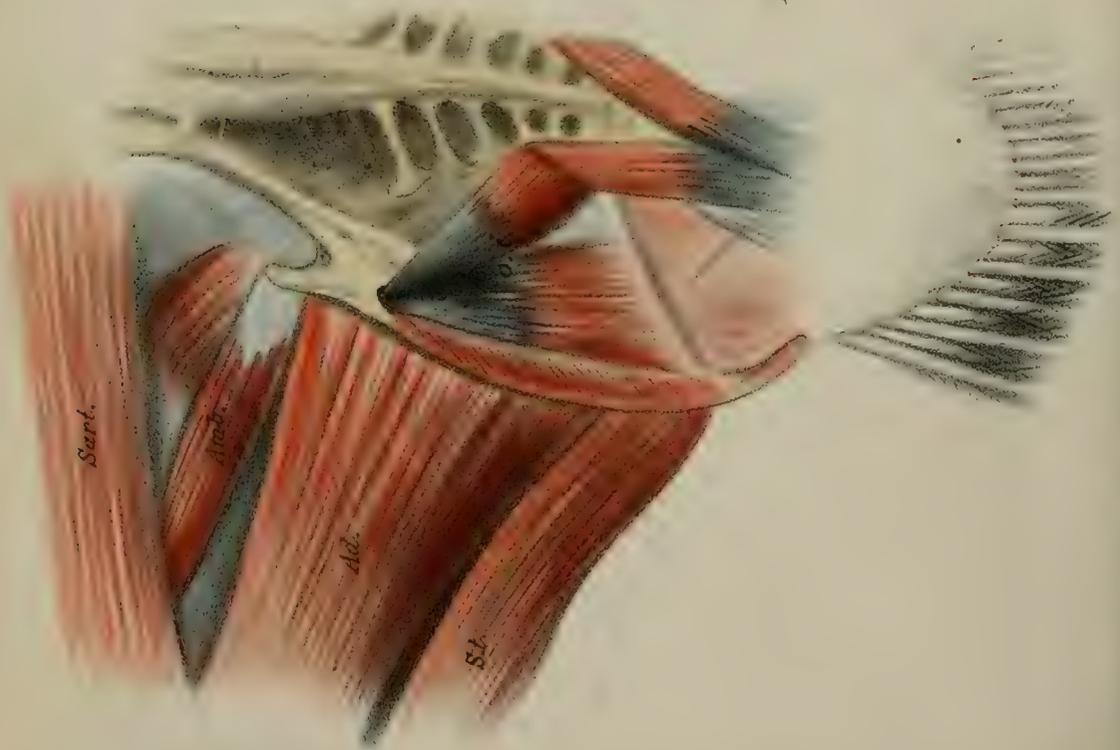


Fig. 2.

3. On the Anatomy of *Chauna derbiana*, and on the Systematic Position of the Screamers (*Palamedeidae*). By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

[Received January 5, 1876.]

(Plates XII.-XV.)

In his memoir "on the systematic position of the Crested Screamer (*Palamedea chavaria*)," published in the 'Proceedings' of this Society\*, Prof. Parker has placed that bird among the Anseres, and away from the Rallidæ, with which it had been generally associated. In his "Classification of Birds"†, Prof. Huxley adopts the same view as Prof. Parker. Both these distinguished authorities base their opinions on anatomical considerations; it therefore behoves me to attempt to substantiate the different views expressed by me in my paper "on certain muscles of Birds, and their value in Classification"‡, as it is so considerably at variance with that of the authorities just mentioned.

The great extent to which the skeleton is permeated with air renders the features presented by the different bones of *Chuna* less distinctive than in the majority of birds. For this reason the soft parts will be first considered.

*Cutaneous System. Pterylosis.*—Nitzsch has described the pterylosis of *Palamedea cornuta* and *Chauna chavaria*; and, as might be expected, *C. derbiana* does not differ in any important particulars from the latter. As he remarks, the most striking point observed in the plucked bird is the extreme whiteness of the surface, which depends on the fact that the skin is almost universally emphysematous to the depth of nearly a quarter of an inch. On pressing with the finger, the characteristic crackling of a tissue filled with air is most marked, the only places in which it is absent, or nearly so, being the anterior surfaces of the upper ends of the tibia, and, to a less degree, two triangular spaces, equilateral, with their bases towards the middle line, situated one on each side over that part of each pectoral region which is near the head of the humerus, in the apex of the larger triangular surface bounded by the superior and axillary margins of the great pectoral muscle.

In the Gannet and the Pelican the skin is likewise emphysematous, but not exactly in the same way. In them the superficial surface of the cutis forms a plane surface, and the deep layer another, with the air-cells intervening between them, and the feather-quills traversing them. In *Chauna*, however, these two cutaneous layers are not definable, the whole presenting the appearance as if a non-emphysematous skin had been forcibly blown up, so as to cause its surface to be irregular and bubbled, more like an artificially distended mammalian lung than any thing else. The feathers and the semiplumes do not perforate the air-cells, but cause the skin to be indented where they are situated.

\* P. Z. S. 1863, p. 511. † P. Z. S. 1867, p. 415. ‡ P. Z. S. 1874, p. 117.

The disproportionately massive appearance of the legs is also caused by the presence of air beneath the tessellated skin, which extends almost to the ungual phalanges of the toes.

The contour-feathers, many of them, possess a very feeble after-shaft, especially in the region of the nape, as found by Nitzsch in *C. chavaria*; and there is also a slight groove along the posterior surface of the rhachis of each.

The rectrices are twelve in number.

There are twenty-six remiges in one of my specimens; Nitzsch and Sundevall find twenty-seven. Of these ten are primaries, the fourth being the largest. Of the sixteen secondaries the distal twelve are subequal, whilst the proximal four decrease in size as they approach the elbow.

The tufted oil-gland is not strikingly large; it is somewhat flat, with a single orifice on each side, surrounded by a circle of half-inch feathers which constitute the tuft.

The tibio-tarsus is nude for its distal third, being there covered, as over the tarso-metatarsæ and digits, with small red polygonal scales.

The plumage is uninterrupted, there being no spaces without contour-feathers except the axillary cavities mentioned by Nitzsch, in which down-feathers only are to be found. The down-feathers are universally distributed. The nude neck-ring of *C. chavaria* is absent in *C. derbiana*. The feathers of the humeral tracts are considerably the strongest of the contour-feathers.

Looked at in its entirety the pterylosis of the Screamers is unique, and in no way approaches that of the Anserine birds.

*Alimentary Canal.*—The *palate* is elongate and triangular, with three longitudinal rows of papillæ, which are conical, large, and therefore comparatively few in front, smaller and more numerous behind. They all tend somewhat backwards.

The *tongue* is just over an inch long, and  $\frac{3}{8}$  of an inch broad, its sides being parallel for nearly their whole length. The tip is obtusely triangular, with a small papillary fringe at its extremity,  $\frac{1}{8}$  of an inch broad. The base is straight, and is edged with spines  $\frac{1}{10}$  of an inch long, and shorter, directed backwards. The surface and lateral margins are quite smooth, the whole organ being flattened, slightly grooved longitudinally down the centre, and nowhere more than  $\frac{1}{8}$  of an inch thick. At its base are two lateral juxtaposed protuberances, rough on the surface, and together equal in area to one third of its surface. There is no transverse constriction or oblique groove like that found on the surface of the tongue in some Anatidæ.

The *œsophagus* is uniform in diameter, no crop being even indicated; it is not capacious.

The *proventriculus* is peculiar. It is more than usually capacious, and is glandular only in a patch which occupies but a small portion of its surface. This patch (which is clearly shown in the representation of this portion of the alimentary canal in Plate XII. fig. 1, at its upper end, where the proventricular dilatation ceases) has a

narrow zonary belt of glands. It can, however, be seen that by far the majority of the glands are aggregated into a posteriorly situated patch. The only birds with which I am acquainted in which the proventricular glands do not form a zone, or an approach to one, are *Struthio* and *Rhea*. In the Gallinæ and Anseres they form a zone.

The glandular surface occupies a subelliptical space, 2 inches by  $1\frac{3}{8}$  in its long and short diameters, in the upper and back part of the canal, with the long axis in the direction of the tube. Its lower end is  $2\frac{3}{4}$  inches from the upper orifice of the gizzard. The gland-tubes are simple, not racemose, and average  $\frac{1}{5}$  inch in length. The remainder of the area of the proventriculus, about five sixths of it, is covered with coarse and irregularly folded epithelium.

The *gizzard* is constructed on the usual type; it is decidedly small in proportion to the size of the bird (in the Anseres it is as conspicuously large), being much more elongate, narrow, and less muscular than in grain-feeders. Longitudinal folds plicate the triturating surfaces, which are smooth in the Geese, Ducks, and Swans.

The *spleen* is the size of a haricot bean, and of much the same shape. Its position is in no way peculiar; but, as in all birds, being placed *above* the gizzard, it tends to confirm the opinion that the latter organ is only the representative of the pyloric end of the stomach, the cardiac component of which is represented by the proventriculus.

The *liver* is composed of two simple rounded lobes, united by a narrow isthmus of hepatic tissue; the lobes are of nearly equal size; and there is a fairly voluminous gall-bladder.

The following table gives the intestinal lengths:—

	♂	♀
	ft. in.	ft. in.
Small intestine . . . . .	7 3	6 10
Large intestine . . . . .	1 1	0 7
Cæca . . . . .	0 3	0 2

The *duodenum*, with its characteristic bend round the pancreas, is more capacious than the rest of the small intestine; but it is not large, being about  $\frac{1}{4}$  inch in diameter. The hepatic and pancreatic ducts enter it at the bend,  $2\frac{1}{2}$  inches from the pylorus.

The pair of *cæca* present a condition unlike that found in any other bird with which I am acquainted. In that they are situated some considerable distance from the cloaca, they agree only with *Struthio* and *Rhea*. In the much larger Cassowaries the large intestine is not more than 7 inches long. In both *Apteryx* and the Tinamous, as well as in all other birds, the Anseres and Gallinæ included, the large intestine does not exceed 4 inches in length. *Chauna* in having a large intestine, the length of which is several times the diameter of the gut, agrees therefore with *Struthio* and *Rhea* only. These organs are figured in Plate XIII., they being opened up in fig. 1 to show their internal structure.

Instead of being smooth externally, the *cæca* are sacculated on two longitudinal bands. They are peculiarly capacious for their

length, and fusiform in general outline. The sacculating bands are not lateral, but on their outer and inner borders, being continued from the longitudinal fibres of the large and the small intestine. Their mucous membrane is not plicated when they are distended. It is only, among other birds, in *Struthio* and *Rhea* that the cæca are sacculated; in these, however, there is only a spiral twist like that in the cæcum of the hares and rabbits.

Each cæcum has a well-developed special sphincter muscle guarding its aperture of communication with the intestine; and what is more peculiar still is, that they do not open into the colon proper, but into a special cavity, a continuation of the main intestinal tube, but separated off by a very constricting sphincter from the colon, as well as by the ileo-cæcal valve from the small intestine. This ileo-colic cavity is  $\frac{3}{4}$  of an inch long and about  $\frac{1}{2}$  an inch in diameter when undistended. Its mucous membrane is like that of the cæca, much more delicate than that of the colon. The ileo-cæcal valve is a small slit-like opening, nearly  $\frac{1}{4}$  of an inch long, with its lips projecting a little way into the ileo-colic cavity. The two openings of the cæca into the same cavity are one on each side of it, a little oblique in regard to it, and considerably larger in lumen. The opening into the colon is very constricted; beyond it the mucous membrane of the large intestine is, as Dr. Crisp remarks\*, transversely plicated, to produce an appearance much like coarse valvulæ conniventes.

Nothing like the above-described condition is to be observed in any other bird, not even in *Struthio* or *Rhea*, in both of which, as typically, the cæca enter the commencement of the uniformly cylindrical colon by fair-sized orifices, not surrounded by a special sphincter. This being the case, I cannot agree with Prof. Parker's remark † that "there is nothing whatever in the digestive organs, which are extremely voluminous, to separate the bird from the Geese."

*Respiratory Organs.*—Prof. Parker ‡ remarks, "the trachea and inferior larynx are truly anserine; for there are no inferior laryngeal muscles, the contractors of the trachea ending one third of an inch above the bifurcation, and only a delicate fan-shaped fascia going to the half-rings. Moreover the trachea itself, from being flat and cartilaginous, becomes round and then compressed, and osseous an inch above the bronchi, so that it cannot be mistaken for any other than the trachea of an anatine bird." In that the lower end of the trachea is of smaller diameter than is the tube higher up, in that in the same part the constituent rings are in close contact without scarcely any intervening membrane, in that there are two pairs of tracheal muscles running to the thoracic parietes, and in that the intrinsic lateral tracheal muscles end before they reach the bifurcation of the bronchi, the syrinx of the Screamers approaches that of some of the Anseres; but in that there is no special modification of the organ in the male, and in the absence of chondrification or ossification of what are generally present as dilating rings or half-rings

\* P. Z. S. 1864, p. 16.

† P. Z. S. 1863, p. 514.

‡ *Loc. cit.*

to the bronchi, the Screamers are not Anserine, and in the latter feature peculiar.

There is nothing remarkable in the rings of the windpipe, their interlocking producing the well-known key-pattern. The last two are greatly compressed laterally, so that the membranous bronchi, in each of which there are only a very few slender half-rings, arise quite close together. As can be seen from the figure, Plate XII. figs. 2, 3, 4, the lateral muscles of the trachea are peculiarly powerful; the upper extrinsic pair is inserted into the middle of the membrane which runs between the body of the coracoid bone and the corresponding limb of the furcula on each side; the lower close to the costal process of the sternum, at the back of the sterno-coracoid articular margin of the former bone. The intrinsic muscle on each side descends the windpipe to end by bifurcating opposite the origin of the sterno-tracheal muscle, and cease, its anterior portion higher than its posterior, six or seven rings lower down, some distance above the bifurcation of the bronchi. The above-mentioned extremely delicate nature of the commencing bronchial tubes is most peculiar.

The lungs present no special features of interest.

There are several myological characters which, though small in themselves, all go to form the exact definition of any group of birds, and aid in the determination of affinities. Among the more important of these are the presence or absence of the ambiens muscle\* (which is of fair size in *Chauna*), the presence or absence of the femoro-caudal, the semitendinosus, and their accessory heads (which are all four found in *Chauna*). Having dwelt fully on the importance of these muscles in the paper just referred to, all I need remark on the present occasion with regard to them is, that there is therefore a difference between this bird and all the true anserine birds, in none of which is there ever a trace of the accessory semitendinosus. A reference to my paper on the muscles of the thigh of birds will show that in possessing all the five above-mentioned muscles the Screamers agree only with the Gallinæ and their nearest allies, the Rallidæ, Musophagidæ, Cuculidæ, Columbæ, and some of the Limicolæ.

With reference to secondary myological points, there are four which, in my estimation, deserve special attention. They are:—

1. The presence or absence of the *expansor secundariorum* muscle.
  2. The presence or absence of a special muscular slip from the *biceps humeri* to the patagium.
  3. The area of origin of the *obturator internus*.
  4. The degree of development of the *tensor-cruoris fasciæ*.
- These will be considered separately.

1. *The presence or absence of the Expansor secundariorum muscle.*

*Expansor secundariorum* is the name which it is my habit to employ for a very small and peculiar triangular muscle arising from the quills of the last few (generally two or three) secondary

\* *Vide* P. Z. S. 1874, p. 116.

remiges at the elbow. Its remarkably long and slender tendon, which frequently traverses a fibrous pulley on the axillary margin of the *teres* muscle, runs up the arm side by side with the axillary vessels and nerves to be inserted in the thorax, into the middle of a tendon which runs from the inner side of the middle of the scapular element of the scapulo-coracoid articulation to near the middle of the thoracic border of the sterno-coracoid articulation, at right angles to it when the fore limb is extended. This arrangement being found very well differentiated in the Storks, may, for the sake of convenience, be termed *Ciconine*. In *Chauna* it is exactly the same, as may be seen from the accompanying drawing (Plate XIV. fig. 1, *e.s*).

In the majority of the Gallinaceous birds the *expansor secundariorum*, with the normal origin from the secondary quills, has a different method of insertion, which has led M. A. Milne-Edwards to describe the muscle in the common Fowl as a part of the *coraco-brachialis (brevis)* in his superb work on fossil birds.

In the genera *Tetrao*, *Francolinus*, *Rollulus*, *Phasianus*, *Euplocamus*, *Gallus*, *Ceriornis*, and *Pavo*, the muscle instead of being inserted into the scapulo-sternal fibrous band above referred to, after blending to a certain extent with the axillary margin of the *teres*, ceases by becoming fixed to a fibrous intersection about one third down the *coraco-brachialis brevis* muscle.

In *Francolinus clapperteni* from among the Francolins, *Coturnix*, *Odontophorus*, *Ortyx*, *Eupsychortyx*, and *Numida*, the tendon does not go so far as the short *coraco-brachialis*, but ends either by simply joining the axillary margin of the *teres*, or by at the same time sending a tendinous slip behind it to the scapula. In *Argus giganteus* the tendon, running from the elbow, turns round the axillary border of the *teres* to end by joining a triangular muscular fasciculus, attached by its base to the upper portion of the thoracic surface, which appears to be nothing but a differentiation-off of the upper portion of the last-named muscle. In the *Cracidæ* this insertion into the scapula is also found, but it is tendinous, like the upper element of the thoracic band above described in the Storks and *Chauna*; and in them there is also a second tendinous slip from the axillary margin of the *coraco-brachialis longus* (Plate XII. fig. 5) (not the *brevis*). In the Megapodidæ also the attachment to the *coraco-brachialis brevis* is wanting, the tendon ending either by blending with the *teres*-margin, or running on to the scapula.

In the Ducks and Geese among the Anseres the tendons under consideration, when they enter the thorax, run towards one another and join, after having expanded out, in the middle line, in front of the œsophagus, and behind the trachea. In the Swans this arrangement is not found, the tendons ending in the ciconine manner, or by running to the upper end of the scapula; and in this respect *Sarcidiornis* resembles them.

From the tabular statement now exhibited (see p. 199) the nature as well as the presence or absence of this muscle can be determined in any special group of birds. The only Anomalognathous birds in which I have found this muscle are the Coraciidæ.

2. *The presence or absence of a special muscular slip from the Biceps humeri to the Patagium.*

The *biceps humeri*, the main flexor of the arm, arises from the upper end of the coracoid bone, and from the upper portion of the flexor surface of the humerus. In certain birds this muscle sends off from its upper end a slender fusiform belly, which runs through the proximal portion of the patagium to join its marginal tendon near the middle of its course (Plate XIV. fig. 2). The presence or absence of this muscular fasciculus is a very constant character among closely allied birds. In the Table (p. 199) are recorded the names of all those birds in which, according to my experience, it is to be found. The only Anomalognathous birds in which I have seen it are the *Caprimulgidæ*.

3. *The Area of Origin of the Obturator internus.*

It is not my intention on the present occasion to enter into the consideration of whether the muscle here called *obturator internus* is homologous with the same-named muscle in Mammalia; suffice it to say that it arises from the pelvic surface of the pubis and ischium, and ends by a tendon which is inserted into the outer surface of the head of the femur.

In a large number of birds, on looking at the pelvic view of this muscle when undisturbed, its shape is seen to be an elongated oval, occupying the obturator fossa, and covering the line of junction of the ischium and pubis. In another large number of birds, instead of being oval it is triangular, its posterior fibres expanding in such a way as to cover most of the pelvic surface of the ischium. There are a few birds in which an intermediate condition is found; they are, however, very few. In most there is not the least difficulty in deciding whether the *obturator internus* is *oval* or *triangular* (compare Plate XV. figs. 1 and 2). From the Table (p. 199) the arrangement existing in most birds can be found.

4. *The degree of Development of the Tensor-cruris fasciæ.*

To this point I have referred in my paper on the muscles of Birds\*, where its relations are explained. "It is the superficial muscle of the outside of the thigh, covering the femur. It is flat and triangular in shape, and arises as a membranous expansion which covers the gluteus ii., from the lower two thirds of the posterior border of the iliac fossa in which that muscle is situated, and from the fibrous septum which separates that muscle from the gluteus iii. Further down it has origin also from the whole length of the ridge which separates the postacetabular area from the external lateral surface of the ischium, and which may be termed the postacetabular ridge, as well as from the posterior border of the ischium, as far forwards as its junction with the pubis, being here slightly overlapped by the semitendinosus. The fibres converge towards the knee; and the deep portion of the muscle blends in its course with the vastus externus, together with which it continues

\* P. Z. S. 1873, p. 628.

forward to become part of the broad thin tendon which covers the knee and is inserted in the front of the tibia-head, the patella being situated in it, together with the long, slender, and flat tendon of the *ambiens* muscle, which is situated below it, running obliquely from inside and above, outwards and downwards. In many birds this muscle does not extend below the level of the femur, but ends inferiorly by blending with the *vastus externus*; and consequently, where such is the case, it evidently cannot, as it does otherwise, cover any of the flexors of the leg." Whether this postacetabular portion of the *tensor fasciæ* is present or absent can be found by referring to the Table (p. 199). There are not many birds in which it is very small.

As the Anserine affinities of the Screamers are being discussed, it ought to be mentioned that in all the former the great pectoral flexor of the wing is peculiarly elongate, and extends upwards above the *symphysis furculæ*, with its fellow forming a median raphe as an anterior continuation of the *carina sterni*. The only other birds in which this occurs are the Penguins. In the Screamers the great pectoral flexor is not large, and does not extend upwards above the middle of the furcula.

In the Anseres the extensor pectoral (second pectoral) is always very long and broad, reaching the lower end of the sternum. In *Chauna* it does not extend nearly to the posterior margin of the sternum, and it is not bulky.

Again, the muscles of the Anseres are always intensely dark in colour, whilst in the Screamer they are quite pale. In this respect the two groups differ in the same way as do the Seals and the Sirenia among Mammals.

*Osseous System.*—The skull, being that portion of the skeleton which is least permeated with air, will receive the greatest attention on the present occasion. With reference to it Prof. Parker remarks\*, "All the skull and face, except at its two ends, conforms to the lamellirostral type." Prof. Huxley also places *Palamedea* in his group "Chenomorphæ," among the several features characterizing those birds being that "the lachrymal region of the skull is remarkably long." That such is not the case in *Chauna*, Prof. Parker has remarked in his article "Birds" in the *Encyclopædia Britannica*†.

It may be well before proceeding further to inquire more fully into the nature of the lamellirostral type. Prof. Parker tells us that "the great embryological distinctions between the skull and face of the Geese and Fowls are, first, that in the latter the space between the periotic mass and the superoccipital cartilage is a mere chink, in the latter a persistent oval space; and secondly, that the anterior parts of the face, viz. the præmaxillæ, prævomers [maxillæ], and dentaries are small and compressed in the Fowls, large and outspread in the sifting birds." A glance at the accompanying figures of the posterior surface of the skulls of a Magellanic Goose, a Derbian Screamer, and a Razor-billed Curassow will enable the reader to decide for himself which of the two groups, the Anseres or the Gallinæ, the

\* P. Z. S. 1863, p. 514.

† Enc. Brit. 8th edit. vol. iii. p. 712.

Screamer more closely approaches. It evidently does not share the peculiarities of the former, in all species of which the surface of origin for the pair of large extensor muscles of the mandible is characteristically compressed from side to side, and elongated from above downwards, at the same time that there is the pair of openings above the foramen magnum (figs. 1, 2, 3, p. 198).

Again, from a comparison of the inferior surfaces of the same three skulls, it is equally evident that in the Screamer the præmaxillæ, maxillaries, and dentaries agree with the same bones in the Gallinaceous bird in not being large and outspreading. The palate of *Chauna* is represented in fig. 4.

In the Screamers the skull is, no doubt, as in the Anseres, desmognathous, having the maxillo-palatines united across the middle line; but this character is not sufficiently important to compel us to unite the two groups; for if such were the case it would be necessary to give credence to an association of birds which is in other respects extremely unnatural. In the Capitonidæ, for instance, *Megalæma* is not desmognathous, whilst *Tetragonops* is so.

As before stated, in the Anserine birds the lachrymal region is specially long. This is least marked in the *Cereopsis* Goose (*Cereopsis novæ-hollandiæ*), where, however, it is clearly apparent. In *Chauna*, the lachrymal region is as short as in the Gallinæ, not in the least elongated.

In both the Anseres and Gallinæ the pterygoid bones have large faceted surfaces for articulation with the basisphenoid rostrum. In both groups these facets are situated very far forwards—quite at the anterior ends of the bones in the latter; in *Chauna*, however, these articulations are quite independent of the anterior ends of the bones (fig. 4), being nearly as far backward as the middle of their otherwise free moieties.

As to the quadrate bones, their cranial articulations are bifid, which is the case in all birds except *Struthio*, *Rhea*, *Dromæus*, *Casuaris*, *Apteryx*, the Crypturi, and some (most) of the Gallinæ. They do to a certain extent resemble the same bones in the Anseres in having the articular surfaces for the jugal arches situated some way behind the level of their mandibular articulations (not a Gallinaceous character), which latter they also resemble in configuration, the usually extended outer facet not running backwards and inwards as in most birds but not in the Gallinæ.

In the Gallinæ, as in the Crypturi, the pterygo-quadrate articulation is much longer than in other members of the class. In *Chauna* this is not the case.

In *Chauna* the angle of the mandible is much prolonged and up-curved, as in the Anseres, from which it however differs in not being deeply excavated in the interval between the upturned process and the inwardly-directed articular angle. It must be remembered that the mandible is much the same in the Gallinæ.

It must also be remembered that the Screamers are the only birds in which there are no uncinatæ processes to the ribs, as has been shown by Mr. Parker.

Fig. 1.

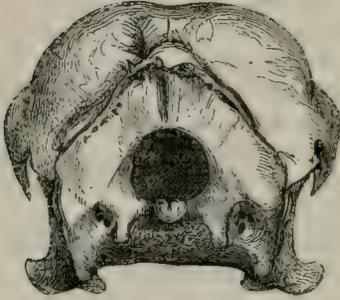


Fig. 3.

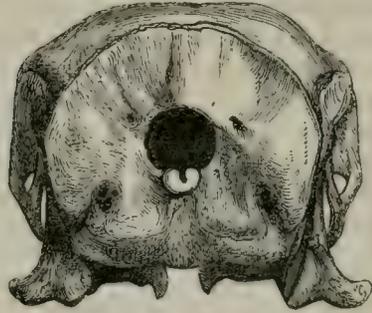
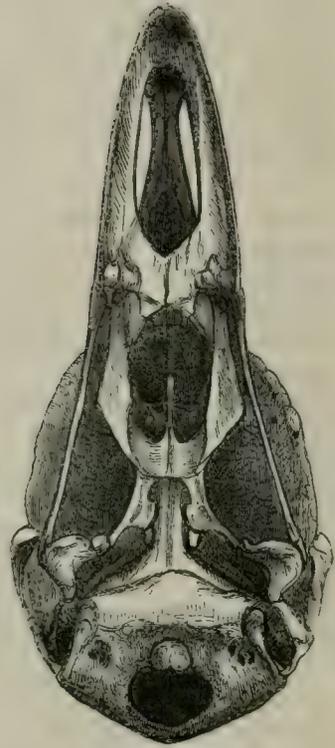
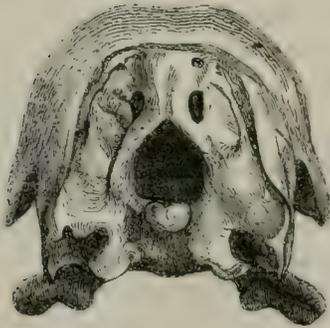


Fig. 4.

Fig. 2.



- Fig. 1. *Chauna derbiana*. Back view of skull.  
 Fig. 2. *Chloëphaga magellanica*. Back view of skull.  
 Fig. 3. *Mitua tuberosa*. Back view of skull.  
 Fig. 4. *Chauna derbiana*. Base of skull.

TABLE.

Name of family.	Expansor secundariorum (see p. 193).	Biceps slip to the patagium (see p. 195).	Obturator internus (see p. 195).	Postacetabular portion of tensor fasciæ (see p. 195).
TINAMIDÆ .....	Ciconine.	Absent.	Triangular.	Large.
PALAMEDEIDÆ ...	Ciconine.	Absent.	Oval.	Absent.
GALLINÆ .....	Present (vide p. 194).	Absent only in Cracidæ.	Triangular.	Large.
RALLIDÆ .....	Ciconine.	Present.	Triangular.	Large.
OTIDIDÆ.....	Ciconine.	Absent.	Oval.	Present.
<i>Cariama</i> .....	Ciconine.	Absent.	Triangular.	Present.
<i>Phanicopterus</i> ...	Ciconine.	Present.	Oval.	Present.
<i>Serpentarius</i> .....	Ciconine.	Absent.	Triangular.	Absent.
MUSOPHAGIDÆ ...	Ciconine.	Absent.	Triangular.	Present.
CUCULIDÆ .....	Ciconine.	Absent.	Triangular.	Present.
PSITTACI.....	Absent.	Absent.	.....	Absent.
ANATIDÆ .....	Ciconine in <i>Cygnina</i> , peculiar in others (vide p. 194).	Present.	Peculiar from elongation of pelvis.	Present, except in <i>Cygnina</i> .
SPHENISCIDÆ .....	.....	.....	Triangular.	Absent.
COLYMBIDÆ .....	Not seen.	Present.	?	Present.
PODICIPITIDÆ.....	Not seen.	Present.	Oval.	Present.
PROCELLARIIDÆ ..	?	?	?	?
FULMARIIDÆ .....	?	?	Oval.	Absent.
PELAGI.....	Ciconine.	Absent.	Oval.	Absent, or extremely small.
CATHARTIDÆ .....	Ciconine.	Absent.	Triangular.	Present.
HERODIONES .....	Ciconine (not in <i>Cancroma</i> and <i>Egretta</i> ).	Absent.	Triangular.	Absent, or extremely small.
STEGANOPODES ...	Absent.	Absent, except in <i>Phalacrocoracidæ</i> .	Oval.	Absent.
ACCIPITRES.....	Absent (not in <i>Falco</i> , <i>Polyborus</i> , and <i>Tinnunculus</i> ).	Absent.	Triangular (exc. <i>Neophron</i> ).	Absent.
STRIGIDÆ .....	Absent.	Absent.	Triangular (not <i>Scops</i> ).	Absent.
COLUMBÆ .....	Feeble or absent.	Present.	Oval.	Present.
CHARADRIIDÆ.....	Ciconine.	Present.	Oval.	Present.
GRUIDÆ .....	Ciconine.	Present.	Triangular.	Present.
LARIDÆ .....	In some.	Present.	Oval.	Absent.
ALCIDÆ .....	Absent.	Present.	Oval.	Present (not in <i>Arctica alle</i> ?).

In conclusion, it seems to me that from considerations of pterylosis, visceral anatomy, myology, and osteology, the Screamers cannot be placed along with the Anserine birds. In the windpipe and the form of the angle of the jaw they, no doubt, closely approach them. In their alimentary canal they are much nearer to *Struthio* and *Rhea* (not *Dromæus* and *Casuaris*) than to any other birds. There is a Ciconine tendency in their myology, whilst their osteology points in no special direction. It seems, therefore, to me that, summing these results, the Screamers must have sprung from the primary

avian stock as an independent offshoot at much the same time as did most of the other important families. It may be fairly asked what reason there is for the assumption that there was a sudden break up of the bird-type at any particular period. It appears to me from the study of anatomy that this was the case; and it is evident that the acquisition of wings by the previously terrestrial type form must have suddenly interpolated a large number of intruders into domains already occupied, and must have all at once called forth a new aerial struggle for existence, which, from the generalness of its action must, within a short time, have brought out a great number of special characters by natural selection.

## EXPLANATION OF THE PLATES.

## PLATE XII.

- Fig. 1. Proventriculus and gizzard of *Chauna derbiana*, cut open, and part of the front wall removed.
2. Anterior view of lower portion of windpipe of *C. derbiana*.
  3. Back view of same, the muscles of the left side having been removed.
  4. Right side view of same.
  5. Portion of right coracoid bone (*c*) with *coraco-brachialis longus* (*c.b.l*) and *coraco-brachialis brevis* (*c.b.b.*) *in situ*, of *Crax globicera*. The *expansor secundariorum* (*e.s*) is seen to spring partly from the first-named muscle.

## PLATE XIII.

- Fig. 1. Cæca of *Chauna derbiana*, with the anterior wall partly removed to show the cavity intervening between the small and large intestine into which the cæca open.
2. The cæca, external view.

## PLATE XIV.

- Fig. 1. Axillary muscles of right side of *Chauna derbiana*. *e.s*, *expansor secundariorum*; *p* 1, great pectoral; *p* 2, second pectoral; *c.b.l*, *coraco-brachialis longus*; *b*, biceps; *t*, triceps; *t.p.b*, *tensor patagii brevis*; *sc*, scapula; *st*, sternum; *c*, coracoid; *f*, furcula; *h*, humerus; *c.v*, cervical vertebræ; *tr*, trachea; *S.R*, secondary remiges.
2. The same part, left side, of *Gallinula chloropus*. *B. slip*, biceps slip; *t.p.l*, *tensor patagii longus*.

## PLATE XV.

- Fig. 1. Muscles of right side of interior of pelvis and inner side of thigh of *Chauna derbiana*, the muscles of the anterior abdominal wall having been removed. *o.i*, obturator internus; *Amb*, *Ambiens*; *Quad*, *Quadriceps extensor*; *Ad*, *adductor*; *s.t*, *semitendinosus*.
2. The same parts of *Euplocamus albo cristatus*, similarly lettered. *sart*, *sartorius*.

4. Notes on Entozoa. Part III. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Correspondent of the Academy of Sciences of Philadelphia.

[Received January 18, 1876.]

(Plate XVI.)

In continuing the "Notes" commenced in 1873, I may observe that I have recently received important additions from naturalists



T.S.C. del. J.Smit lith.

M&N.Hanhart imp.

ECHINORHYNCHUS ELEGANS.



abroad. Although it so happens that comparatively few of the parasites are altogether new to science, yet most of the contributions present, in one way or another, points of interest. I propose in future to extend the character of my notes, not only recording new habitats and describing new species, but also paying regard to all facts tending to throw light upon the question of geographical distribution. I wish also to remark more fully on structural and morphological peculiarities, especially when dealing with aberrant types. The importance of certain species in relation to epidemics will also receive attention. None can regret more than myself the necessarily incomplete character of these records. It is evident, however, that if we home-naturalists defer all public notice of the receipt of specimens from co-workers abroad until we happen to have time at our command to do full justice to the contributions, a multitude of useful facts will inevitably be lost to science. In this connexion I may likewise observe that the mere verification of already known phenomena, especially in the matter of distribution, is not without its cumulative value.

#### 8. *FILARIA TEREBRA* (Diesing).

On the 27th of February, 1875, Dr. Edward L. Moss, of H.M.S. 'Alert,' now engaged in the Arctic Expedition, brought me three examples of a nematode, which I have little hesitation in referring to this species.

Dr. Moss obtained these parasites in 1874, during the time that he had charge of the Naval Hospital at Esquimalt, Vancouver's Island, British Columbia. They occupied the abdominal cavity of the Black-tailed Deer (*Cervus columbianus*). The worms (usually one, but occasionally two, being present in each cervine bearer) were commonly found lying amongst the coils of the small intestine. They had not in any way attached themselves to the peritoneal membrane. I understood Dr. Moss to say, in conversation, that he had shot seventeen deer in all, the males and females being in about equal proportion; nevertheless not one of the bucks examined by him showed any trace of the presence of these entozoa. This absence of parasites in the male hosts can hardly, I should think, have been otherwise than accidental. Hitherto the worm appears to have been observed in the Red Deer (*C. elaphus*) and in three species of American Roe (*C. rufus*, *C. simplicicornis*, and *C. nambi*) by Natterer. Two of the worms measured each about  $2\frac{1}{2}$  inches in length, the third exceeding 3 inches. The head of one was injured; but the other two displayed in profile two prominent oral papillæ. Probably there were four of these processes, such as Dujardin described in his *Filaria cervina*, which, according to Diesing, is a synonym of this species. The body is marked throughout its entire length by a series of prominent and regular folds, these, in some situations, becoming so conspicuous that, under an ordinary pocket-lens, they present a beaded appearance. All the specimens had their attenuated tails more or less spirally twisted; and a single brown-coloured line occupied the whole length of the body. The precise relations

of this narrow but well-marked band are worthy of further study. I believe the parasites were all males; but I was unable to detect the external sexual openings.

#### 9. ECHINORHYNCHUS TRANSVERSUS (Rud.)

On the 18th of February, 1875, I received from Dr. Hooker, Pres. R.S., eleven examples of a small acanthocephalus worm for identification. They were obtained by his son, Mr. Charles P. Hooker, who subsequently informed me by letter that he had found them in a Redwing (*Turdus iliacus*) which he dissected on or about the 5th of January, 1875. It was also mentioned that the worms occupied the large intestine, probably to the number of one hundred in all. Hitherto this parasite has been found abundantly in the Blackbird, Thrush, and in most of the *Turdidæ*; but not, I believe, in the Redwing. It has also been obtained from the Starling and Redbreast.

The occurrence of so many of these armed parasites in one host is a noteworthy circumstance; and it is difficult to understand how they could be present in such numbers without inflicting severe injury on the bearer. Of course there is no proof that the bird did not suffer inconvenience: at all events, analogous facts of parasitism produced by other species of Echinorhynchi show that these Entozoa are occasionally productive of fatal results.

#### 10. ECHINORHYNCHUS ECHINODISCUS (Diesing).

On the 1st of November, 1875, I received from Prof. Flower, F.R.S., a glass jar labelled as follows, "Entozoon found attached to intestine of the Tamandua Ant-eater." The parasite was obtained from the Society's Gardens on the 12th of August, 1871.

The Brazilian traveller, Natterer, originally obtained this worm from *Myrmecophaga jubata* and *M. bivittata*. Creplin described it from a *M. didactyla* from Surinam (Wiegmann's Archiv, 1849). I presume the *M. tamandua* answers to the *M. bivittata* of Geoffroy, as well as to the tridactyle and tetradactyle species of Linnæus.

The parasite in question appears to have been solitary. It is a female, measuring exactly 10 inches long. The annulations of the body commence about  $\frac{1}{2}$  an inch from the head, and are continued on uninterruptedly with great regularity to the end of the tail. On the average, twenty rings may be counted to the inch; thus there are quite 200 altogether, as they are somewhat more closely packed towards the neck and also at the tail. The proboscis was firmly anchored within the gut; and I was unsuccessful in my attempt to dissect it out entire. For a space of  $\frac{1}{4}$  of an inch in diameter at the point of anchorage, the intestine was opaque from inflammatory exudation.

#### 11. ECHINORHYNCHUS ELEGANS (Diesing).

Six or eight years back, Dr. Murie placed in my hands a glass jar containing eight parasites. I could not examine them at the time; but on the 18th of April 1873 I made a careful study of the worms, briefly noting down the principal facts of structure. Although the

label on the jar was in places well nigh obliterated, I made out that the worms had come from a Monkey; but not being certain as to the species, I did not attempt the identification of the parasites. Dr. Murie has since further obliged me by looking up his notes; and on the 2nd of April 1875, he informed me by letter that the host was a Pinche Monkey (*Hapale edipus*). This well known Marmoset had been obtained from New Granada. The cause of the animal's death, which occurred at the Society's Gardens on or about the 30th of June, 1866, was not ascertained. I have not in this case observed any signs of inflammation in the intestine of the host, a portion of which, with several of the Entozoa remaining attached was also supplied to me. The mucous layer of the gut shows deep conical depressions at the spots where the detached worms had anchored themselves.

So far as I can make out, Diesing's original description of the parasite is the only one that exists. I have gone over his numerous memoirs contributed to the Vienna Accademy, but can find nothing beyond the specific characters given in his 'Systema.' All the specimens in the Vienna Museum, whence his description is taken, were collected by Natterer. They were procured from the Marakina (*Midas rosalia*), from two other true Marmosets (*Hapale ursulus* and *H. chrysoleucus*), and from a Squirrel Monkey or Tee-tee (*Callithrix sciureus*).

Though in one or two unimportant particulars our observations do not agree, Diesing's description is amply sufficient for the systematist's purpose. By referring to the four specimens which I have selected for illustration, it will be seen that all the worms were more or less bent upon themselves. The larger specimens present a tolerably uniform thickness throughout, the smaller ones being thicker behind and almost club-shaped (Plate XVI. fig. 1). In detached examples, the front end of the parasite is seen to support a narrow and long neck, which is usually well marked off from the body proper (*d*). It is more or less regularly annulated, the folds being continued downwards along the body, but gradually losing their regular arrangement. If the anterior extremity of the neck be examined with a powerful pocket lens, its abrupt and truncate surface will be seen to display a number of lines or grooves radiating from a common centre (fig. 2). During the perfect retraction of the proboscis the centre is represented by a clear space, or wide opening, which communicates with a cavity immediately beneath. The end of the neck thus forms a sort of collar, or rosette, made up of rays arranged like the spokes of a wheel. When the proboscis is exerted this collar is more or less convex, but it becomes slightly concave when the proboscis is retracted. Not improbably this attractive-looking surface suggested to Diesing the specific title which he gave to the worm. He recognized 24 rays: they probably vary from that number up to 28; at least, I counted 27 in the specimen (fig. 3). During exertion, the proboscis forms, to the naked eye, a nipple-like projection (fig. 2). According to Diesing it supports three rows of hooks; but I certainly saw four rows (fig. 4). When separately magnified these hooks present very different appearances

as to size and contour. These I believe to be due to respective degrees of growth (fig. 5). Selecting one of the largest hooks, I found it to measure about  $\frac{1}{200}$  in. in length, the broadest part of its posterior root-process giving  $\frac{1}{1000}$  in. approximately. The base between the two fang-points measured  $\frac{1}{250}$  in.; whilst internally the hook displayed a well-defined cavity taking the general form of the organ itself. At its lowermost angle the cavity becomes suddenly narrowed into a fine channel that terminates in an opening at the centre of the extremity of the posterior fang. This tube is something less than the  $\frac{1}{10000}$  inch in diameter (fig. 6).

By making a vertical section of the worm one may obtain a good view of the arrangement of the parts about the head. Somewhat diagrammatically I have represented the parts as they appear in the retracted condition of the proboscis (fig. 7). This organ is now seen resting, as it were, in a cavity formed by the arching over of the rosette-shaped collar. The sheath of the proboscis itself is bordered by powerful retractor muscles, which during extreme contraction reduce the proboscis to the form of an oval disk, at the same time carrying the whole organ downward so as to conceal it entirely within the lumen of the neck. The lower end of the muscular sheath assumes the shape of a reversed cone, well rounded off at its dependent apex. The sides of the neck are lined with longitudinal muscular bundles, portions of which are, I suspect, differentiated to form the special retractors of the sheath. Be that as it may, on either side of the bulbous end of the sheath the lemnisci are conspicuous and easily drawn out with a fine pair of forceps. They extend downwards to near the centre of the somatic cavity, attaining, in the largest specimens, a length of no less than  $\frac{3}{4}$  inch. Free ovaria were not observed; but I found abundance of eggs, which were of an oval form, measuring about  $\frac{1}{500}$  in. from pole to pole and  $\frac{1}{800}$  in. in breadth. They displayed three distinct envelopes. The outer transparent and very delicate membrane was marked by decussating curvilinear lines (fig. 8 *a*), being succeeded by a second thicker envelope (*b*), the two being separated by fluid contents. Many ova were found freed from these coverings, these being, as a rule, rather more advanced in growth, as shown by their finely divided yolk-contents, which in some instances had passed into an early embryonal stage. In this condition the eggs measured only  $\frac{1}{750}$  by  $\frac{1}{670}$  in. My sections of the body of the parasite showed the openings of numerous water-vascular channels; but I did not carry the investigation further.

#### EXPLANATION OF PLATE XVI.

- Fig. 1. Four examples of *Echinorhynchus elegans*: *a*, immature; *b*, *c*, *d*, full-grown, natural size.
- Fig. 2. Anterior extremity of a mature worm, showing the annulations of the neck (*a*), the collar in profile (*b*), and the exerted portion of the proboscis (*c*). Enlarged.
- Fig. 3. The collar, viewed from above, showing the folded border of the neck (*a*), the series of rays (*b*), and the central opening (*c*). Highly magnified.
- Fig. 4. Diagram of the proboscis in its retracted condition, to show the arrangement of the hooks.





Willis del. et lith.

M & N. Harhart imp.

PERUVIAN BUTTERFLIES





- Fig. 5. Four of the hooks as serially arranged on the proboscis: *a*, from the external series, *b*, from the second, *c*, from the third, and *d*, from the innermost, respectively. Magnified 60 diameters.
- Fig. 6. A hook from the outermost row; showing the apex (*a*), base (*b*), bulbous projection (*c*), the posterior root-process or fang (*d*), the minute opening at its extremity (*e*), which by means of a narrow channel (*f*) communicates with the general cavity of the organ (*g*). The anterior fang is marked *h*. Magnified 355 diameters.
- Fig. 7. Diagram representing a vertical section of the anterior end of the neck: *a*, collar; *b*, fold of the first annulation; *c*, sheath of the proboscis; *d*, lumen of the neck; *e*, cavity for lodgment of the retracted proboscis; *f*, longitudinal muscular layer; *g*, lemniscus.
- Fig. 8. Three eggs, showing the outer (*a*), middle (*b*), and inner envelope (*c*); also the yolk (*d*). Magnified 350 diameters.
- Fig. 9. Two of the eggs found divested of their external coverings.

5. List of the Butterflies of Peru, with Descriptions of new Species. By HERBERT DRUCE, F.L.S., F.Z.S. With some Notes by EDWARD BARTLETT.

[Received January 10, 1876.]

(Plates XVII. & XVIII.)

During the past few years Mr. Salvin and I have received several collections from Peru, principally made by Mr. Henry Whitely. I now think it advisable to draw up the following list of the species, only including those that I have been able to examine myself, and of which I am certain of the locality being correct. I hope by so doing to give some idea of the Butterfly-fauna of Peru, as well as to advance our knowledge of the geographical distribution of Butterflies. The collections from which I have made this list were formed by Mr. Bartlett, Mr. Henry Whitely, and Mr. Pearce, in the following localities.

Mr. Bartlett collected in the eastern part of Peru; for the exact places visited by him, see map, P. Z. S. 1873, p. 252, pl. xxv. Mr. Henry Whitely's principal collection was made in the valley of Cosnipata, situated on the eastern slope of the Andes of Carabaya, and the smaller collections at Paucartombo and Huasampilla, eastward of Cuzco, at an elevation of about 9000 to 10,000 feet; he also made a very small collection last year at Huiro, valley of Santana, north of Cuzco, at an elevation of about 4800 feet. Mr. Pearce, who travelled in Peru and Bolivia as a botanical collector for Messrs. James Veitch and Sons, the well-known Horticulturists, collected at Pozuzo and Mūna.

The collections contained 494 species (18 of which I have described as new), representing 133 genera.

Mr. Bartlett's collection had been picked over before any specimens came into our possession; so that this list does not contain all the species collected by him.

## Family I. NYMPHALIDÆ, Swains.

## Subfamily 1. DANAINÆ, Bates.

## Genus DANAIS, Latr.

1. *D. ERESIMUS*, Cram. (*Pap. e.*) Pap. Exot. ii. t. 175. f. G, H (1779).

Ucayali (*Bartlett*). Mus. D.  
 "Not common; frequents the banks of rivers."—*E. B.*

2. *D. HERMIPPUS*, Feld. Reise Nov. Lep. ii. p. 348 (1867).

Cormillo (*Pearce*). Mus. S. G.

## Genus LYCOREA, Doubl.

1. *L. CLEOBÆA*, Godt. (*Helic. c.*) Enc. Méth. ix. p. 222 (1819).  
 Peru. Mus. D.

2. *L. ATERGATIS*, Doubl. & Hew. Gen. D. L. t. 16. f. 1 (1847).

Pozzuzo (*Pearce*). Mus. S. G.  
 Nauta (*Bartlett*). Mus. D.

"Found in damp shady places."—*E. B.*

## Genus ITUNA, Doubl.

1. *T. PHENARETE*, Doubl. & Hew. Gen. D. L. t. 17. f. 1 (1847).

Pozzuzo (*Pearce*). Mus. S. G. & D.

## Genus METHONA, Doubl.

1. *M. PSIDI*, Linn. (*Pap. p.*) Mus. Ulr. p. 228 (1764).

Pozzuzo (*Pearce*). Mus. S. G.

Ucayali (*Bartlett*). Mus. D.

"In shady places on the banks of the Ucayali."—*E. B.*

## Genus THYRIDIA, Hübn.

1. *T. INO*, Feld. Wien. ent. Mon. vi. p. 75 (1862).

Pozzuzo (*Pearce*). Mus. S. G.

## Genus DIRCENNA, Doubl.

1. *D. ZELIE* (*Helic. z.*), Guér. Icon. Règne Anim. Ins. texte, p. 470 (1844).

Ucayali (*Bartlett*). Mus. S. G. & D.

"Frequents dull shady places."—*E. B.*

2. *D. RHŒA*, Feld. Wien. ent. Mon. iv. p. 102 (1860).

Ucayali (*Bartlett*). Mus. S. G.

## Genus CERATINIA, Hübn.

1. *C. OULITA*, Hew. (*Ith. o.*) Exot. Butt. ii. *Ith.* t. 22. f. 138 (1859).

Peru. Mus. D.

2. *C. STATILLA*, Hew. (*Ith. s.*) Exot. Butt. v. *Ith. t.* 32. f. 217 (1874).

Huiro, valley of Santana (*H. Whitely*). Mus. D.

3. *C. CRISPINILLA*, Hopff. Stett. ent. Zeit. 1874, p. 340.

Ucayali (*Bartlett*). Mus. D.

4. *C. SEMIFULVA*, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 163 (1869).

Pozuzo (*Pearce*). Mus. S. G. & D.

5. *C. ANASTASIA*, Bates, Trans. Linn. Soc. xxiii. p. 526 (1862).

Ucayali (*Bartlett*). Mus. D.

"Taken in the broad pathways to Sarayacu on the Upper Ucayali; not common."—*E. B.*

6. *C. FRATER*, Salv. (*Ith. f.*) Ann. Nat. Hist. ser. 4, vol. iv. p. 163 (1869).

Pozuzo (*Pearce*). Mus. S. G. & D.

7. *C. ALEXIA*, n. sp. (Plate XVII. fig. 4.)

Upperside (*female*): anterior wing black, with the base rufous orange; a yellow spot at the end of the cell and one below nearest the anal angle crossed near the apex by a band of yellow, a submarginal row of six small white spots; posterior wing rufous orange, a spot at the end of the cell and the outer margin black. Underside the same as above, with less orange-colour; the costal margin of the posterior wing black, and a submarginal row of white spots on the hind margin.

Exp.  $2\frac{1}{4}$  inches.

Peru. Mus. D.

8. *C. BAANA*, n. sp.

Upperside (*female*) orange; anterior wing crossed beyond the middle by a narrow band of yellow, an elongated spot in the cell, one at the end of the cell, and one below near the inner margin all black; the apex broadly black; posterior wing orange, with the outer margin (which is very narrow) black. Underside the same as above, except that the base of the posterior wing is yellow, the costal margin black, and a submarginal band of white spots to both wings.

Exp.  $2\frac{1}{4}$  inches.

Peru. Mus. D.

9. *C. TIGRINA*, n. sp. (Plate XVII. fig. 2.)

Upperside (*female*) like *C. fluonia* without the yellow markings, except a small spot beyond the middle on the costal margin, the apex rufous with a marginal row of black spots; posterior wing rufous, with the central band as in *C. fluonia*, the outer margin black, den-  
tated on the inner side. Underside as above.

Exp.  $2\frac{1}{4}$  inches.

Ucayali (*Bartlett*).

Mus. D. & S. G.

The specimens vary in the amount of yellow in the posterior wing. It may be a local race of *C. fluonia*, but is a distinct and well-marked form.

Genus SAIS, Hübn.

1. S. ZITELLA, Hew. (*Ith. z.*) Exot. Butt. iv. *Ith.* t. 25. f. 176 (1868).

Ucayali (*Bartlett*).

Mus. S. G. & D.

Genus SCADA, Kirby.

1. S. THEAPHIA (Bates), Trans. Linn. Soc. xxiii. p. 529 (1862).

Ucayali (*Bartlett*).

Mus. D.

“Found in low moist places in the forest, upon a small white flower.”—*E. B.*

Genus MECHANITIS, Fabr.

1. M. ORTYGIA, n. sp. (Plate XVII. fig. 5.)

Upperside (*male*) transparent yellowish white, bordered with greyish black, the margins all black; the anterior wing crossed at the end of the cell by a black band widest on the costal margin. Underside as above, except that the base and half of the costal margin of the posterior wing is yellow, and several white spots at the apex of both wings.

Exp. 2 inches.

Huero, valley of Santana (*H. Whitely*).

Mus. D.

A most singular species, exactly like an *Ithomia* with the neuration of *Mechanitis*.

2. M. POLYMNIA, Linn. (*Pap. p.*) Mus. Ulr. p. 224 (1764).

Nauta and Chyavetes (*Bartlett*).

Mus. D.

3. M. METHONE, Hew. Exot. Butt. ii. *Mech.* t. 3. f. 14 (1860).

Peru.

Mus. D.

4. M. MAZÆUS, Hew. *l. c.* t. 2. f. 8 (1860).

Huallaga (*Bartlett*).

Mus. S. G.

5. M. OCONA, n. sp.

Upperside (*male*): anterior wing black, the base to the middle of the cell rufous; an oblique band crossing the end of the cell to the apex and two others beyond bright yellow, the third close to the apex and only extending to the middle of the wing, four small white spots on the hind margin; posterior wing orange, yellowish in the middle, crossed from the inner margin to the apex by a zigzag band of black, the outer margin black, widest at the apex. Underside the same as above, with a submarginal row of white spots to both wings and the costal margin of the posterior wing black.

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

Huero, valley of Santana (*H. Whitely*).

Mus. D.

Mr. Whitely has only sent one specimen of this species.

## Genus NAPEOGENES, Bates.

1. N. CORENA, Hew. (*Ith. c.*) Exot. Butt. ii. *Ith. t.* 23. f. 142 (1861).

Yurimaguas (*Bartlett*). Mus. D.  
"Rare."—*E. B.*

2. N. VERTICILLA, Hew. Exot. Butt. v. *Ith. t.* 33. f. 219 (1874).

Peru. Mus. D.

3. N. PHARO, Feld. Wien. ent. Mon. vii. p. 76 (1862).

Ucayali (*Bartlett*). Mus. D.

"The species of this genus are found in the darkest parts of the forest, upon small obscure flowers, which they resemble, only being noticed when disturbed."—*E. B.*

4. N. PYRRHO, n. sp. (Plate XVII. fig. 1.)

Upperside (*female*): anterior wing orange, the apical half and a round spot in the cell black, crossed at the apex by a band of pale yellow; posterior wing orange, with the outer margin and a band of spots placed longitudinally across the middle black. Underside: anterior wing the same as above, with a submarginal row of white spots; posterior wing as above, with two small white spots at the apex.

Exp.  $2\frac{1}{4}$  inch.

Yurimaguas (*Bartlett*). Mus. D.

## Genus ITHOMIA, Hübner.

1. I. ANCHIALIA, Hew. Exot. Butt. iv. *Ith. t.* 26. f. 162 (1868).

Ucayali (*Bartlett*). Mus. D.

2. I. ILEDINA, Hew. C. C. ii. *Ith. t.* 21. f. 129 (1858).

Ucayali (*Bartlett*). Mus. D.

"Rare."—*E. B.*

3. I. JANARILLA, Hew. Exot. Butt. iii. *Ith. t.* 24. f. 150 (1863).

Yurimaguas (*Bartlett*). Mus. D.

"Very common."—*E. B.*

4. I. ONEGA, Hew. Exot. Butt. i. *Ith. t.* 1. f. 1 (1852).

Ucayali (*Bartlett*). Mus. D. & S. G.

"Very plentiful."—*E. B.*

5. I. ATTALIA, Hew. Exot. Butt. ii. *Ith. t.* 13. f. 77 (1855).

Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

6. I. QUINTINA, Feld. Reise Nov. Lep. ii. t. 44. f. 11, 12, iii. p. 361 (1867).

Chanchamayo (*Thamm*). Mus. D.

Pozuzo (*Pearce*). Mus. S. G.

7. I. TUTIA, Hew. Exot. Butt. i. *Ith.* t. 1. f. 6 (1852).  
 Nauta (*Bartlett*). Mus. D.  
 The specimen from Nauta differs from the type by having the yellow band replaced by tawny, and may prove to be a distinct species.
8. I. PHONO, Hübn. (*Hymenitis p.*) Zutr. ex. Schmett. f. 987, 988 (1837).  
 Yurimaguas (*Bartlett*). Mus. D.
9. I. ZAVALLETTA, Hew. Exot. Butt. i. t. 9. f. 49 (1854).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 Ucayali (*Bartlett*). Mus. D.  
 "Not common."—*E. B.*
10. I. SAO, Hübn. (*Hymn. s.*) Zutr. ex. Schmett. f. 767, 768 (1832).  
 Ucayali (*Bartlett*). Mus. D.  
 "Plentiful, and found flying with other species."—*E. B.*
11. I. ANTISAO, Bates, Trans. Linn. Soc. xxiii. p. 544 (1862).  
 Ucayali (*Bartlett*). Mus. S. G.
12. I. PRIMULA, Bates, Trans. Linn. Soc. xxiii. p. 545 (1862).  
 Yurimaguas (*Bartlett*). Mus. D.  
 "The only locality in which I found this species."—*E. B.*
13. I. EURIMEDIA, Cram. (*Pap. e.*) Pap. Ex. ii. t. 126. f. C, D (1779).  
 Nauta and Yurimaguas (*Bartlett*). Mus. D.  
 "Not common."—*E. B.*
14. I. ELARU, Hew. Exot. Butt. i. *Ith.* t. 11. f. 62, 63 (1855).  
 Ucayali (*Bartlett*). Mus. S. G.
15. I. SEBA, Hew. Exot. Butt. v. *Ith.* t. 20. f. 196 (1872).  
 Yurimaguas (*Bartlett*). Mus. D.
16. I. SALONINA, Hew. Exot. Butt. i. *Ith.* t. 14. f. 86 (1855).  
 Peru. Mus. D.
17. I. TIMNA, Hew. Exot. Butt. i. *Ith.* t. 8. f. 44 (1854).  
 Huallaga (*Bartlett*). Mus. S. G.
18. I. CHRYSODONIA, Bates, Trans. Linn. Soc. xxiii. p. 546, t. 56. f. 3 a (1862).  
 Yurimaguas (*Bartlett*). Mus. D.
19. I. CIDONIA, Hew. Exot. ii. *Ith.* t. 20. f. 121 (1857).  
 Yurimaguas and Huallaga (*Bartlett*). Mus. D. & S. G.

20. I. ORIANA, Hew. Exot. Butt. ii. *Ith.* t. 22. f. 134 (1859).  
Ucayali and Yurimaguas (*Bartlett*). Mus. S. G. & D.  
"Scarce."—*E. B.*
21. I. NEPHELE, Bates, Trans. Linn. Soc. xxiii. p. 548 (1862).  
Huallaga (*Bartlett*). Mus. S. G.  
Nauta and Yurimaguas (*Bartlett*). Mus. D.  
"Not common."—*E. B.*
22. I. THEUDELINDA, Hew. Exot. Butt. ii. *Ith.* t. 23. f. 146  
(1861).  
Peru. Mus. D.
23. I. ZALMUNNA, Hew. Exot. Butt. iv. *Ith.* t. 27. f. 175, 176  
(1869).  
Peru. Mus. D.
- Genus MELINÆA, Hübn.
1. M. CYDIPPE, Salv. Ann. Nat. Hist. ser. 4, vii. p. 412 (1871).  
Pozzuzo (*Pearce*). Mus. S. G. & D.
2. M. ORESTES, Salv. C. C. p. 412.  
Pozzuzo (*Pearce*). Mus. S. G.
3. M. PHASIANA, Butl. Trans. Ent. Soc. 1870, p. 489.  
Yurimaguas (*Bartlett*). Mus. D.
4. M. CHINCHA, n. sp. (Plate XVII. fig. 3.)  
♂. Exactly like *M. ishka*, Butl. (Hew. Exot. Butt. i. *Mech.* t. 1.  
f. 3), excepting that the yellow band is replaced by tawny.  
Exp.  $3\frac{1}{4}$  inches.  
Pozzuzo (*Pearce*). Mus. S. G.
5. M. PARDALIS, Bates, Trans. Linn. Soc. xxiii. p. 552 (1867).  
E. Peru (*Bartlett*). Mus. D.

Genus TITHOREA, Doubl.

1. T. HARMONIA, Cram. (*Pap. h.*) Pap. Exot. ii. t. 190 (1779).  
Nauta (*Bartlett*). Mus. D.
2. T. NEITHA, Hopff. Stett. ent. Zeit. 1874, p. 337.  
Chanhamayo (*Thamm.*). Mus. D.

Subfamily 2. SATYRINÆ, Bates.

Genus CITHÆRIS, Hübn.

1. C. AURORA, Feld. Wien. ent. Mon. vi. p. 175 (1862).  
Ucayali (*Bartlett*). Mus. D.  
Pozzuzo (*Pearce*). Mus. S. G.  
"Found in the darkest parts of the forest, on the ground and  
about rotten fruit" &c.—*E. B.*

2. C. PYROPINA, Salv. & Godm. (*Callitæra p.*) Ann. Nat. Hist. ser. 4, ii. f. 141 (1868).

Pozzuzo (*Pearce*).

Mus. S. G. & D.

Genus HETÆRA, Fab.

1. H. PIERA, Linn. (*Pap. p.*) Mus. Ulr. p. 220 (1764).

Ucayali and Yurimaguas (*Bartlett*).

Mus. D.

“This species I found commonly in the dense and moist parts of the forest on the Upper Ucayali, and in similar localities at Yurimaguas, but not so plentiful.”—*E. B.*

2. II. HYPÆSIA, Hew. Trans. Ent. Soc. ser. 2, ii. p. 247, t. 23. f. 2 (1854).

Valley of Cosnipata (*H. Whitely*).

Mus. D.

3. II. MACLEANNANIA, Bates, Ent. Month. Mag. i. p. 180 (1865).

Pozzuzo (*Pearce*).

Mus. S. G.

The specimens from Peru are much more highly coloured than the type.

Genus PIERELLA, Westw.

1. P. HYCETA, Hew. Exot. Butt. ii. *Hæt.* t. 1. f. 1 (1860).

Pozzuzo (*Pearce*).

Mus. S. G.

Nauta and Yurimaguas (*Bartlett*).

Mus. D.

“Not common; found in the darkest parts of the forest.”—*E. B.*

2. P. DINDYMENE, Cram. (*Pap. d.*) Pap. Exot. iii. t. 198. f. F, G (1780).

Ucayali and Yurimaguas (*Bartlett*).

Mus. D.

“Common in low moist parts of the dense forest.”—*E. B.*

3. P. LAMIA, Sulz. Gesch. Ins. t. 18. f. 1 (1776).

Ucayali (*Bartlett*).

Mus. S. G. & D.

4. P. ASTYOCHÆ, Erichs. (*Hæt. a.*) Schomb. Reisen, iii. p. 599 (1848).

Ucayali (*Bartlett*).

Mus. S. G.

5. P. LENA, Linn. (*Pap. l.*) Syst. Nat. i. 2. p. 784 (1767).

Ucayali and Yurimaguas (*Bartlett*).

Mus. S. G. & D.

“Very common.”—*E. B.*

6. P. HORTONA, Hew. Trans. Ent. Soc. ser. 2, ii. p. 246, t. 23. f. 1 (1854).

Ucayali, Huallaga, and Yurimaguas (*Bartlett*).

Mus. S. G. & D.

“Very common.”—*E. B.*

Genus ANCHIPHLEBIA, Hübn.

A. TAYGETINA, Butl. Cat. Sat. B. M. p. 107, t. 5. f. 2 (1868).

Ucayali (*Bartlett*).

Mus. S. G.

“Rare; found in the dense forest.”—*E. B.*

## Genus ANTIRRHŒA, Hübn.

A. PHILOPŒMEN, Feld. Wien. ent. Mon. vi. p. 425 (1862).

Pozuzo (*Pearce*).

Mus. S. G.

## Genus ORESSINOMA, Westw.

1. O. TYPHLA, Doubl. &amp; Hew. Gen. Diurn. Lep. t. 62. f. 5 (1851).

Valley of the Cosnipata (*H. Whitely*).

Mus. S. G.

Huiro, ad alt. 4800 ped., valley of Santana (*H. Whitely*).

Mus. D.

2. O. SORATA, Salv. &amp; Godm. Ann. Nat. Hist. ser. 4, vol. ii. p. 144 (1868).

Huasampilla (*H. Whitely*).

Mus. D.

One specimen only.

## Genus EUPTYCHIA, Hübn.

1. E. HESIONE, Sulz. (*Pap. h.*) Gesch. Ins. p. 144, t. 17. f. 3, 4 (1776).Muña (*Pearce*).

Mus. S. G.

Ucayali (*Bartlett*).

Mus. S. G. &amp; D.

"Common; found about flowers on the banks of rivers and open ground."—*E. B.*2. E. OCYPETE, Fab. (*Pap. o.*) Gen. Ins. p. 260 (1777).

Peru.

Mus. D.

3. E. CAMERTA, Cram. (*Pap. c.*) Pap. Exot. iv. t. 295. f. F (1782).Nauta (*Bartlett*).

Mus. D.

"Common about the banks of rivers."—*E. B.*

4. E. ERIGONE, Butl. P. Z. S. 1866, p. 466, t. 39. f. 5.

Ucayali (*Bartlett*).

Mus. D.

"Found in shady footpaths near villages."—*E. B.*5. E. LIBYE, Linn. (*Pap. l.*) Syst. Nat. i. 2. p. 772 (1767).Valley of Cosnipata (*H. Whitely*).

Mus. D.

6. E. RUSTICA, Butl. Cat. Sat. B. M. p. 32, t. 1. f. 4 (1868).

Muña (*Pearce*).

Mus. S. G.

7. E. HIEMALIS, Butl. P. Z. S. 1866, p. 494.

Ucayali (*Bartlett*).

Mus. S. G.

## Genus LYMANOPODA, Westw.

1. L. FERRUGINOSA, Butl. Cat. Sat. B. M. p. 169, t. 4. f. 3 (1868).

Valley of the Cosnipata (*H. Whitely*).

Mus. S. G.

Huasampilla (*H. Whitely*).

Mus. D.

2. *L. VENOSA*, Butl. Cat. Sat. B. M. p. 171, t. 4. f. 5 (1868).  
 Valley of the Cosnipata (*H. Whitely*). Mus. S. G.  
 Huasampilla (*H. Whitely*). Mus. D.
3. *L. ACRÆIDA*, Butl. Cat. Sat. B. M. p. 171, t. 4. f. 6 (1868).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 Huasampilla (*Whitely*). Mus. D.
4. *L. OCELLIFERA*, Butl. Ann. Nat. Hist. 1873, xii. p. 219.  
 Huasampilla (*H. Whitely*). Mus. D.
5. *L. RUBESCENS*, Butl. Ann. Nat. Hist. 1873, xii. p. 219.  
 Huasampilla (*H. Whitely*). Mus. D.

Genus *STEROMA*, Westw.

1. *S. ANDENSIS*, Feld. Reise Nov. Lep. iii. p. 475 (1867).  
 Peru. Mus. D.
2. *S. BEYA*, Doub. Hew. Gen. D. L. t. 66. f. 6 (1851).  
 Huiro, valley of Santana (*H. Whitely*). Mus. D.
3. *S. UMBRACINA*, Butl. Ann. Nat. Hist. 1873, xii. p. 221.  
 Huasampilla (*H. Whitely*). Mus. D.
4. *S. SUPERBA*, Butl. Cat. Sat. B. M. p. 172, t. 5. f. 6 (1868).  
 Huasampilla (*H. Whitely*). Mus. D.

Genus *PEDALIODES*, Butl.

1. *P. PANCIS*, Hew. (*Pronophila p.*) Trans. Ent. Soc. ser. 3, vol. i.  
 p. 8, t. 4. f. 26, 27 (1862).  
 Muña (*Pearce*). Mus. S. G.  
 Huasampilla (*H. Whitely*). Mus. D.
2. *P. ANGULARIS*, Butl. Cat. Sat. B. M. p. 176, t. 4. f. 7 (1868).  
 Peru. Mus. D.
3. *P. PALLANTIAS*, Hew. (*Pron. p.*) Exot. Butt. v. *Pron.* viii.  
 f. 51, 59 (1874).  
 Muña (*Pearce*). Mus. S. G.
4. *P. PÓRINA*, Hew. Trans. Ent. Soc. ser. 3, vol. i. p. 9, t. 4.  
 f. 28 (1862).  
 Muña (*Pearce*). Mus. S. G.  
 Huiro, valley of Santana (*H. Whitely*). Mus. D.  
 One specimen only.

5. *P. ZOIPPUS*, n. sp. (Plate XVIII. fig. 1.)

Upperside brown; anterior wing darkest in the middle; posterior wing with the inner margin and the anal angle rufous brown. Underside the same as above; posterior wing with several very in-

distinct white dots near the outer margin, and a submarginal dark brown line.

Exp.  $1\frac{3}{4}$  inch.

Peru.

Mus. D.

Genus OXEOSCHISTUS, Butl.

O. PRONAX, Hew. (*Pron. p.*) Exot. Butt. ii. *Pron. t.* 2. f. 10, 11 (1860).

Pozzuzo (*Pearce*).

Mus. S. G.

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

Genus LASIOPHILA, Feld.

1. L. CIRTA, Feld. Wien. ent. Mon. iii. p. 336, t. 6. f. 1 (1859).

Muña (*Pearce*).

Mus. S. G.

2. L. ORBIFERA, Butl. Cat. Sat. B. M. p. 182, t. 5. f. 6.

Huasampilla (*H. Whitely*).

Mus. D.

3. L. PHALEZIA, Hew. (*Pron. p.*) Exot. Butt. iv. *Pron. t.* 3. f. 13, 14 (1868).

Valley of Cosnipata (*H. Whitely*).

Mus. D.

Genus DÆDALMA, Hew.

D. WHITELYI, n. sp. (Plate XVII. figs. 6 & 7.)

Upperside dark brown; both wings crossed parallel to and near the outer margin by a row of white spots. Underside very like *D. dorinda*, Feld., without so much of the white on the posterior wing; better figured than described.

Exp.  $3\frac{1}{4}$  inches.

Huasampilla, ad alt. 10,000 ped. (*H. Whitely*).

Mus. D.

The largest described species of *Dædalma*, and very distinct on the upperside.

Genus PRONOPHILA, Westw.

1. P. THELEBE, Doubl. & Hew. Gen. D. L. t. 60. f. 3 (1851).

Valley of Cosnipata (*H. Whitely*).

Mus. D.

2. P. VARIABILIS, Butl. Ann. Nat. Hist. 1873, p. 223.

Huasampilla (*H. Whitely*).

Mus. D.

3. P. CORDILLERA, Westw. Gen. D. L. p. 358, note (1851).

Peru.

Mus. D.

Genus TAYGETIS, Hübn.

1. T. CHRYSOGONE, Doubl. & Hew. Gen. D. L. t. 4 (1851).

Pozzuzo (*Pearce*).

Mus. S. G.

2. T. MERMERIA, Cram. (*Pap. m.*) Pap. Exot. i. t. 96. f. B (1779).

Yurimaguas (*Bartlett*).

Mus. D.

"Common in the low parts of the dense forest."—*E. B.*

3. *T. THAMYRA*, Cram. (*Pap. t.*) Pap. Exot. iii. t. 242. f. B (1782).  
Ucayali (*Bartlett*). Mus. D.  
"A common species on the Ucayali."—*E. B.*
4. *T. PENELEA*, Cram. (*Pap. p.*) Pap. Exot. ii. t. 101. f. G (1779).  
Yurimaguas (*Bartlett*). Mus. D.
5. *T. MARPESSA*, Hew. (*Debis? m.*) Exot. Butt. iii. *Deb.* t. 1.  
f. 2 (1862).  
Nauta (*Bartlett*). Mus. D.

Genus *CORADES*, Doubl. & Hew.

1. *C. IDUNA*, Hew. Ann. Nat. Hist. ser. 2, vol. vi. p. 437 (1850).  
Muña (*Pearce*). Mus. S. G.  
Huasampilla (*H. Whitely*). Mus. D.
2. *C. PANNONIA*, Hew. Ann. Nat. Hist. ser. 2, vol. vi. p. 438,  
t. 10. f. 1 (1850).  
Peru. Mus. D.
3. *C. ULEMA*, Hew. Ann. Nat. Hist. ser. 2, vol. vi. p. 438, t. 10.  
f. 3 (1850).  
Muña (*Pearce*). Mus. S. G.
4. *C. CISTENE*, Hew. Exot. Butt. iii. *Cor.* t. 1. f. 4, 5 (1863).  
Muña (*Pearce*). Mus. S. G.  
Huasampilla (*H. Whitely*). Mus. D.
5. *C. FUSCIPLAGA*, Butl. Ann. Nat. Hist. 1873, xii. p. 224.  
Huasampilla (*H. Whitely*). Mus. D.
6. *C. FULMINALIS*, Butl. Cist. Ent. p. 26 (1870).  
Peru. Mus. D.

Genus *BIA*, Hübn.

- B. ACTORION*, Linn. (*Pap. a.*) Syst. Nat. i. 2. p. 794 (1767).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Ucayali (*Bartlett*). Mus. D.  
"Common in low moist places in the dense forest upon rotten  
fruit" &c.—*E. B.*

Subfamily 4. *MORPHINÆ*, Butl.Genus *MORPHO*, Fabr.

1. *M. AURORA*, Westw. Gen. D. L. p. 339. n. 9, note (1851).  
Huasampilla (*H. Whitely*). Mus. D.
2. *M. ZEPHYRITIS*, Butl. Lepidoptera Exot. pl. 56. f. 3, 4, p. 156  
(1873).  
Paucartambo (*H. Whitely*). Type, Mus. D.  
Mr. Whitely has only obtained a single specimen of this beautiful  
species; it is one of the finest things sent home by him.

3. *M. LAMPHARIS*, Butl. Ann. Nat. Hist. ser. 4, vol. xii. p. 225 ;  
Lep. Exot. pl. 56. f. 1, 2, p. 156 (1873).

Huasampilla (*H. Whitely*).

This I think a good species, though closely allied to *M. sulkowskyi*.  
Mr. Hewitson has lately received specimens sent by Mr. Buckley  
from Bolivia.

4. *M. CÆRULEUS*, Perry, Arcana (1811).

*M. didus*, Hoff. Stett. ent. Zeit. 1874, p. 355.

Peru (*Dr. Staudinger*).

Mus. D.

Very distinct from *M. menelaus*, Linn., with which Mr. Kirby  
places it. I have seen many examples.

5. *M. ALEXANDROVNA*, Druce, Trans. Ent. Soc. 1874, p. 155.

Huasampilla (*H. Whitely*).

Mus. D.

One specimen only.

6. *M. ACHILLES*, Linn. (*Pap. a.*) Mus. Ulr. p. 211 (1874).

Pozzuzo (*Pearce*).

Mus. S. G.

Chamicuros (*Bartlett*).

Mus. D.

"Found in the dense forest."—*E. B.*

7. *M. HELENOR*, Cram. Pap. Ex. i. t. 86. f. A, B (1779).

Pozzuzo (*Pearce*).

Mus. S. G.

8. *M. PATROCLUS*, Feld. Wien. ent. Mon. v. p. 110. n. 105 (1861).

*M. papirius*, Hopff. Stett. ent. Zeit. 1874, p. 356.

Pozzuzo (*Pearce*).

Mus. S. G.

Peru (*Dr. Staudinger*).

Mus. D.

#### Subfamily 5. BRASOLINÆ, Bates.

##### Genus OPSIPHANES, Westw.

1. *O. CASSIÆ*, Linn. (*Pap. c.*) Mus. Ulr. p. 265 (1764).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

2. *O. XANTHUS*, Linn. (*Pap. x.*) *l. c.* p. 276.

Ucayali (*Bartlett*).

##### Genus CALIGO, Hübn.

1. *C. IDOMENEUS*, Linn. (*Pap. i.*) Mus. Ulr. p. 213 (1764).

Ucayali (*Bartlett*).

Mus. S. G.

"In the dense forest."—*E. B.*

2. *C. EUPHORBUS*, Feld. (*Pavonia e.*) Wien. ent. Mon. vi. p. 123  
(1862).

Ucayali (*Bartlett*).

Mus. S. G.

3. *C. DENTINA*, Druce, Trans. Ent. Soc. 1874, p. 155.

Valley of Cosnipata (*H. Whitely*).

Type, Mus. D.

## Subfamily 6. ACRÆINÆ, Bates.

## Genus ACRÆA, Fabr.

1. A. ANTEAS, Hew. Gen. D. L. t. 18. f. 5 (1848).  
Peru (*Dr. Staudinger*). Mus. D.
2. A. TERPSINÆ, Feld. Wien. ent. Mon. vi. p. 78. n. 63 (1862).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
3. A. LAVERNA, Doubl. & Hew. Gen. D. L. t. 18. f. 4 (1848).  
Huiro, valley of the Santana (*H. Whitely*). Mus. D.
4. A. GRISEATA, Butl. Cist. Ent. i. p. 170. n. 49 (1873).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
5. A. MUCIA, Hopff. Stett. ent. Zeit. 1874, p. 346.  
Peru (*Dr. Staudinger*). Mus. D.
6. A. NICYLLA, Hopff. *l. c.* p. 346.  
Peru (*Dr. Staudinger*). Mus. D.
7. A. CALLIANIRA, Hübn. Zutr. ex. Schmett. f. 845, p. 846  
(1837).  
Pozzuzo (*Pearce*). Mus. S. G.  
Huiro, valley of the Santana (*H. Whitely*). Mus. D.
8. A. ERINOME, Feld. Wien. ent. Mon. v. p. 101 (1861).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Huasampilla and Hiro, valley of Santana (*H. Whitely*). Mus. D.
9. A. RADIATA, Hew. Ex. Butt. iv. *Acræa*, t. 6. f. 39-41 (1868).  
Valley of Cosnipata (*H. Whitely*). Mus. D.
10. A. ABANA, Hew. Exot. Butt. iv. *Acræa*, t. 6. f. 35, 36 (1868).  
Pozzuzo (*Pearce*). Mus. S. G.

## Subfamily 7. HELICONINÆ, Butt.

## Genus HELICONIUS, Latr.

1. H. ZOBEIDE, Butt. Ann. Nat. Hist. ser. 4. vol. iii. p. 18, t. 9.  
f. 3 (1869).  
Ucayali (*Bartlett*). Type, Mus. D.  
"Found upon flowers near villages."—*E. B.*
2. H. CLYTIA, Cram. (*Pap. c.*) Pap. Exot. i. t. 66. f. C. D (1779).  
Ucayali (*Bartlett*). Mus. D.
3. H. RHEA, Cram. (*Pap. r.*) Pap. Exot. i. t. 54. f. C, D (1779).  
Nauta and Ucayali (*Bartlett*). Mus. D.  
Pozzuzo (*Pearce*). Mus. S. G.  
"Found on the banks of rivers, very common."—*E. B.*

4. *H. LEUCADIA*, Bates, T. L. S. xxiii. p. 556 (1862).  
Yurimaguas (*Bartlett*). Mus. D.
5. *H. PERUVIANA*, Feld. Wien. ent. Mon. iii. p. 396 (1859).  
Peru. Mus. D.
6. *H. DORIS*, Linn. (*Pap. d.*) Mant. Plant. p. 536 (1771).  
Santa Cruz (*Bartlett*). Mus. D.  
"Not common."—*E. B.*
7. *H. MELPOMENE*, Linn. (*Pap. m.*) Mus. Ulr. p. 232 (1764).  
Valley of Santana (*H. Whitely*), one specimen only; Ucayali  
(*Bartlett*); rare in Peru (*E. B.*) Mus. D.
8. *H. THELXIOPE*, Hübn. Samml. ex. Schmett. (1806-16).  
Upper Ucayali (*Bartlett*). Mus. S. G.  
"Not common; found about flowers near the villages."—*E. B.*
9. *H. AGLAOPE*, Feld. Wien. ent. Mon. vi. p. 79. n. 67 (1862).  
Pozuzo (*Pearce*); Ucayali (*Bartlett*). Mus. S. G.
10. *H. BARTLETTI*, n. sp. (Plate XVIII. fig. 2.)  
Upperside (*male*) black; anterior wing with the base orange-red,  
crossed beyond the middle by a band of light yellow, from the costal  
margin to near the outer margin the band is broken and crossed by  
the nervules, which are black; posterior wing black, brownish on the  
costal margin, an orange-red streak in the cell, and six between the  
abdominal margin and the middle of the wing. Underside as above,  
with less red at the base of the anterior wing; abdomen black, the  
sides spotted with yellow. *Female* the same as the male, with all  
the orange-red markings wider, and a marginal row of small white  
spots on the underside of the posterior wing.  
Exp. ♂  $2\frac{3}{4}$  inches, ♀ 3 inches.  
Santa Cruz (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
This species is allied to *Xanthocles*, Bates, a Demerara species,  
but quite distinct.
11. *H. ESTELLA*, Bates, Trans. Linn. Soc. xxiii. p. 650 (1862).  
Ucayali (*Bartlett*). Mus. S. G.
12. *H. XENOCLEA*, Hew. Ex. Butt. i. *Helic.* t. 1. f. 1 (1852).  
Peru (*Dr. Staudinger*). Mus. D.
13. *H. TELESIPHE*, Doubl. & Hew. Gen. D. L. t. 15. f. 2 (1847).  
Huasampilla and Huiro, valley of Santana (*H. Whitely*). Mus. D.
14. *H. ARISTONA*, Hew. Exot. Butt. i. *Helic.* t. 1. f. 4 (1852).  
Ucayali (*Bartlett*). Mus. D.  
Pozuzo (*Pearce*). Mus. S. G.

15. *H. SISYPHUS*, Salv. Ann. Nat. Hist. ser. 4. vol. vii. p. 413.  
Valley of Cosnipata (*H. Whitely*). Type, Mus. S. G. & D.
16. *H. AURORA*, Bates, Trans. Linn. Soc. xxiii. p. 555 (1862).  
Sarayacu, on the Upper Ucayali (*Bartlett*). Mus. D.  
"Rare, found on the footpaths in the forest."—*E. B.*
17. *H. ARCUELLA*, Druce, Trans. Ent. Soc. 1874, p. 156.  
Yurimaguas (*Bartlett*). Type, Mus. D.

Genus *EUEIDES*, Hübn.

1. *E. HELICONIOIDES*, Feld. Wien. ent. Mon. v. p. 102 (1861).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
2. *E. UNIFASCIATUS*, Butl. Syst. Ent. vol. i. p. 169. n. 46 (1873).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
3. *E. LYBIA*, Fabr. (*Pap. l.*) Syst. Ent. p. 460. n. 73 (1775).  
Ucayali (*Bartlett*). Mus. D.  
"Not common; flies about the villages."—*E. B.*
4. *E. ALIPHERA*, Godt. (*Ceth. a.*) Enc. Méth. ix. p. 246 (1819).  
Santa Cruz, on the Huallaga (*Bartlett*). Mus. D.  
Huiro, valley of Santana (*H. Whitely*). Mus. D.  
"Plentiful about the villages."—*E. B.*
5. *E. ISABELLA*, Cram. (*Pap. i.*) Pap. Ex. iv. t. 350. f. C, D (1782).  
Nauta and Upper Ucayali (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
"Rare; found about the banks of rivers."—*E. B.*

Subfamily 8. *NYMPHALINÆ*, Bates.Genus *COLÆNIS*, Hübn.

1. *C. DIDO*, Linn. (*Pap. d.*) Syst. Nat. i. 2. p. 782 (1767).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.  
Nauta (*Bartlett*). Mus. D.  
"Not common."—*E. B.*
2. *C. TELESIPHE*, Hew. Trans. Ent. Soc. ser. 3, vol. v. p. 564  
(1867).  
POZZUZO (*Pearce*). Mus. S. G.  
Valley of Cosnipata and Huiro, valley of Santana (*H. Whitely*).  
Mus. D.
3. *C. PHERUSA*, Linn. (*Pap. p.*) Mus. Ulr. p. 293 (1764).  
Ucayali (*Bartlett*). Mus. D.  
"Found on flowers about the villages."—*E. B.*

4. *C. JULIA*, Fab. (*Pap. j.*) Syst. Ent. p. 509 (1775).

Cosnipata valley (*H. Whitely*).

Mus. S. G. & D.

Ucayali (*Bartlett*).

Mus. D.

"Common about the villages and on the mud-banks of the rivers."—*E. B.*

Genus *AGRAULIS*, Boisd.

1. *A. JUNO*, Cram. (*Pap. j.*) Pap. Exot. iii. 215. f. B, C (1782).

Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.

Ucayali (*Bartlett*).

Mus. D.

"Not common."—*E. B.*

2. *A. LUCINA*, Feld. Wien. ent. Mon. vi. p. 110 (1872).

Yurimaguas (*Bartlett*).

Mus. D.

"Scarce."—*E. B.*

3. *A. MONETA*, Hübn. Samml. exot. Schmett. (1816–24).

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

4. *A. GLYCERA*, Feld. Wien. ent. Mon. v. p. 102 (1861).

Pozzuzo (*Pearce*).

Mus. S. G.

Genus *ERESIA*, Boisd.

1. *E. ELEPHIÆA*, Hew. Ex. Butt. iv. p. 102 (1861).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

2. *E. ANIETA*, Hew. Ex. Butt. iii. *Eres.* t. 6. f. 33, 34 (1864).

Pozzuzo (*Pearce*).

Mus. S. G.

3. *E. PUSILLA*, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 172 (1869).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

4. *E. PHÆDIMA*, Salv. Ann. Nat. Hist. ser. 4, vol. ii. p. 146 (1868).

Pozzuzo (*Pearce*).

Mus. S. G. & D.

5. *E. THOMIOLA*, Salv. Ann. Nat. Hist. ser. 4, p. 171 (1869).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

6. *E. PERILLA*, Hew. Exot. Butt. i. *Eres.* t. 1. f. 4 (1852).

Yurimaguas (*Bartlett*) and valley of Cosnipata (*H. Whitely*).

Mus. D.

7. *E. ACRÆINA*, Hew. Ex. Butt. iii. *Eres.* t. 3. f. 15 (1864).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

8. *E. MUNDINA*, n. sp. (Plate XVIII. fig. 4.)

Upperside dark brown; anterior wing crossed beyond the middle by a broad red band. Underside: anterior wing, the base black, a red streak along the costal margin to the end of the cell, and a red band the same as above, the apex brownish white, crossed by the

black nervules; posterior wing brownish white, all the nervules black.

Exp.  $1\frac{3}{4}$  inch.

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

A most curious species, precisely like *Acræa erinome*, Feld., with which the single specimen sent by Mr. Whitely was mixed.

9. *E. ACTINOTE*, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 171 (1869).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

10. *E. POLINA*, Hew. Exot. Butt. i. *Eres. t. 7. f. 6* (1852).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

11. *E. ANGUSTA*, Hew. Ex. Butt. iv. *Eres. t. 7. f. 58, 59* (1868).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

12. *E. NAUPLIA*, Linn. (*Pap. n.*) Mus. Ulr. p. 309 (1764).

Nauta (*Bartlett*).

Mus. D.

"Found in the moist parts of the forest."—*E. B.*

13. *E. CLARA*, Bates, Journ. Ent. ii. p. 192 (1864).

Ucayali (*Bartlett*).

Mus. S. G. & D.

"Found in the moist parts of the forest."—*E. B.*

14. *E. NANA*, Druce, Trans. Ent. Soc. 1874, p. 156.

Valley of Cosnipata, and Huiro, valley of Santana (*H. Whitely*).

Mus. D.

15. *E. NUSSIA*, n. sp. (Plate XVIII. fig. 5.)

Upperside dark brown; anterior wing with two white spots, one on the costal margin near the apex, the other below, nearest the anal angle; posterior wing powdered with ochraceous yellow, the outer margin dentated, and crossed beyond the middle with three ochreous bands. Underside the same as *E. nana*.

Exp.  $1\frac{1}{2}$  inch.

Peru.

Mus. D.

16. *E. PEARCEI*, n. sp. (Plate XVIII. fig. 3.)

Upperside dark brown; anterior wing crossed beyond the middle from the costal margin to the inner margin by three broken bands of orange spots; posterior wing crossed in the middle by a wide orange-coloured band. Underside pale yellow, slightly speckled with brown.

Exp. 1 inch.

Pozuzo (*Pearce*).

Mus. S. G.

A beautiful little species, and very distinct from any other.

#### Genus SYNCHLOË, Doubl.

*S. SAUNDERSII*, Doubl. & Hew. Gen. D. L. t. 24. f. 2 (1847).

Pozuzo (*Pearce*).

Mus. S. G.

## Genus EUREMA, Doubl.

1. E. KEFERSTEINII, Doubl. & Hew. Gen. D. L. t. 24. f. 4 (1847).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
2. E. DIONE, Latr. (*Van. d.*) Humb. Bonpl. Obs. Zool. ii. p. 87,  
t. 37. f. 1, 2 (1811-19).  
Pozzuzo (*Pearce*). Mus. S. G.  
Valley of Cosnipata, and Huiro, valley of the Santana (*H.*  
*Whitely*). Mus. D.

## Genus JUNONIA, Hübn.

- J. LAVINIA, Cram. (*Pap. l.*) Pap. Ex. i. t. 21. f. C, D (1775).  
Nauta and Ucayali (*Bartlett*); Huiro, valley of Santana (*H.*  
*Whitely*). Mus. D.
- "This species may be found basking in the sun all day long upon  
a red flower that grows about the villages and river-banks."—*E. B.*

## Genus ANARTIA, Hübn.

1. A. JATROPHÆ, Linn. Mus. Ulr. p. 289 (1764).  
Nauta and Upper Ucayali (*Bartlett*). Mus. S. G. & D.  
"Very common, always to be seen about flowers in open places  
in the forest."—*E. B.*
2. A. AMALTHEA, Linn. (*Pap. a.*) Mus. Ulr. p. 288 (1764).  
Nauta and Yurimaguas (*Bartlett*). Mus. D.  
"Very common."—*E. B.*

## Genus CYBDELIS, Boisd.

1. C. DIOTIMA, Hew. Exot. Butt. i. *Cybd.* t. 2. f. 8, 9 (1852).  
Valley of Cosnipata (*H. Whitely*). Mus. D.  
Huiro, valley of Santana (*H. Whitely*). Mus. D.
2. C. CECIDA, Hew. Ex. Butt. iv. *Cybd.* t. 4. f. 26, 27 (1869).  
Lima. Mus. D.
3. C. WHITELYI, Butl. Ann. Nat. Hist. 1873, xii. p. 226.  
Huasampilla (*H. Whitely*). Mus. D.
4. C. THRASYLLA, Feld. Wien. ent. Mon. iii. p. 397 (1859).  
Huasampilla (*H. Whitely*). Mus. D.

## Genus EUNICA, Hübn.

1. E. MYGDONIA, Godt. (*Nymph. m.*) Enc. Méth. ix. p. 416  
(1823).  
Nauta (*Bartlett*). Mus. D.  
Cosnipata valley (*H. Whitely*). Mus. D.  
"Found about the banks of rivers."—*E. B.*
2. E. TITHONIA, Feld. (*Faunia t.*) Reise Nov. Lep. iii. pp. 407,  
613, t. 52. f. 6-8 (1867).  
Chyabetes (*Bartlett*). Mus. D.

3. E. CINARA Hew. (*Cybd. c.*) Exot. Butt. i. *Cybd. t. 1. f. 2* (1852).  
 Santa Cruz and Huallaga (*Bartlett*). Mus. D.  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.
4. E. CELMA, Hew. (*Cybd. c.*) Exot. Butt. i. *Cybd. t. 1 f. 3* (1852).  
 Huallaga (*Bartlett*). Mus. S. G.  
 Found on the forest footpaths near the river.
5. E. BECHINA, Hew. (*Cybd. b.*) Exot. Butt. i. *Cybd. t. 2. f. 10* (1852).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.
6. E. ELEGANS, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 173 (1869).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
7. E. CARIAS, Hew. (*Cybd. c.*) Exot. Butt. ii. *Cybd. t. 3. f. 21, 22* (1857).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
8. E. TENEBROSA, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 173 (1869).  
 Pozzuzo (*Pearce*). Mus. S. G.
9. E. BRUNNEA, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 174 (1869).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & E.
10. E. CARALIS, Hew. (*Pap. c.*) Exot. Butt. ii. *Cybd. t. 3. f. 18, 19* (1857).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.
11. E. CLYTIA, Hew. (*Cybd. c.*) Exot. Butt. i. *Cybd. t. 1. f. 5, 6* (1852).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
12. E. ORPHISE, Cram. (*Pap. o.*) Pap. Ex. i. t. 42. f. E, F (1776).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.
13. E. POMONA, Feld. (*Faun. p.*) Reise Nov. Lep. iii. p. 407, t. 52. f. 11, 12 (1867).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.
14. E. EUROTA, Cram. (*Pap. e.*) Pap. Ex. ii. t. 136. f. C, D (1775).  
 Huallaga (*Bartlett*). Mus. S. G.
15. E. AMELIA, Cram. (*Pap. a.*) Pap. Exot. ii. t. 136. f. B, C (1779).  
 Huallaga (*Bartlett*). Mus. S. G.

16. E. NORICA, Hew. (*Cybd. n.*) Exot. Butt. i. *Cybd. t. 2. f. 13* (1852).

Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

17. E. CHLOROCHROA, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 172 (1869).

Valley of Cosnipata (*H. Whitely*). Mus. S. G.

"The species of this genus are found about the mud-banks of rivers and open forest-streams, also on the footpaths in the forest and near villages."—*E. B.*

#### Genus EPIPHILE, Doubl.

1. E. IBLIS, Feld. Wien. ent. Mon. v. p. 105 (1861).

Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.

2. E. LAMPETHUSA, Doubl. & Hew. Gen. D. L. t. 27. f. 3 (1848).

Valley of Cosnipata (*H. Whitely*). Mus. S. G.

#### Genus EPICALIA, West.

E. NUMILIA, Cr. (*Pap. n.*) Pap. Exot. ii. t. 81. f. E, F (1779).

Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.

#### Genus TEMENIS, Hübn.

1. T. ARIADNE, Cram. (*Pap. a.*) Pap. Exot. ii. t. 180. f. E, F (1779).

Ucayali (*Bartlett*); Pozzuzo (*Pearce*). Mus. S. G.

Chyavetos (*Bartlett*). Mus. D.

"Found upon leaves and flowers in the footpaths of the dense forest."—*E. B.*

2. T. PULCHRA, Hew. (*Paromia p.*) Exot. Butt. ii. *Epiphile, t. 2. f. 1, 2.* (1861).

Pozzuzo (*Pearce*). Mus. S. G.

The specimens of this species from Pozzuzo differ much from the typical form by not having the black band on the underside of the anterior wing, its larger size, and brighter colour. I at first thought it a distinct species; but upon comparison with the specimens in the British Museum, I find that they have a specimen clearly intermediate between the two forms.

#### Genus EUBAGIS, Boisd.

1. E. MÆON, Doubl. & Hew. Gen. D. L. t. 30. f. 1 (1849).

Yurimaguas (*Bartlett*). Mus. D.

2. E. GISELLA, Hew. Exot. Butt. ii. *Eub. t. 11. f. 11, 12* (1859).

Yurimaguas (*Bartlett*); valley of Cosnipata (*H. Whitely*). Mus. D.

3. E. INES, Godt. (*Nymphalis i.*) Enc. Méth. ix. p. 421 (1823).

Huiro, valley of Santana (*H. Whitely*). Mus. D.

4. *E. SERINA*, Fabr. (*Pap. s.*) Syst. Ent. p. 497 (1775).  
Ucayali (*Bartlett*). Mus. S. G.
5. *E. SALPENZA*, Feld. Wien. ent. Mon. vi. p. 113 (1862).  
Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.
6. *E. RACIDULA*, Hew. Exot. Butt. i. *Eub.* t. 1. f. 2, 3 (1852).  
Ucayali (*Bartlett*). Mus. S. G.
- “The species of this genus are always to be seen flying about the river-banks feeding upon rotten fruit” &c.—*E. B.*

Genus *CALLICORE*, Hübn.

1. *C. ELUINA*, Hew. (*Cat. e.*) Ex. Butt. i. t. 4. f. 30, 31 (1854).  
Huasampilla, and Huiro, valley of Santana (*H. Whitely*).  
Mus. D.
2. *C. CLYMENA*, Cram. (*Pap. c.*) Pap. Ex. i. t. 24. f. E, F (1775).  
Pozzuzo (*Pearce*). Mus. S. G.  
Ucayali (*Bartlett*). Mus. D.  
“Found on the mud-banks of the rivers upon decayed fruit.”—  
*E. B.*
3. *C. NEGLECTA*, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 176  
(1869).  
Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.
4. *C. LIDWINA*, Feld. Wien. ent. Mon. vi. p. 114 (1862).  
Pozzuzo (*Pearce*). Mus. S. G.  
Valley of Cosnipata (*H. Whitely*). Mus. D.

Genus *PERISAMA*, Doubl.

1. *P. OPPELII*, Latr. (*Erycina o.*) Humb. Bonpl. Obs. Zool. i.  
p. 237, t. 24. f. 1, 5 (1811?).  
Valley of Cosnipata (*H. Whitely*). Mus. D.
2. *P. XANTHICA*, Hew. (*Cat. x.*) Exot. Butt. iv. *Cat.* t. 11. f. 75,  
76 (1868).  
Peru (*Dr. Staudinger*). Mus. D.  
Pozzuzo (*Pearce*). Mus. S. G.
3. *P. MORONA*, Hew. (*Cat. m.*) Ex. Butt. iv. *Cat.* t. 12. f. 93, 94  
(1868).  
Huasampilla (*H. Whitely*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
4. *P. HILARA*, Salv. Ann. Nat. Hist. ser. 4, vol. iv. p. 175 (1869).  
Valley of Cosnipata, and Huiro, valley of Santana (*H. Whitely*).  
Mus. D.

5. *P. VANINKA*, Hew. (*Cat. v.*) Ex. Butt. i. *Cat. t. 4. f. 32, 33* (1854).

Valley of Cosnipata and valley of Santana (*H. Whitely*).

Mus. S. G. & D.

6. *P. JURINEI*, Guenée, *Lépid. du Mus. de Genève*, p. 28. n. 36, pl. 1. f. 6.

Valley of Cosnipata (*H. Whitely*).

Mus. D.

7. *P. CANOMA*, Druce, *Trans. Ent. Soc.* 1874, p. 156.

Huasampilla (*H. Whitely*).

Type, Mus. D.

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

8. *P. RHODOPTERA*, *Butl. Cist. Ent.* vol. i. p. 162 (1873).

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

9. *P. CAMELITA*, Hew. (*Cat. c.*) *Exot. Butt.* vol. v. *Cat. t. 13. f. 99, 100* (1876).

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

10. *P. COMNENA*, Hew. (*Cat. c.*) *Exot. Butt.* iv. *Cat. t. 2. f. 77, 78* (1868).

Valley of Cosnipata and Huasampilla (*H. Whitely*).

Mus. D.

11. *P. OCHRIPENNIS*, *Butl. Cist. Ent.* i. p. 161 (1873).

Huasampilla and valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

12. *P. TRISTRIGOSA*, *Butl. Syst. Ent.* vol. i. p. 161 (1873).

Valley of Cosnipata (*H. Whitely*).

Mus. D. & S. G.

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

13. *P. CHASEBA*, Hew. (*Cat. c.*) *Exot. Butt.* *Cat. t. 5. f. 34, 35* (1855).

Valley of Cosnipata, and Huiro, valley of Santana (*H. Whitely*).

Mus. D.

Pozzuzo (*Pearce*).

Mus. S. G.

14. *P. CALAMIS*, Hew. (*Cybd. c.*) *Exot. Butt.* iv. *Cyb. t. 4. f. 23, 24* (1869).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

#### Genus CATAGRAMMA, Boisd.

1. *C. ÆGINA*, *Feld. Wien. ent. Mon.* v. p. 107 (1861).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

2. *C. ZELPHANTA*, Hew. *Ex. Butt.* ii. *Cat. t. 8. f. 58, 59* (1858).

Pozzuzo (*Pearce*).

Mus. S. G.

3. *C. PASITHEA*, Hew. Exot. Butt. iii. *Cat. t. 10. f. 73, 74* (1864).  
 Ucayali (*Bartlett*); Pozuzo (*Pearce*). Mus. S. G.  
 Valley of Cosnipata (*H. Whitely*). Mus. D.
4. *C. FELDERI*, Hew. Exot. Butt. iii. *Cat. t. 10. f. 68, 69* (1874);  
 N. *Cat. t. 12. f. 96* (1868).  
 Pozuzo (*Pearce*). Mus. S. G.
5. *C. EXCELSIOR*, Hew. Exot. Butt. ii. *Cat. t. 7. f. 49, 50, t. 9. f. 64* (1858).  
 Peru. Mus. D.
6. *C. PERISTERA*, Hew. Exot. Butt. i. *Cat. t. 2. f. 15-17* (1853).  
 Huallaga (*Bartlett*); Pozuzo (*Pearce*). Mus. S. G.
7. *C. CONOSURA*, Doubl. & Hew. Gen. D. L. t. 28. f. 2 (1847).  
 Peru. Mus. D.
- Genus *CALLITHEA*, Boisid.
1. *C. DEGANDII*, Hew. Exot. Butt. ii. *Call. t. 2. f. 6-8* (1858).  
 Ucayali (*Bartlett*). Mus. D.
2. *C. WHITELYI*, Salvin, Ann. Nat. Hist. ser. 4, vol. iv. p. 179 (1869).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.  
 Huasampilla (*H. Whitely*). Mus. D.
3. *C. DEPUSETI*, Feld. (*Cyane, d.*) Wien. ent. Mon. v. 107 (1861).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
4. *C. OPTIMA*, Butl. Lep. Ex. i. p. 12, t. 5. f. 1, 2 (1869).  
 Santa Cruz (*Bartlett*). Mus. D. & S. G.  
 "The species of this genus are found associating with *Catagramma* upon the mud-banks of the rivers, feeding upon rotten fruit" &c.—  
*E. B.*

Genus *CALLIZONA*, Doubl.

- C. FULVESCENS*, Butl. Cist. Ent. vol. i. p. 162 (1873).  
 Pozuzo (*Pearce*). Mus. S. G.

Genus *PANDORA*, Westw.

1. *P. PROLA*, Doubl. & Hew. Gen. D. L. t. 43. f. 5 (1850).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
 Chamicuros (*Bartlett*). Mus. D.
2. *P. REGINA*, Bates, Journ. Ent. ii. p. 213 (1864).  
 Pozuzo (*Pearce*), and valley of Cosnipata (*H. Whitely*).  
 Mus. S. G.  
 Ucayali (*Bartlett*). Mus. D.  
 "These beautiful Butterflies delight in sitting flat against the walls of houses and on the steep clay banks of the rivers; they were very abundant."—*E. B.*

## Genus GYNÆCIA, Doubl.

G. DIRCE, Linn. (*Pap. d.*) Mus. Ulr. p. 287 (1764).

Ucayali (*Bartlett*).

Mus. D.

"Found on the forest footpaths about the leaves of bushes and flowers."—*E. B.*

## Genus AGERONIA, Hübn.

1. A. CHLOË, Stoll (*Pap. c.*) Supp. Cram. t. 5. f. 1, 1 $\alpha$  (1787).

Ucayali (*Bartlett*).

Mus. S. G.

2. A. FERENTINA, Godt. (*Nymp. f.*) Enc. Méth. ix. p. 428 (1823).

Huiro, valley of Santana (*H. Whitely*).

Mus. D.

3. A. FERONIA, Linn. (*Pap. f.*) Mus. Ulr. p. 283 (1764).

Ucayali (*Bartlett*).

Mus. D.

4. A. FORNAX, Hübn. Samml. ex. Schmett. (1816–24); Doubl. Hew. Gen. D. L. t. 10. f. 1 (1847).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

5. A. AMPHINOME, Linn. (*Pap. a.*) Syst. Nat. i. 2. p. 779 (1767).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

"The species of this genus are found on the bark of the trees which are covered with grey moss, to which they assimilate, usually near villages on the forest foot-paths."—*E. B.*

## Genus DIDONIS, Fabr.

1. D. AGANISA, Boisd. Sp. Gén. i. t. 9. f. 7 (1836).

Ucayali (*Bartlett*).

Mus. S. G.

2. D. BIBLIS, Fabr. (*Pap. b.*) Syst. Ent. p. 505 (1775).

Ucayali (*Bartlett*).

Mus. D.

## Genus OLINA, Westw.

O. OZECA, Doubl. & Hew. Gen. D. L. p. 407, t. 31. f. 31 (1848).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

## Genus PYRRHOGYRA, Hübn.

1. P. NEÆREA, Linn. (*Pap. n.*) Mus. Ulr. p. 297 (1764).

Pozzuzo (*Pearce*).

Mus. S. G.

Valley of Cosnipata (*H. Whitely*).

Mus. D.

2. P. LYSANIAS, Feld. Wien. ent. Mon. vi. p. 115 (1862).

Pozzuzo (*Pearce*).

Mus. S. G.

## Genus TIMETES, Westw.

1. T. CORESIA, Godt. (*Nymph. c.*) Enc. Méth. ix. p. 359 (1823).

Pozzuzo (*Pearce*).

Mus. S. G.

Valley of Cosnipata (*H. Whitely*).

Mus. D.

2. *T. NORICA*, Hew. Exot. Butt. i. *Tim.* t. 1. f. 3, 4 (1852).  
Ucayali (*Bartlett*). Mus. S. G. & D.
3. *T. EGINA*, Bates, Journ. Ent. ii. p. 329, t. 10. f. 1 (1865).  
Ucayali (*Bartlett*). Mus. D.
4. *T. TUTELINA*, Hew. Exot. Butt. i. *Tim.* t. 1. f. 5 (1852).  
Santa Cruz (*Bartlett*). Mus. S. G.  
Yurimaguas (*Bartlett*). Mus. D.
5. *T. LIVIUS*, Kirb. (*T. berania*, Hew.) Exot. Butt. i. t. 1. f. 2 (1852); Staud. Verh. zool.-bot. Ges. 1875, p. 104.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
6. *T. CRETHON*, Fabr. (*Pap. c.*) Gen. Ins. p. 252 (1777).  
Ucayali (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
7. *T. CORINNA*, Latr. (*Van. c.*) Humb. Bonpl. Obs. Zool. ii. p. 84, t. 36. f. 5, 6 (1819).  
Pozzuzo (*Pearce*). Mus. S. G.  
Huiro, valley of Santana (*H. Whitely*). Mus. D.
8. *T. MARCELLA*, Feld. Wien. ent. Mon. v. p. 108 (1861).  
Pozzuzo (*Pearce*). Mus. S. G.
9. *T. HERMIONE*, Feld. *l. c.* p. 97.  
Pozzuzo (*Pearce*). Mus. S. G.  
Ucayali (*Bartlett*). Mus. S. G. & D.
- “One or other species of this genus was to be found in nearly all the localities I visited, on the mud-banks of the rivers and streams, feeding upon decayed fruit” &c.—*E. B.*

## Genus VICTORINA, Blanch.

1. *V. STENELES*, Linn. (*Pap. s.*) Mus. Ulr. p. 218 (1764).  
Pozzuzo (*Pearce*). Mus. S. G.
2. *V. EPAPHUS*, Latr. (*Van. e.*) Humb. & Bonpl. Obs. Zool. ii. p. 74, t. 35. f. 3, 4 (1811-19).  
Valley of Cosnipata (*H. Whitely*); Yurimaguas (*Bartlett*).  
Mus. D.  
Pozzuzo (*Pearce*). Mus. S. G.  
“Found on the mud-banks.”—*E. B.*
3. *V. SULPITIA*, Cram. (*Pap. s.*) Pap. Exot. iv. t. 328, f. A, B (1782).  
Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Nauta (*Bartlett*). Mus. D.  
“Found about the footpaths of the forest on the leaves of bushes” &c.—*E. B.*

## Genus HETEROCHROA, Boisd.

1. H. IPHICLA, Linn. (*Pap. i.*) Mus. Ulr. p. 311 (1764).  
Nauta and Yurimaguas (*Bartlett*). Mus. D.
2. H. CALLIPHICLEA, Butl. Cat. Fabr. p. 58. n. 5 (1870).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Differs slightly from the type in the orange spot above.
3. H. EROSLA, Hew. Ann. Nat. Hist. xx. p. 259, t. 20. f. 3 (1847).  
Yurimaguas (*Bartlett*). Mus. D.  
Pozzuzo (*Pearce*), and valley of Cosnipata (*H. Whitely*).  
Mus. S. G.
4. H. XIMENA, Feld. Wien. ent. Mon. vi. p. 116 (1862).  
Pozzuzo (*Pearce*). Mus. S. G.
5. H. ARICIA, Hew. Ann. Nat. Hist. xx. p. 263, t. 21. f. 11 (1847).  
Valley of Cosnipata (*H. Whitely*). Mus. D.
6. H. CYTHEREA, Linn. (*Pap. c.*) Mus. Ulr. p. 305 (1764).  
Ucayali and Yurimaguas (*Bartlett*). Mus. S. G. & D.
7. H. BOREAS, Butl. P. Z. S. 1865, p. 668. f. 2.  
Valley of Cosnipata (*H. Whitely*). Mus. D.
8. H. ALALA, Hew. Ann. Nat. Hist. xx. p. 261, t. 21. f. 8 (1847).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.  
Huiro, valley of Santana (*H. Whitely*). Mus. D.
9. H. TIZONA, Feld. Reise Nov. Lep. iii. p. 424 (1867).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
10. H. LARA, Hew. Ann. Nat. Hist. ser. 2, vol. vi. p. 437, t. 9.  
f. 8 (1850).  
Pozzuzo (*Pearce*). Mus. S. G.
11. H. MESENTINA, Cram. (*Pap. m.*) Pap. Ex. ii. t. 162. f. B, C  
(1779).  
Huallaga (*Bartlett*). Mus. S. G.  
"These Butterflies I found on the leaves and flowers in the foot-  
paths of the dense forest.—*E. B.*

## Genus APATURA, Fabr.

1. A. CYANE, Latr. (*Nymph. c.*) Humb. Bonpl. Obs. Zool. ii. p. 82,  
t. 36. f. 3, 4 (1811–23).  
Pozzuzo (*Pearce*), and valley of Cosnipata (*H. Whitely*).  
Mus. S. G.
2. A. PAVONII, Latr. (*Nymp. p.*) Humb. Bonpl. Obs. Zool. i. p.  
197, t. 18. f. 34 (1811?).  
Nauta (*Bartlett*). Mus. D.  
"Found on the walls of houses and bushes in villages."—*E. B.*

3. A. AGATHINA, Cram. (*Pap. a.*) *Pap. Exot.* ii. t. 167. f. E, F (1782).

Ucayali (*Bartlett*). Mus. S. G.

Valley of Cosnipata (*H. Whitely*). Mus. D.

“Found about the villages and plantations of plantains, on the ripe fruit and decayed vegetable matter.”—*E. B.*

4. A. ELIS, Feld. *Wien. ent. Mon.* v. p. 109. n. 100 (1861).

Pozzuzo (*Pearce*), and valley of Cosnipata (*H. Whitely*).

Mus. S. G.

Huasampilla (*H. Whitely*).

Mus. D.

5. A. SELINA, Bates, *Journ. Ent.* ii. p. 334. n. 139 (1865).

Sarayacu (*Bartlett*).

Mus. D.

“Very rare, found about the villages.”—*E. B.*

6. A. LINDA, Feld. *Wien. ent. Mon.* vi. p. 117. n. 119 (1862).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

7. A. GRISELDIS, Feld. *Wien. ent. Mon.* vi. p. 117. n. 120 (1862).

Nauta and Sarayacu (*Bartlett*).

Mus. D.

8. A. LUCASII, Doubl. & Hew. *Gen. D. L.* t. 45. f. 2 (1850).

Huasampilla (*H. Whitely*).

Mus. D.

9. A. CHERUTINA, Feld, *Reise Nov. Lep.* iii. p. 435 (1867).

Pozzuzo (*Pearce*), and valley of Cosnipata (*H. Whitely*).

Mus. S. G.

10. A. LAVINIA, Butl. (*Chlorippe l.*) *P. Z. S.* 1866, p. 39, t. 3. f. 1.

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

11. A. ZUNILDA, Godt. (*Nymp. z.*) *Enc. Méth.* ix. p. 377 (1823).

Pozzuzo (*Pearce*).

Mus. S. G.

“The species of this genus prefer the villages on account of the different kinds of fruit that are cultivated in and about them, also for the refuse which the Indians throw away.”—*E. B.*

#### Genus AGANISTHOS, Boisd.

1. A. ORION, Fabr. (*Pap. o.*) *Syst. Ent.* p. 485 (1775).

Chyavitas (*Bartlett*).

Mus. D.

Valley of Cosnipata.

Mus. S. G. & D.

“About the borders of the dense forest.”—*E. B.*

2. A. ACHERONTA, Fabr. (*Pap. a.*) *Syst. Ent.* p. 501 (1775).

Nauta (*Bartlett*).

Mus. D.

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

“Very common, in some places on the mud-banks I found these insects in patches of hundreds together, feeding upon the rotten fruit” &c.—*E. B.*

## Genus PREPONA, Boisd.

1. P. LAERTES, Hübn. Samml. ex. Schmett. (1806-16).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
2. P. MEANDER, Cram. (*Pap. m.*) Pap. Exot. i. t. 12. f. A, B (1775).  
Chamicuras (*Bartlett*). Mus. D.  
"Very rare, found in the forest footpaths."—*E. B.*
3. P. LYCOMEDAS, Cram. (*Pap. l.*) Pap. Ex. ii. t. 158. f. D (1779).  
Pozzuzo (*Pearce*). Mus. S. G.
4. P. PRÆNESTE, Hew. Exot. Butt. ii. *Prep.* t. 2. f. 7, 8 (1859).  
Pozzuzo (*Pearce*). Mus. S. G.

## Genus AGRIAS, Doubl.

- A. SARDANAPALUS, Bates, Proc. Ent. Soc. ser. 2, vol. v. p. 111 (1860).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Peru (*Dr. Staudinger*). Mus. D.

## Genus SMYRNA, Hübn.

- S. BLOMFIELDIA, Fabr. (*Pap. b.*) Spec. Ins. ii. p. 84 (1781).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

## Genus MEGISTANIS, Westw.

1. M. BÆOTUS, Doubl. Hew. Gen. D. L. t. 48. f. 2 (1850).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
2. M. DEUCALION, Feld. Wien. ent. Mon. iv. p. 238 (1860).  
Chamicuras (*Bartlett*). Mus. D.  
"Plentiful about mud-banks."—*E. B.*

## Genus HYPNA, Hübn.

- H. CLYTEMNESTRA, Cram. (*Pap. c.*) Pap. Exot. ii. t. 137. f. A B (1779), iv. t. 364. f. A, B.  
Pozzuzo (*Pearce*). Mus. S. G.

## Genus PAPHIA, Fabr.

1. P. EURYPHYLE, Feld. (*Nymp. e.*) Wien. ent. Mon. vi. p. 119 (1862).  
Pozzuzo (*Pearce*). Mus. D.
2. P. PHIDILE, Hübn. Zutr. exot. Schmett. f. 905, 906 (1837).  
Ucayali (*Bartlett*). Mus. D.  
"Found about the river-banks and villages."—*E. B.*
3. P. ERYTHEMA, Bates, Journ. Ent. ii. p. 342 (1865).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

4. *P. CHRYSOPHANA*, Bates, Ent. Mo. Mag. iii. p. 152 (1866).  
Yurimaguas (*Bartlett*). Mus. D.
5. *P. NESSUS*, Latr. (*Nymp. n.*) Humb. Bonp. Obs. Zool. ii. p. 76,  
t. 35. f. 5, 6 (1811-23).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
6. *P. TYRIANTHINA*, Salv. & Godm. Ann. Nat. Hist. ser. 4, vol. ii.  
p. 148. n. 17 (1868).  
Huasampilla (*H. Whitely*). Mus. D.
7. *P. GLYCERIUM*, Doubl. & Hew. Gen. D. L. t. 50. f. 1 (1850).  
Nauta (*Bartlett*). Mus. D.
8. *P. XENOCLES*, Westw. Gen. D. L. p. 319. n. 11, note (1850).  
Huasampilla (*H. Whitely*). Mus. D.
9. *P. XENOCRATES*, Westw. *l. c.* n. 13.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
10. *P. MORVUS*, Fabr. (*Pap. m.*) Syst. Ent. p. 484 (1775).  
Nauta (*Bartlett*). Mus. D.
11. *P. GLAUCE*, Feld. (*Nymp. g.*) Wien. ent. Mon. vi. p. 119  
(1862).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
12. *P. PHANTES*, Hoff. Stett. ent. Zeit. 1874, p. 353. n. 57.  
Peru (*Dr. Staudinger*). Mus. D.  
A very distinct species.
13. *P. ALBERTA*, n. sp. (Plate XVIII. fig. 6.)  
Upperside blue-black; anterior wing with the base, a large spot  
crossing the wing at the apex, and two smaller spots near the anal  
angle, greyish blue; posterior wing thickly irrorated with greyish  
blue. Underside glossy brown, thickly speckled with dark and light  
brown markings.  
Exp.  $2\frac{3}{4}$  inches.  
Peru. Mus. D.
14. *P. CYANEA*, Salv. & Godm. Ann. Nat. Hist. ser. 4, vol. ii. p.  
148 (1868).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
15. *P. APPIAS*, Hübn. (*Cor. a.*) Samml. exot. Schmett. (1816-41).  
Ucayali (*Bartlett*). Mus. S. G.  
"The species of this genus are generally found about the river-  
banks, near villages and forest-streams."—*E. B.*

Genus *SIDERONE*, Hübn.

*S. THEBAIS*, Feld. Wien. ent. Mon. vi. p. 422 (1862).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

The specimen differs slightly from Felder's type by having the red band of the posterior wing broken into spots.

Genus *PROTOGONIUS*, Hübn.

*P. CECROPS*, Doubl., var. *ÆQUATORIALIS*, Butl. P. Z. S. 1875, p. 35, pl. v. f. i.

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

The specimen differs from the variety named by Mr. Butler by wanting the yellow spots near the outer margin of the anterior wing, and would, without doubt, be considered a distinct species by some; but I should be very sorry to describe it, not having yet seen any two specimens alike.

Family II. *LEMONIIDÆ*.Subfamily I. *LIBYTHEINÆ*, Bates.Genus *LIBYTHEA*, Fabr.

*L. CARINENTA*, Cram. (*Pap. c.*) Pap. Exot. ii. t. 108. f. E, F (1782).

Ucayali (*Bartlett*).

Mus. D.

"Found in the forest footpaths."—*E. B.*

Family III. *ERYCINIDÆ*.Subfamily I. *NEMEOBIINÆ*, Bates.Genus *EURYBIA*, Hübn.

1. *E. SALOME*, Cram. (*Pap. s.*) Pap. Exot. i. t. 12. f. G, H (1775).

Ucayali (*Bartlett*).

Mus. S. G.

2. *E. DARDUS*, Fabr. (*Pap. d.*) Mant. Ins. ii. p. 30 (1787).

Nauta and Lower Ucayali (*Bartlett*).

Mus. D.

"Common in the dense forest upon dead leaves and rubbish."—*E. B.*

3. *E. DONNA*, Feld. Wien. ent. Mon. vi. p. 410 (1862).

Pozzuzo (*Pearce*).

Mus. S. G.

The specimen from Peru differs slightly in the width of the red of the posterior wing, and the black spots being smaller than they are in the Bogota specimens in my collection.

4. *E. LAMIA*, Cram. (*Pap. l.*) Pap. Exot. ii. t. 150. f. C (1779).

Pozzuzo (*Pearce*).

Mus. S. G.

5. *E. HALIMEDE*, Hübn. (*Lim. subt. h.*) Samml. ex. Schmett. (1806-16).

Ucayali (*Bartlett*).

Mus. S. G.

## Genus Meseomia, Hübn.

1. *M. ULRICA*, Cram. (*Pap. u.*) *Pap. Exot.* ii. t. 100. f. E, F (1782).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 Nauta (*Bartlett*). Mus. D.  
 "Found in the forest footpaths."—*E. B.*
2. *M. JUDICALIS*, Butl. *Trans. Ent. Soc.* 1874, p. 430.  
 Ucayali (*Bartlett*). Type, Mus. D.

## Subfamily 2. Eurygoninæ, Bates.

## Genus Eurygona, Boisid.

- E. EUTYCHUS*, Hew. *Exot. Butt.* t. 5. f. 44-46 (1856).  
 Ucayali (*Bartlett*); Pozzuzo (*Pearce*). Mus. S. G.  
 "In the dense forest."—*E. B.*

## Subfamily 3. Erycininæ, Bates.

## Genus Thermone, Westw.

- T. PAIS*, Hübn. (*Helio p.*) *Samml. ex. Schmett.* (1816-41).  
 Pozzuzo (*Pearce*). Mus. S. G.

## Genus Notheme, Westw.

- N. EUMEUS*, Fabr. (*Pap. e.*) *Spec. Ins.* ii. p. 63 (1781).  
 Nauta (*Bartlett*). Mus. D.

## Genus Panara, Westw.

- P. PHERECLUS*, Linn. *Syst. Nat.* i. 2. pp. 792, 248 (1767).  
 Ucayali (*Bartlett*). Mus. S. G.

## Genus Lymnas, Blanch.

- L. ZOEGA*, Hew. *Exot. Butt.* i. *Lim.* t. 1. f. 2 (1852).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 This species varies much in the width of the orange border of the hind wings.

## Genus Lyropteryx, Westw.

- L. APPOLLONIA*, Westw. *Gen. Diurn. Lep.* p. 433. n. 1, note, t. 72. f. 1 (1851).  
 Valley of Cosnipata (*H. Whitely*). Mus. D. & S. G.  
 Pozzuzo (*Pearce*). Mus. S. G.

## Genus Necyria, Westw.

1. *N. SAUNDERSII*, Hew. (*Eryc. s.*) *Trans. Ent. Soc.* ser. 2, ii. p. 245, t. 22. f. 1 (1854).  
 Pozzuzo (*Pearce*). Mus. S. G.

2. N. WHITELYANA, Druce, Trans. Ent. Soc. 1874, p. 159.

Huasampilla (*H. Whitely*).

Type, Mus. D.

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

Genus ERYCINA, Fab.

1. E. MELIBŒUS, Fabr. (*Pap. m.*) Gen. Ins. p. 271 (1777).

Pozzuzo (*Pearce*).

Mus. S. G.

Yurimaguas (*Bartlett*).

Mus. D.

"On mud-banks and forest footpaths."—*E. B.*

2. E. AULESTES, Cram. (*Pap. a.*) Pap. Exot. ii. t. 128. f. G (1779).

Ucayali (*Bartlett*).

Mus. S. G.

3. E. COLUBRA, Saund. Trans. Ent. Soc. ser. 2, v. p. 103, t. 11. f. 12 (1859).

Valley of the Cosnipata (*H. Whitely*).

Mus. S. G.

Genus DIORHINA, Morisse.

1. D. PERIANDER, Cram. (*Pap. p.*) Pap. Exot. ii. t. 188. f. C (1779).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

Ucayali (*Bartlett*).

Mus. D.

"On mud-banks and forest footpaths."—*E. B.*

2. D. PSECAS, Saund. Trans. Ent. Soc. v. p. 219, t. 20. f. 4, 4 a (1849).

Ucayali (*Bartlett*).

Mus. D.

Genus ZEONIA, Swains.

Z. SYLPHINA, Bates, Journ. Linn. Soc. Zool. ix. p. 383 (1868).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

Differs from the type in having the crimson streak along the abdominal margin bright orange.

Genus ITHOMEIS, Bates.

I. MIMICA, Bates, Trans. Linn. Soc. xxiii. p. 542, note, n. 4 (1862).

Sarayacu (*Bartlett*).

Mus. S. G.

Genus CHAMÆLIMNAS, Feld.

C. BRIOLA, Bates, Journ. Linn. Soc. Zool. ix. p. 379 (1868).

Ucayali (*Bartlett*).

Mus. D.

"Forest footpaths."—*E. B.*

Genus ORESTIA, Feld.

O. VITULA, Hew. (*Limnas v.*) Exot. Butt. i. *Lim.* t. 1. f. 5 (1852).

Yurimaguas (*Bartlett*).

Mus. D.

"Forest footpaths."—*E. B.*

## Genus SISEME, Westw.

1. S. PALLAS, Latr. (*Eryc. p.*) Humb. Bonpl. Obs. Zool. i. p. 244, t. 24. f. 5, 6 (1811?).

Huasampilla (*H. Whitely*). Mus. D.

2. S. CAUDALIS, Bates, Journ. Linn. Soc. Zool. ix. p. 384 (1868).

Huasampilla, and Huiro, valley of the Santana (*H. Whitely*).  
Mus. D.

3. S. LUCILIUS, Hopff. Stett. ent. Zeit. 1874, p. 363.

Huiro, valley of the Santana (*H. Whitely*). Mus. D.  
A very distinct species.

4. S. MILITARIS, Hopff. (*Lasia m.*) Stett. ent. Zeit. 1874, p. 365.

*S. leculenta*, Erschoff.

Peru (*Dr. Staudiger*). Mus. D.

A beautiful species, and very distinct from any that I am acquainted with.

## Genus RIODINA, Westw.

R. LYSIPPUS, Linn. (*Pap. l.*) Mus. Ulr. p. 332 (1764).

Ucayali (*Bartlett*). Mus. D.

## Genus AMARYNTHIS, Hübn.

A. MENERIA, Cram. (*Pap. m.*) Pap. Exot. i. t. 94. f. D, E (1779).

Huallaga and Ucayali (*Bartlett*); Pozzuzo (*Pearce*). Mus. S. G.

Nauta (*Bartlett*). Mus. D.

## Genus ANTEROS, Hübn.

A. BRACTEATA, Hew. Exot. Butt. iii. *Ant.* t. 1. f. 11, 12 (1867).

Ucayali (*Bartlett*). Mus. S. G.

## Genus EMESIS, Fabr.

E. MANDANA, Cram. (*Pap. m.*) Pap. Exot. iii. t. 271. f. E, F (1782).

Pozzuzo (*Pearce*); valley of the Cosnipata (*H. Whitely*).

Mus. S. G.

## Genus CHARIS, Hübn.

C. CÆCIAS, Hew. Exot. Butt. iii. *Char.* t. 1. f. 2 (1866).

Pozzuzo (*Pearce*). Mus. S. G.

## Genus BÆOTIS, Hübn.

B. BACENIS, Hew. Exot. Butt. v. *Erycinidæ*, *Bæot.* f. 1 (1874).

Valley of the Cosnipata (*H. Whitely*). Mus. S. G.

Huiro, valley of the Santana (*H. Whitely*). Mus. D.

Genus *LASAIA*, Bates.

- L. MERIS, Cram. (*Pap. m.*) Pap. Exot. iv. t. 366. f. B, C (1782).  
 Valley of the Cosnipata (*H. Whitely*). Mus. S. G.  
 Nauta and Yurimaguas (*Bartlett*). Mus. D.  
 "Common about the banks of rivers and villages."—*E. B.*

Genus *NYMPHIDIUM*, Fabr.

1. N. CARICÆ, Linn. (*Pap. c.*) Mus. Ulr. p. 324 (1764).  
 Ucayali (*Bartlett*). Mus. S. G.  
 2. N. ASCOLIA, Hew. Exot. Butt. i. *Nymph.* t. 1. f. 4 (1852).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 3. N. MELOPE, Hübn. (*Lim. subt. m.*) Samml. ex. Schmett.  
 (1806–1816).  
 Ucayali (*Bartlett*). Mus. D.  
 "Frequents the forest footpaths."—*E. B.*

Genus *URANEIS*, Bates.

- U. HYALINA, Butl. Journ. Linn. Soc. Zool. ix. p. 225, t. 6.  
 f. 26 (1867).  
 Pozzuzo (*Pearce*). Mus. S. G.

Genus *STALACTIS*, Hübn.

1. S. PHLEGIA, Cram. (*Pap. p.*) Pap. Exot. iii. t. 197. f. F, t. 236.  
 f. C (1782).  
 Ucayali (*Bartlett*). Mus. S. G.  
 2. S. CALLIOPE, Linn. (*Pap. c.*) Mus. Ulr. p. 223 (1764).  
 Ucayali (*Bartlett*). Mus. S. G.  
 3. S. EUTERPE, Linn. (*Pap. e.*) Mus. Ulr. p. 226 (1764).  
 Nauta and Upper Ucayali (*Bartlett*). Mus. S. G. & D.  
 "All the species of *Stalactis* are found on the forest footpaths."  
 —*E. B.*

Family IV. *LYCÆNIDÆ*, Steph.Genus *LYCÆNA*, Fabr.

1. L. HANNO, Stoll (*Pap. h.*) Suppl. Cram. t. 39. f. 2, 2 B  
 (1790).  
 Pozzuzo (*Pearce*). Mus. S. G.  
 2. L. —, sp. ?  
 Huiro, valley of Santana (*H. Whitely*). Mus. D.  
 3. L. KOÁ, n. sp. (Plate XVIII. fig. 7.)  
 Upperside dark violet-blue, with the outer margins brown. Under-  
 side pale brown, darkest at the base of the wings; anterior wing with

two white streaks at the end of the cell and two fine white broken lines crossing from the costal margin to the inner margin; posterior wing with a silver-white streak from the base to the apex nearest to the costal margin, a broad white spot beyond the middle nearest the anal angle.

Exp.  $\frac{3}{4}$  inch.

Pozzuzo (*Pearce*).

Type, Mus. S. G.

A beautiful little species, of which Mr. Pearce only obtained two or three specimens.

#### Genus THECLA, Fabr.

1. T. LUXURINA, Feld. Reise Nov. Lep. p. 262, t. 32. f. 21, 22 (1865).

Pozzuzo (*Pearce*).

Mus. S. G.

2. T. MARSYAS, Linn. (*Pap. m.*) Mus. Ulr. p. 315 (1784).

Pozzuzo (*Pearce*).

Mus. S. G.

3. T. GIBBEROSA, Hew. Ill. Diurn. Lep. p. 85, t. 33. f. 48, 49 (1867).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

4. T. METON, Cram. (*Pap. m.*) Pap. Exot. iii. t. 201. f. D, E (1782).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

5. T. STREPHON, Fabr. (*Pap. s.*) Syst. Ent. p. 522 (1775).

Upper Ucayali (*Bartlett*).

Mus. S. G. & D.

6. T. PAPHLAGON, Feld. (*Pseud. p.*) Reise Nov. Lep. ii. p. 249, t. 31. f. 10, 11 (1865).

Huasampilla, ad alt. 10,000 ped. (*H. Whitely*).

Mus. D.

7. T. OCRISIA, Hew. Desc. Lyc. p. 5 (1868); Ill. Diurn. Lep. p. 123, t. 48. f. 235, 236 (1869).

Huירו, valley of Santana (*H. Whitely*).

Mus. D.

One specimen only.

8. T. BEON, Cram. (*Pap. b.*) Pap. Exot. iv. t. 319. f. B, C (1782).

Santa Cruz (*Bartlett*).

Mus. D.

"Forest footpaths."—*E. B.*

#### Family V. PAPILIONIDÆ.

##### Subfamily 1. PIERINÆ, Bates\*.

##### Genus PEREUTE, Herr.-Schäff.

1. P. CHAROPS, Boisd. (*Eut. c.*) Sp. Gén. i. p. 407, t. 18. f. 1 (1836).

Pozzuzo (*Pearce*).

Mus. S. G.

\* I have arranged the *Pierinæ* according to Mr. Butler's paper on that subfamily in 'Cistula Entomologica,' vol. i. pp. 33-58.

2. *P. TELTHUSA*, Hew. (*Eut. t.*) Exot. Butt. ii. *Eut. t.* 1. f. 1, 3 (1860).

Pozzuzo (*Pearce*). Mus. S. G.

3. *P. CALLINICE*, Feld. (*Eut. c.*) Wien. ent. Mon. v. p. 7, 9 (1861).

Cosnipata (*Whitely*). Mus. D.

Genus LEODONTA, Butl.

*L. ZENOBINA*, Hopff. Stett. ent. Zeit. 1869, p. 429, 1874, p. 331.

Cosnipata (*Whitely*). Mus. S. G.

Peru (*Dr. Staudinger*). Mus. D.

Genus MYLOTHRIS, Hübn.

1. *M. PYRRHA*, Fabr. (*Pap. p.*) Syst. Ent. p. 464 (1775).

Huallaga (*Bartlett*). Mus. S. G.

Huasampilla (*H. Whitely*). Mus. D.

2. *M. LORENA*, Hew. (*Pier. l.*) Exot. Butt. i. *Pier. t.* 1. f. 7 (1852).

Nauta and Upper Ucayali (*Bartlett*). Mus. D.

"Very common."—*E. B.*

Genus HESPEROCHARIS, Felder.

1. *H. NEREIS*, Feld. Reise Nov. Lep. ii. p. 146 (1865).

Cosnipata valley (*Whitely*). Mus. S. G.

2. *H. NEREINA*, Hopff. Stett. ent. Zeit. 1874, p. 336.

Cosnipata valley (*Whitely*); Peru (*Dr. Staudinger*). Mus. D.

3. *H. CATAGRAMMA*, Koll. (*Pier. c.*) Denkschr. Akad. Wiss. Wien. math.-nat. Cl. i. p. 361 (1850).

Cosnipata valley (*Whitely*). Mus. S. G.

Huiro, 4800 ft.; valley of the Santana (*Whitely*). Mus. D.

Genus CATASTICTA, Butler.

1. *C. NOTHA*, Luc. (*Eut. n.*) Rev. Zool. 1852, p. 195.

Cosnipata valley (*H. Whitely*). Mus. D.

2. *C. SISAMNUS*, Fab. (*Pap. s.*) Ent. Syst. iii. 1. p. 44 (1793).

Pozzuzo (*Pearce*) and valley of the Cosnipata (*H. Whitely*).  
Mus. S. G.

3. *C. MANCO*, Doub. (*Eut. m.*) Ann. Nat. Hist. ser. 2, i. p. 121 (1848).

Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

## Genus SPHÆNOGONA, Butler.

1. *S. SALOME*, Feld. (*I. s.*) Wien. ent. Mon. v. p. 84 (1861).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

2. *S. CONSTANTIA*, Feld. Reise Nov. Lep. ii. p. 200 (1865).  
Huiro, 4800 ft. elevation, valley of the Santana (*H. Whitely*).  
Mus. D.

## Genus TERIAS, Swainson.

1. *T. ALBULA*, Cram. (*Pap. a.*) Pap. Exot. i. t. 27. f. E (1775).  
Ucayali (*Bartlett*). Mus. S. G.  
Yurimaguas (*Bartlett*). Mus. D.

2. *T. ELATHEA*, Cram. (*Pap. e.*) Pap. Exot. ii. t. 99. f. C, D  
(1779).  
Valley of Cosnipata (*Whitely*). Mus. D.

3. *T. ÆQUATORIALIS*, Feld. Wien. ent. Mon. v. p. 85 (1861).  
Huiro, 4800 ft. elevation, valley of Santana (*H. Whitely*).  
Mus. D.

The type was from Ecuador.

4. *T. FLAVILLA*, Bates, Journ. Ent. i. p. 241. n. 4 (1861).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

5. *T. RETICULATA*, Butl. P. Z. S. 1871, p. 539.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Huasampilla ad alt. 10,000 ped., Huiro ad alt. 4,800 ped., valley  
of Santana (*H. Whitely*). Mus. D.

## Genus LEPTOPHOBIA, Butler.

1. *L. ELEONE*, Doubl. (*Pier. e.*) Gen. Diurn. Lep. t. 6. f. 6  
(1847).  
Valley of Cosnipata (*H. Whitely*). Mus. D.

2. *L. CINEREA*, Hew. (*Pier. c.*) Trans. Ent. Soc. ser. 3, v. p. 563  
(1847).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

3. *L. PHILOMA*, Hew. (*Pier. p.*) Equat. Lep. p. 79 (1870).  
Pozuzo (*Pearce*). Mus. S. G.

## Genus AMYNTHIA, Swainson.

*A. MENIPPE*, Hübn. Samml. ex. Schmett. (1806–1816).  
Ucayali (*Bartlett*). Mus. D.  
"Common everywhere."—*E. B.*

## Genus CALLIDRYAS, Boisdu.

1. *C. EUBULE*, Linn. (*Pap. eub.*) Syst. Nat. i. 2. p. 743 (1766).  
Ucayali (*Bartlett*). Mus. D.  
"Common on the Huallaga and in the whole of East Peru visited  
by me."—*E. B.*

2. *C. CIPRIS*, Fab. (*Pap. cip.*) Ent. Syst. iii. 1. p. 212 (1793).  
Valley of Cosnipata (*H. Whitely*). Mus. D.
3. *C. RURINA*, Feld. Wien. ent. Mon. v. p. 82 (1861).  
Huiro ad alt. 4800 ped., valley of Santana (*H. Whitely*).  
Mus. D.  
One specimen only.
4. *C. PHILEA*, Linn. (*Pap. ph.*) Syst. Nat. i. 2. p. 764 (1776).  
Upper Ucayali (*Bartlett*). Mus. D.  
"Not common."—*E. B.*
5. *C. ARGANTE*, Fab. (*Pap. a.*) Syst. Ent. p. 470 (1775).  
Upper and Lower Ucayali (*Bartlett*). Mus. S. G. & D.  
"Very abundant."—*E. B.*
6. *C. TRITE*, Linn. (*Pap. t.*) Syst. Nat. i. 2. p. 763 (1766).  
Upper Ucayali (*Bartlett*). Mus. D.
7. *C. STATIRA*, Cram. (*Pap. s.*) Pap. Exot. ii. t. 120. f. C, D (1779).  
Upper and Lower Ucayali (*Bartlett*). Mus. S. G. & D.  
"The species of this genus are very abundant at certain seasons;  
they may be found by thousands on mud-banks of rivers, mingled  
with *Pieris*, *Papilio*, and others."—*E. B.*

Genus *PIERIS*, Boisd.

1. *P. DEMOPHILE*, Linn. (*Pap. d.*) Syst. Nat. i. 2. p. 761 (1767).  
Nauta and Upper Ucayali (*Bartlett*). Mus. D.
2. *P. PISONIS*, Hew. Exot. Butt. ii. t. 6. f. 40, 41 (1861).  
Nauta and Upper Ucayali (*Bartlett*). Mus. S. G. & D.
3. *P. DIANA*, Feld. Wien. ent. Mon. v. p. 81 (1861).  
Nauta (*Bartlett*). Mus. D.  
" *Pieris* is generally distributed over the whole of East Peru; and  
some of the species are extremely common on the mud-banks of the  
rivers, where they assemble in patches of hundreds together. It is  
puzzling to the traveller what becomes of the females. The whole  
of the four years I was in Peru I only obtained about six females of  
all the species of the genus *Pieris*; the males I collected by hundreds."  
—*E. B.*

Genus *APPIAS*, Hübn.

1. *A. ILAIRE*, Godt. (*Pap. i.*) Enc. Méth. ix. p. 142 (1819).  
Nauta (*Bartlett*). Mus. D.  
"Very common."—*E. B.*
2. *A. DRUSILLA*, Cram. (*Pap. d.*) Pap. Exot. ii. t. 207. f. C (1779).  
Valley of Cosnipata (*H. Whitely*). Mus. D. & S. G.

## Genus DAPTONOURA, Butl.

1. *D. PANTOPORIA*, Hübn. (*Myl. p.*) Samml. exot. Schmett. (1816, 1841).

Valley of Cosnipata (*H. Whitely*). Mus. S. G.

2. *D. LEUCANTHE*, Feld. (*Pier. l.*) Wien. ent. Mon. v. p. 82 (1861).

Pozzuzo (*Pearce*); Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Huasampilla, ad alt. 10,000 ped. (*H. Whitely*). Mus. D.

## Genus SYNCHLOË, Hübn.

*S. MONUSTA*, Linn. (*Pap. m.*) Mus. Ulr. p. 237 (1764).

Chamicuras (*Bartlett*). Mus. D.

## Genus DISMORPHIA, Hübn.

*D. NEMESIS*, Latr. (*Pier. n.*) Humb. Bonpl. Obs. Zool. ii. p. 78, t. 35. f. 7, 8 (1811-1819).

Huio, ad alt. 4,800 ped.; valley of Santana (*H. Whitely*).  
Mus. D.

## Genus MOSCHONEURA, Butl.

1. *M. EUMELIA*, Cram. (*Pap. e.*) Pap. Exot. iii. t. 280. f. D (1782).

Yurimaguas (*Bartlett*). Mus. S. G. & D.  
"In low moist parts of the forest, flying with *Ithomia*."—*E. B.*

2. *M. THEUGENIS*, Doubl. (*Lep. t.*) Ann. Nat. Hist. ser. 2, i. p. 124 (1848).

Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Huasampilla (*H. Whitely*). Mus. D.

3. *M. THERMESIA*?, Godt. (*Pier. t.*) Enc. Méth. ix. p. 164 (1819).

Huio, ad alt. 4800 ped.; valley of Santana (*H. Whitely*).  
Mus. D.

4. *M. PENIA*, Hopff. (*Lep. p.*) Stett. ent. Zeit. 1874, p. 334.

Peru (*Dr. Staudinger*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Mr. Salvin's specimen is not so yellow on the underside, but does not differ in any other respect.

## Subfamily 2. PAPILIONINÆ, Swains.

## Genus PAPILIO, Linn.

1. *P. SESOSTRIS*, Cram. Pap. Exot. iii. t. 211. f. F, G (1782).

Ucayali and Yurimaguas (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.

"Very common about the banks of rivers."—*E. B.*

2. *P. CUTORA*, Gray, Cat. Lep. Ins. B. M. i. p. 58, t. 10\*, f. 6 (1852).  
Ucayali and Huallaga (*Bartlett*). Mus. S. G.
3. *P. ERLACES*, Gray, Cat. Lep. Ins. B. M. i. p. 49, t. 8. f. 9 (1852).  
Pozuzo (*Pearce*). Mus. S. G.
4. *P. ÆNEAS*, Linn. Mus. Ulr. p. 197 (1764).  
Ucayali (*Bartlett*). Mus. S. G.
5. *P. MADYES*, Doubl. Ann. Nat. Hist. xviii. p. 375 (1846).  
Huiro, ad alt. 4800 ped.; valley of Santana (*H. Whitely*).  
Mus. D.  
One specimen only.
6. *P. POLYDAMAS*, Linn. Mus. Ulr. p. 192 (1764).  
Upper Ucayali (*Bartlett*). Mus. S. G.  
"Not common; found on the mud-banks of rivers."—*E. B.*
7. *P. LYCIDAS*, Cram. Pap. Exot. ii. t. 113. f. A (1779).  
Huallaga (*Bartlett*). Mus. S. G.  
Ucayali (*Bartlett*). Mus. D.  
"Rare, about the banks of rivers and forest-streams."—*E. B.*
8. *P. BELUS*, Cram. Pap. Exot. ii. t. 112. f. A, B (1779).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
Chamicuras (*Bartlett*). Mus. D.  
"Plentiful about river-banks and villages."—*E. B.*
9. *P. CRASSUS*, Cram. Pap. Exot. ii. t. 112. f. C (1779).  
Nauta, Ucayali, and Yurimaguas (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.  
"Very common about the banks of rivers."—*E. B.*
10. *P. PAUSANIAS*, Hew. Trans. Ent. Soc. ser. 2, ii. p. 22, t. 6. f. 2 (1852).  
Chamicuras (*Bartlett*). Mus. D.  
"Not common on the banks of forest-streams."—*E. B.*
11. *P. DOLICAON*, Cram. Pap. Exot. i. t. 17. f. C, D (1775).  
Ucayali (*Bartlett*). Mus. S. G.
12. *P. AUTOSILAUS*, Bates, Trans. Ent. Soc. ser. 2, v. p. 348 (1861).  
Ucayali (*Bartlett*). Mus. D.
13. *P. TELESILAUS*, Feld. Verh. zool.-bot. Ges. xiv. pp. 301, 345 (1864).  
Ucayali (*Bartlett*). Mus. D.

14. *P. ANDROGEOS*, Cram. Pap. Exot. i. t. 16. f. C, D (1775).  
Huasampilla, ad alt. 10,000 ped. (*H. Whitely*). Mus. D.
15. *P. ANCHISIADES*, Esp. Auss. Schmett. t. 13. f. 1, 2 (1785–1798).  
Chamicuras and Yurimaguas (*Bartlett*). Mus. D.  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
16. *P. ISIDORUS*, Doubl. Ann. Nat. Hist. xviii. p. 374 (1846).  
Pozzuzo (*Pearce*). Mus. S. G.
17. *P. ZAGREUS*, Doubl. Ann. Nat. Hist. xix. p. 174 (1847).  
Pozzuzo (*Pearce*). Mus. S. G.
18. *P. CTESIAS*, Feld. Reise Nov. Lep. p. 86, t. 14. f. C, D (1865).  
Pozzuzo (*Pearce*); valley of Cosnipata (*H. Whitely*).  
Mus. S. G.  
Ucayali (*Bartlett*); Huasampilla (*H. Whitely*). Mus. D.
19. *P. XANTHOPLEURA*, Salv. & Godm. Ann. Nat. Hist. ser. 4, ii. p. 151 (1868).  
Lower Huallaga (*Bartlett*). Mus. S. G.
20. *P. WARSCEWICZII*, Hopff. Stett. ent. Zeit. 1866, p. 29; Hew. Exot. Butt. iv. Pap. t. 10. f. 30 (1869).  
Valley of Cosnipata (*H. Whitely*). Mus. D.  
“Most of the Papilios may be found on the sand- and mud-banks of rivers, some more abundant than others. They congregate by hundreds on the decayed fruit and vegetable matter thrown about by the Indians, and retire to the forest at night, generally sitting on the underside of the leaves of trees.”—*E. B.*

## Family VI. HESPERIDÆ, Leach.

## Genus THYMELE, Fab.

1. *T. SIMPLICIUS*, Stoll (*Pap. s.*) Supp. Cram. t. 39. f. 6, 6 E (1790).  
Ucayali (*Bartlett*). Mus. D.
2. *T. EURYCLES*, Latr. (*Hesp. e.*) Enc. Méth. ix. p. 730. n. 5 (1823).  
Ucayali (*Bartlett*). Mus. S. G. & D.
3. *T. ORION*, Cram. (*Pap. o.*) Pap. Exot. ii. t. 155. f. A, B (1779).  
Peru (ex *Mus. Saund.*). Mus. D.
4. *T. CATILLUS*, Cram. (*Pap. c.*) Pap. Exot. iii. t. 260. f. F, G (1782).  
Pozzuzo (*Pearce*). Mus. S. G.
5. *T. PROTEUS*, Linn. (*Pap. p.*) Mus. Ulr. p. 333 (1764).  
Pozzuzo (*Pearce*). Mus. S. G.

6. *T. EXADEUS*, Cram. (*Pap. e.*) *Pap. Exot.* iii. t. 260. f. C (1782).  
Ucayali (*Bartlett*). Mus. D.

Genus *TELEGONUS*, Hübn.

1. *T. RAMUSIS*, Cram. (*Pap. r.*) *Pap. Exot.* iv. t. 342. f. C (1782).  
Pozzuzo (*Pearce*). Mus. S. G.
2. *T. NAXOS*, Hew. (*Eud. n.*) *Descr. of Hesp.* p. 10 (1867); *Exot. Butt.* v. *Eudamus*, t. 3. f. 19 (1875).  
Ucayali (*Bartlett*). Mus. S. G.

3. *T. LACYDUS*, n. sp. (Plate XVIII. fig. 10.)  
Upperside dark brown, paler on the outer margin of all the wings.  
Underside as above, the palpi and underside of the head orange.  
Exp. 2 inches.  
Ucayali (*Bartlett*). Type, Mus. S. G.  
I have a specimen from Villa Nova, on the Amazons.

Genus *THRACIDES*, Hübn.

- T. ARISTOTELES*, Doubl. & Hew. *Diurn. Lep.* t. 80. f. 2 (1852).  
Yurimaguas (*Bartlett*). Mus. D.

Genus *ENTHEUS*, Hübn.

- E. PELEUS*, Linn. (*Pap. p.*) *Mus. Ulr.* p. 327 (1764).  
Ucayali (*Bartlett*). Mus. D.

Genus *OXYNETRA*, Feld.

- O. SEMIHYALINA*, Feld. *Wien. ent. Mon.* vi. p. 180 (1862); *Reise Nov. Lep.* iii. t. 70. f. 9 (1867).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

Genus *PYRRHOPYGA*, Hübn.

1. *P. THASUS*, Cram. (*Pap. t.*) *Pap. Exot.* iv. t. 380. f. M, N (1782).  
Valley of Cosnipata (*H. Whitely*); Ucayali (*Bartlett*). Mus. D.
2. *P. LEUCOLOMA*, Ersch.  
Pozzuzo (*Pearce*). Mus. S. G.
3. *P. ACASTUS*, Cram. (*Pap. a.*) *Pap. Exot.* i. t. 41. f. C, D (1776).  
Ucayali and Yurimaguas (*Bartlett*). Mus. S. G. & D.
4. *P. HADASSA*, Hew. *Trans. Ent. Soc.* ser. 3, ii. p. 484 (1866).  
Valley of Cosnipata (*H. Whitely*). Mus. D.
5. *P. SCYLLA*, Men. *Cat. Mus. Pet. Lep.* i. p. 95, t. 4. f. 7 (1855).  
Pozzuzo (*Pearce*). Mus. S. G.
6. *P. GNETUS*, Fabr. (*Pap. g.*) *Spec. Ins.* ii. p. 135 (1781).  
Yurimaguas (*Bartlett*). Mus. D.  
Cosnipata valley (*H. Whitely*). Mus. S. G.

7. *P. PITYUSA*, Hew. Exot. Butt. ii. *Pyr.* t. 2. f. 11 (1875).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
8. *P. JAMINA*, Butl. Trans. Ent. Soc. 1870, p. 499.  
*P. zimra*, Hew. Exot. Butt. iv. *Pyr.* pl. ii. f. 11 (1871).  
Nauta (*Bartlett*). Mus. D.
9. *P. AZETA*, Hew. Trans. Ent. Soc. ser. 3, ii. p. 479 (1866).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

Genus *MYSCELUS*, Hübn.

1. *M. EPIMACHIA*, Herr.-Schäff. Prod. Syst. Lep. iii. p. 59. n. 13 (1869).  
Pozzuzo (*Pearce*). Mus. S. G.  
Cosnipata valley (*H. Whitely*). Mus. D.
2. *M. PHORONIS*, Hew. (*Eryc. p.*) Descr. Hesp. p. 1 (1867).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.

Genus *ERYCIDES*, Hübn.

1. *E. PYGMALION*, Cram. (*Pap. p.*) Pap. Exot. iii. t. 245. f. A, B (1782).  
Pozzuzo (*Pearce*). Mus. S. G.  
Chamicuras (*Bartlett*). Mus. D.
2. *E. CORYTAS?*, Cram. (*Pap. c.*) Pap. Exot. ii. t. 100. f. C (1779).  
Nauta (*Bartlett*). Mus. D.
3. *E. ORASUS*, n. sp. (Plate XVIII. fig. 9.)  
Upperside glossy black, with the fringe white; the palpi, head, neck, and anus dark red. Underside the same as *E. socrata*, but darker, with the basal half of the posterior wing white.  
Exp.  $1\frac{7}{8}$  inch.  
Valley of Cosnipata (*H. Whitely*), ex *Mus. Saunders*. Mus. D.
4. *E. OREIDES*, Hew. Exot. Butt. v. *Pyrrh.* & *Eryc.* f. 32, 35 (1875).  
Pozzuzo (*Pearce*). Mus. S. G.
5. *E. CHARONOTIS*, Hew. Desc. Boliv. Butt. p. 21 (1874).  
Valley of Cosnipata (*H. Whitely*). Mus. D.

Genus *CARYSTUS*, Hübn.

1. *C. PSITTACINA*, Feld. (*Hesp. p.*) Reise Nov. Lep. iii. p. 518, t. 71. f. 17, 18 (1867).  
Valley of Cosnipata (*H. Whitely*). Mus. S. G.
2. *C. SIMULIUS*, n. sp. (Plate XVIII. fig. 8.)  
Upperside dark brown; anterior wing crossed beyond the middle

from the costal margin to the inner margin by a band of six small yellow spots; a yellow spot at the end of the cell; posterior wing crossed in the middle by a narrow band from the costal margin to near the anal angle. Underside brown; anterior wing with the base blackish, the spots as above, but larger, some of them running together; posterior wing crossed by a wide white band.

Exp.  $1\frac{3}{4}$  inch.

Valley of Cosnipata (*H. Whitely*).

Mus. D.

Allied to *C. xanthaphes*, Hübn., but very distinct.

Genus PYRGUS, Hübn.

1. *P. OMRINA*, Butl. Trans. Ent. Soc. 1870, p. 509.

Pozzuzo (*Pearce*).

Mus. S. G.

Peru.

Type, Mus. D.

2. *P. THESTIA*, Hew. (*Leucoch. t.*) Equat. Lep. p. 77 (1870).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

3. *P. SYRECHTUS*, Fab. (*Pap. s.*) Syst. Ent. p. 534 (1775).

Ucayali (*Bartlett*).

Mus. D.

Genus BRONTIADES, Hübn.

*B. PROCAS*, Cram. (*Pap. p.*) Pap. Exot. ii. t. 179. f. D (1779).

Ucayali (*Bartlett*).

Mus. D.

Genus CARTEROCEPHALUS, Butl.

1. *C. DIMIDIATUS*, Feld. Reise Nov. Lep. iii. p. 522, t. 74. f. 7, 8 (1867).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G. & D.

2. *C. AGATHOCLES*, Feld. *l. c.* f. 16, 17.

Pozzuzo (*Pearce*).

Mus. S. G.

This species varies very much. A specimen in my collection is almost without the orange bands of the posterior wing.

Genus ACHYLODES, Hübn.

1. *A. THRASO*, Hübn. Samml. exot. Schmett. (1806-1816).

Pozzuzo (*Pearce*).

Mus. S. G.

2. *A. —*, sp. ?

Pozzuzo (*Pearce*).

Mus. S. G.

3. *A. BUSIRUS*, Cram. (*Pap. b.*) Pap. Exot. iii. t. 261. f. A-C (1782).

Pozzuzo (*Pearce*).

Mus. S. G.

Nauta (*Bartlett*).

Mus. D.

4. *A. CORBULO*, Cram. (*Pap. c.*) Pap. Exot. iv. t. 354. f. A (1782).

Valley of Cosnipata (*H. Whitely*).

Mus. S. G.

5. *A. OZOTES*, Butl. Trans. Ent. Soc. 1870, p. 515.  
 Pozzuzo (*Pearce*). Mus. S. G.  
 Valley of Cosnipata (*H. Whitely*). Mus. D.
6. *A. MELANDER*, Cram. (*Pap. m.*) Pap. Exot. iii. t. 270. f. H (1782).  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G. & D.
7. *A. VIRIDICEPS*, Butl. Cist. Ent. i. p. 115 (1872).  
 Pozzuzo (*Pearce*). Mus. S. G.
8. *A. THRASYBULUS*, Fab. (*Hesp. t.*) Ent. Syst. iii. 1. p. 346  
 (1793).  
 Ucayali (*Bartlett*). Mus. D.
9. *A. NEARCHUS*, Latr. (*Hesp. n.*) Humb. Bonp. Obs. Zool. ii.  
 p. 135, t. 43. f. 3, 4 (1811-1823).  
 Ucayali and Yurimaguas (*Bartlett*). Mus. S. G. & D.
10. *A.* —, sp.? \*  
 Pozzuzo (*Pearce*). Mus. S. G.
11. *A. PAUSUS*, Doubl. & Hew. (*Achly. p.*) Gen. Diurn. Lep. t. 80.  
 f. 6 (1852).  
 Nauta (*Bartlett*). Mus. D.
12. *A.* —, sp.? \*  
 Valley of Cosnipata (*H. Whitely*). Mus. S. G.

## Genus HELIAS, Fabr.

*H. ALBIPLAGA*, Feld. Reise Nov. Lep. iii. p. 531, t. 73. f. 18, 19  
 (1867).

Huiro, valley of Santana (*H. Whitely*). Mus. D.

"I found the whole of the *Hesperidæ* plentiful throughout East Peru; they are found about the flowers in plantations and villages, as well as sand- and mud-banks of the rivers."—*E. B.*

## EXPLANATION OF THE PLATES.

## PLATE XVII.

- |  |   |
|--|---|
| Fig. 1. <i>Napeogenes pyrrho</i> , p. 209. | Fig. 4. <i>Ceratinia alexia</i> , p. 207. |
| 2. <i>Ceratinia tigrina</i> , p. 207.      | 5. <i>Mechanitis ortygia</i> , p. 208.    |
| 3. <i>Melinæa chincha</i> , p. 211.        | 6 & 7. <i>Dædalma whitelyi</i> , p. 215.  |

## PLATE XVIII.

- |   |   |
|---|---|
| Fig. 1. <i>Pedaliodes zoippus</i> , p. 214. | Fig. 6. <i>Paphia alberta</i> , p. 234. |
| 2. <i>Heliconius bartletti</i> , p. 219.    | 7. <i>Lycæna koá</i> , p. 239.          |
| 3. <i>Eresia pearcei</i> , p. 222.          | 8. <i>Carystus simulius</i> , p. 248.   |
| 4. — <i>mundina</i> , p. 221.               | 9. <i>Erycides orasus</i> , p. 248.     |
| 5. — <i>nussia</i> , p. 222.                | 10. <i>Telegonus lacydus</i> , p. 247.  |

\* I cannot determine these species; they are simply brown on both sides.

6. On a small Collection of Butterflies from the New Hebrides. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received January 12, 1876.]

The following species have recently been received from Alfred Corrie, Esq., Surgeon to H.M.S. 'Pearl.'

Family NYMPHALIDÆ.

Genus CALLIPLŒA, Butler.

1. CALLIPLŒA GRÆFFIANA, Herrich-Schäffer (two males).

Havannah Harbour, Vaté or Sandwich Island.

Dr. Herrich-Schäffer figures the female of this Butterfly, and remarks;—"Herr Hewitson erklärt sie für *E. hisme*, Boisd., welche identisch mit *E. eunice* sein soll."

The collection of the British Museum contains both *C. hisme* and *C. eunice*; they are quite distinct from one another and from *C. graeffiana*; the latter, indeed, occupies an intermediate position between *C. eunice* and *C. iphianassa*, from both of which it differs in the pale external area of the wings.

The male has a well-defined subcostal spot in primaries (as in *C. iphianassa*), and six well-defined discal spots, all white; a small oval lilac spot on interno-median area; secondaries with the usual whity brown subcostal patch; two obliquely placed subapical white spots, and four pale-brown discal spots. Expanse of wings 3 inches.

This species is new to the Museum collection.

Genus DANAIS, Latreille.

2. DANAIS MODERATA, Butler (two males).

Havannah Harbour, Vaté or Sandwich Island.

The two specimens sent by Mr. Corrie agree in every respect with the type, thus establishing its constancy.

Genus DOLESCHALLIA, Felder.

3. DOLESCHALLIA MONTROUZIERI, Butler (two males).

Espirito Santo, Havannah Harbour, Vaté or Sandwich Island.

Rather larger than the type, but in other respects similar.

Genus JUNONIA, Hübner.

4. JUNONIA VILLIDA, Fabricius (one female).

Havannah Harbour, Vaté or Sandwich Island.

Genus DIADEMA, Boisduval.

5. DIADEMA NERINA, Fabricius (four males and two females).

Havannah Harbour, Vaté or Sandwich Island.

This species has hitherto been known only from Australia, Woodlark Island, and Java. One of Mr. Corrie's females is a curious

variety, in which the tawny spot of primaries above is barely visible, and the submarginal whitish spots are obsolete.

The specimens were taken on the 7th of July, 1875; they are much worn, which indicates that they must have been some time on the wing.

6. *DIADEMA OCTOCŪLA*, Butler (one male and two females).

Havannah Harbour, Sandwich Island (22nd July, 1875).

This species has hitherto been unique in Mr. Druce's collection from Totoya, Fiji; the male from Vaté differs slightly from my figure in the outline of the tawny band of primaries.

Hitherto I have considered the *D. formosa* of Herrich-Schäffer to be the male of my *D. octocula*; but now that we have both sexes I am compelled to admit that Mr. Wallace was correct in determining the type to be a male in which the abdomen is greatly distended; *D. formosa* is a distinct species.

The female of *D. octocula* differs from the male in its superior size, the much paler colour of the tawny bands; the primaries with better-defined papillated ocellus; four or five subapical white spots; secondaries with white pupils to all the black spots.

Family LYCÆNIDÆ.

Genus LAMPIDES, Hübner.

7. *LAMPIDES TAITENSIS*, Boisduval (one female).

Espirito Santo, New Hebrides (6th August, 1875).

The arrival of this little species is interesting; I had supposed *L. taitensis* to be the *L. platissa* of Herrich-Schäffer; but as Boisduval says, at the end of his description, "Il est de la taille de *Catochrysops baticus*" (which suits this species admirably, whilst *L. platissa* more nearly resembles *L. strabo*), I have very little doubt that we now actually possess the typical *L. taitensis* of the 'Astrolabe.'

8. *LAMPIDES CANDRENA*, Herrich-Schäffer (one female).

Montague Island.

It is impossible to decide, without seeing plenty of specimens of both sexes, whether or not the females of this species vary in the width of the brown outer border; in the specimen here registered, and one previously received from Fiji, the border is nearly twice as wide as in an example sent to us from Germany with Herrich-Schäffer's name attached to it, yet in the males I find no such difference.

9. *LAMPIDES GOODENOVII*, n. sp.

♀. Allied to the preceding, but brilliant greenish *morpho*-blue, the outer borders black, sharply defined; the under surface altogether deeper in colour, reddish brown, crossed by the same whitish lines; ocelli with reddish-orange zones. Expanse of wings 1 inch 2 lines.

Espirito Santo, New Hebrides (6th August, 1875).

This species is more brilliantly coloured than any other Butterfly in the genus; I have named it in honour of the universally beloved

and much lamented Commodore Goodenough, who met his death whilst out with Messrs. Perry and Corrie on an entomological excursion.

Family PAPILIONIDÆ.

Genus BELENOIS, Hübner.

10. BELENOIS NISEIA, McLeay (one male).

Havannah Harbour, Vaté or Sandwich Island.

The single example sent differs a little from the Australian type, inasmuch as it resembles *B. clytie* ♂ on the upperside; but, without seeing more specimens, it would be unsafe to consider it a distinct species.

7. Descriptions of new Birds obtained by Mr. C. Buckley in Bolivia. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.R.S.

[Received January 14, 1876.]

A collection of bird-skins formed by Mr. C. Buckley during his recent expedition into Bolivia, at several localities on the eastern slope of the main chain of the Andes, contains about 250 specimens, referable to 133 species. As a second collection is shortly expected from Mr. Buckley, we reserve a full account of the first one until the series is complete, and for the present only give descriptions of the new species which it contains. These are:—

1. DIGLOSSA GLAUCA, sp. nov.

*Ex cinereo cærulescens fere unicolor; alis caudaque nigris cæruleo limbatis: subtus obscurior, remigum marginibus internis cinereis: rostro corneo, mandibula inferiore ad basin alba, pedibus nigris: long. tota 4·0, alæ 2·3, caudæ 1·6.*

*Hab.* Nairapi, Bolivia (*Buckley*).

*Mus.* S.-G.

Of this new *Diglossa* Mr. Buckley sends but one specimen. It is a small species belonging to the "homochroous" section of Sclater's arrangement (*Ibis*, 1875, p. 207), and may be best placed between *D. plumbea* and *D. personata*. From the latter it is distinguishable by its much inferior size, from the former by its colour.

2. BUARREMON MELANOPS, sp. nov.

*Buarremon rufinucha*, Sclater, *Cat. A. B.* p. 91 (nec Lafr. et D'Orb.).

*Supra niger; pileo cum nucha castaneo; lateribus capitis et mento summo nigris: subtus flavus, hypochondriis et crisso in olivaceum transeuntibus: rostro nigro, pedibus obscure corneis: long. tota 6·0, alæ 2·7, caudæ 2·6.*

*Hab.* Simacu, Bolivia (*Buckley*).

*Mus.* S.-G. et P. L. S.

*Obs. B. rufinucha* (Lafr. et D'Orb.) \* macula frontali utrinque sulphurea sane species diversa est.

Slater has long had two examples of this species in his collection obtained from the Maison Verreaux. They were referred to *B. rufinucha* erroneously, as it appears on examination of the specimens of that species in the British Museum. Mr. Buckley sends us five examples of this bird, all obtained at Simacu.

### 3. LEPTOPOGON TRISTIS, sp. nov.

*Supra olivaceus, unicolor; alis nigris, tectricum alarium et secundariorum externorum apicibus macula quadrata sulphureo-alba ornatis; remigum et rectricum marginibus externis olivaceis: subtus sulphureo-flavus: subalaribus flavis: rostro et pedibus nigris: long. tota 4.4, alæ 2.15, caudæ 2.0, tarsi 0.75.*

*Hab.* Bolivia, Simacu (*Buckley*).

*Mus.* S.-G. et P. L. S.

*Obs.* Sp. corporis colore supra olivaceo, subtus omnino flavo, ab aliis hujusce generis satis definita.

Slater has long had a single worn and imperfect skin of this *Leptopogon* in his collection under the MS. name which we now publish. Mr. Buckley sends but a single specimen. Slater's example was obtained from a dealer in Paris, without any locality attached to it.

### 4. HYPOXANTHUS ATRICEPS, sp. nov.

*Hypoxanthus rivolii*, Scl. et Salv. P. Z. S. 1873, p. 780.

*Hab.* Peruvia alta, Husampilla (*Whitely*); Bolivia, Ramosani (*Buckley*).

*Mus.* S.-G.

*Obs.* Similis *H. rivolii*, sed pileo summo in mari nigerrimo nec rubro.

An examination of a series of skins of this Woodpecker from Columbia, Ecuador, Peru, and Bolivia seems to show the form from the two latter countries is distinct—the head in the male being black, and never acquiring the brilliant crimson of the northern form.

February 15, 1876.

Prof. Mivart, F.R.S., in the Chair.

The following report on the additions to the Society's Menagerie during the month of January 1876 was read by the Secretary:—

The total number of registered additions to the Society's Menagerie during the month of January 1876 was 52, of which 32 were by presentation, 10 by purchase, and 10 were received on deposit. The total number of departures during the same period by death and removals was 78.

\* *Vide* Slater, Syn. Av. Tanagr. p. 25.

The most noticeable additions during the month were:—

1. A Levaillant's Cynictis (*Cynictis penicillata*), presented by Viscount Mandeville, January 5th. Of this rare and elegantly shaped Carnivore (figured in the Society's 'Transactions,' vol. i. pl. iii.) but few specimens have been lately received. One previously obtained was accidentally omitted from the Revised List of Vertebrates, where the species is not mentioned.

2. A White-spotted Crane (*Porzana notata*), captured at sea off Cape Santa Maria, Uruguay, by an officer of the R.M.S.S. 'Elbe,' and received January 19th. The specimen agrees accurately with the figure in the 'Zoology of the Voyage of the Beagle' (Birds, pl. 48). The species is rare, and quite new to the collection.

3. A Panda (*Ælurus fulgens*), sent home from Calcutta, and purchased 16th February, 1876. There has been but one living specimen of this rare animal previously in the collection.

Mr. Sclater exhibited the Parrot designated in Tschudi's 'Fauna Peruana' (Aves, p. 271) *Conurus illigeri*, which had been kindly sent to him for examination by M. Louis Coulon, Honorary Director of the Museum of Neuchâtel, and observed that it had been wrongly determined by the author of the 'Fauna Peruana.' The specimen, which, in spite of what Tschudi said, was certainly not far from mature, presented no traces of the red markings on the front, back, and belly, which are characteristic of *Ara maracana* (i. e. *Conurus illigeri* of Tschudi), and had besides a larger and deeper bill and longer tail. It appeared to belong to a species hitherto unrecognized, which might be described as follows:—



Head of *Ara couloni* (nat. size).

*ARA COULONI*, sp. nov.

*Conurus illigeri*, Tsch. Fauna Per. Aves, p. 271.

*Sittace maracana*, part, Finsch, Papag. i. p. 420.

Diagn. *Viridis, capite undique remigibus et rectricibus extus cæru-*

*lescentibus: caudæ parte basali in rectricibus externis rubricante: alarum et caudæ pagina inferiore flavicante: long. tota 16·0, alæ 8·7, caudæ rectr. med. 9·5, lat. 4·5.*

*Hab.* Peruvia alta, in reg. sylvatica orientali, ab incolis Loro real dicta (*Tschudi*).

*Mus.* Novo-Castellano.

*Obs.* Species ab *Ara maracana* rostro majore, genis solum nudis, area postoculari plumosa, et corporis colore rubro nullo certissimè diversa, et Ludovico Coulon, Musei Novo-Castellani Directori optimo, dicata.

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Dr. T. S. Cobbold, F.R.S., exhibited and made remarks on a Parasite (*Echinorhynchus*) obtained from the Tamandua Ant-eater which had died in the Society's Menagerie, and had been described in his communication made at the last meeting.

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Mr. W. K. Parker read the second part of his memoir on Ægithognathous Birds\*, of which the following is an abstract:—

In my former communication I described thirty-one examples of this kind of palatal structure in birds; in the present paper I have added fifty-one more.

Altogether these eighty-two birds belong to thirty-nine "families;" so that I have taken, on an average, two examples of each family. The materials for this research have been kindly and liberally put into my hands by a number of friends, among whom I may mention Professors Alfred Newton, T. Rupert Jones, and Garrod, Dr. Murie, Osbert Salvin, Esq., Robert Swinhoe, Esq., Mr. W. J. Williams, and Mr. Bartlett.

I began my last paper with a bird showing "Ægithognathism" in its initial state. I end this communication with another instance: the first was *Turnix*, this is *Thinocorus*—both of the utmost importance to any one seeking for the true passerine *phylum*.

Now if any one will say that because I have found initial Ægithognathism in birds so far down below the most degraded (or rather *non-elevated*) type of Passerines, as these birds, that therefore I, putting these types in the Ægithognathous list, seek to make them appear as "Coracomorphæ," such a one has failed to catch my drift. Do we modern biologists believe in the gradual modification of types or evolution of species, or do we not? If we do, we shall reasonably expect to find that our neatly trimmed and highly special types must have had grosser and more general ancestors in the Tertiary period. Allowing this supposition, and looking upon birds as a hot-blooded group whose *root* lay low down, once, among the cold blooded reptiles, shall we not expect to find birds more or less related to the modern types having the nature of several at once?—"all these in their pregnant causes mixed."

In the examples given in this second part I have shown pecu-

\* For part I. see Trans. Zool. Soc. ix: p. 289.

liarities of the skull that belong to certain groups of families, which will, when once understood, be very helpful to Taxonomists. These more minute researches go to modify some of Professor Huxley's views, as expressed in his paper 'On the Classification of Birds' (P. Z. S. 1867, p. 415). Certain it is that the skull of a bird often seems to harmonize very ill with the rest of its structure, even with the rest of the skeleton. Still the morphology of this chief part of the framework, modified as it is in relation to the nervous, digestive, and respiratory systems, must be of the utmost importance to any one seeking to have broad views on these subjects.

"The groups formed by cranio-facial characters have a variable value; the desmognathous face passes over the Struthious border and is possessed by the gallo-struthious Tinamous. The saurognathous face (see Trans. Linn. Soc. 1875, plates i.-v.) is possessed by the "Celeomorphæ" only—namely, by the Woodpeckers and Wry-necks.

"The ægithognathous face is possessed by all the 'Coracomorphæ,' and by them only, *in a perfect form*, with the single exception of the Swifts (Cypselidæ)—a mere big 'genus' capable of being cut up into a few subgenera.

"The desmognathous face turns up in many places; its fundamental or embryonic form is the schizognathous, the simple reptilian cleft palate; this becomes desmognathous by ankylosis of the right and left elements of the palate. Desmognathism is seen in the Ægithognathæ when ossification is very intense, as in *Artamus*, *Paradisea*, and *Gymnorhina*.

"The simple, open, or cleft palate generally occurs in the groups that lie on a level two or three degrees above the Ratitæ, as Rails, Plovers, Cranes, and the Fowl tribe; but it is also retained in types that in other respects are amongst the highest and most specialized, as the Trochilidæ and the Caprimulgidæ.

"In the present paper research has been made into the morphology of the skull in the following groups—namely Tanagridæ, Brachypodidæ, Phytotomidæ, Meliphagidæ, Mniotiltidæ, Cœrebidæ, Vireonidæ, *Cardinalis*, Icteridæ, Emberizidæ, Fringillidæ, Alaudidæ, Paridæ, Panuridæ, Cypselidæ, Hirundinidæ, Oriolidæ, Motacillidæ, Muscipidæ, Liotrichidæ, *Saxicola*, and Nectariniidæ.

"And, lastly, the remarkable skull of *Thinocorus* is described, a small Chilian type, whose body is thoroughly Charadrian, but whose head is a mysterious mixture. Being imperfectly ægithognathous, it is here compared with the completely ægithognathous Passerine types on the one hand, and on the other with birds much nearer akin, namely the Crane and the Sun-bittern. These latter, in an appendix, serve to compare with *Thinocorus*, and also show the schizognathous palate for comparison with the more complex palate of a Passerine bird.

"*Thinocorus*, whilst essentially a Plover, if the characters of the skeleton generally be considered, yet shows more likeness in its skull to that variety of the Plover type which we see in the larger Cranes.

“The Tinamous, largely specialized into a kind of low gallinaceous *carinate* type, yet retain the same form of skull and face as the *Ratitæ*. *Thinocorus* also retains much that is dromæognathous in its skull, mixed with normal schizognathism: but superadded to these characters we find an intimate union of the broad vomer with the largely developed alinasal floor; a little more metamorphosis, and the palate would have corresponded with that of the Passerine birds.

“But in this bird, as in the Hemipod (*Turnix*) it is not in the structure of the vomer and its relation to the nasal labyrinth that we find all the Passerine characters. The face, generally, is rich in such modifications: I showed them in my former Part with regard to *Turnix*, and in this in the genus *Thinocorus*.

“In the marvellously specialized skulls of the Passerinae unlooked-for osseous centres often appear; these are often very uniform in certain families which are more or less allied.

“The first I may mention here are the “palato-maxillaries;” these are a pair of bones, separately representing the ingrowth of our upper jaw-bone which forms the “hard palate.” I find these in the following families, namely Tanagridæ, Brachypodidæ, Mniotiltidæ, Cœrebidæ, Cardinalidæ, Icteridæ, and Emberizidæ. In some families, besides lesser ossicles added to the vomer, one on each shoulder, the vomer is not merely composed of a right and left half, but each moiety is more or less broken up into two centres. Here we have repeated the tetramerous vomer (vomeres and ‘septomaxillaries’) of the Snake and the Lizard. The families showing this structure more or less clearly are the Mniotiltidæ, Cœrebidæ, Vireonidæ, Muscicapidæ, and Saxicolidæ.

“With the exception of *Menura*, the South-American types are most generalized, low, and, I may say, ancient; next to them the Australian birds, and those from Malaisia and Central America; whilst the most highly specialized types belong to the northern hemisphere generally.

“Looked at from my particular morphological stand-point, facts like these seem to me to be well worth the pleasant labour I have spent in obtaining them.”

This paper will be published entire in the Society’s ‘Transactions.’

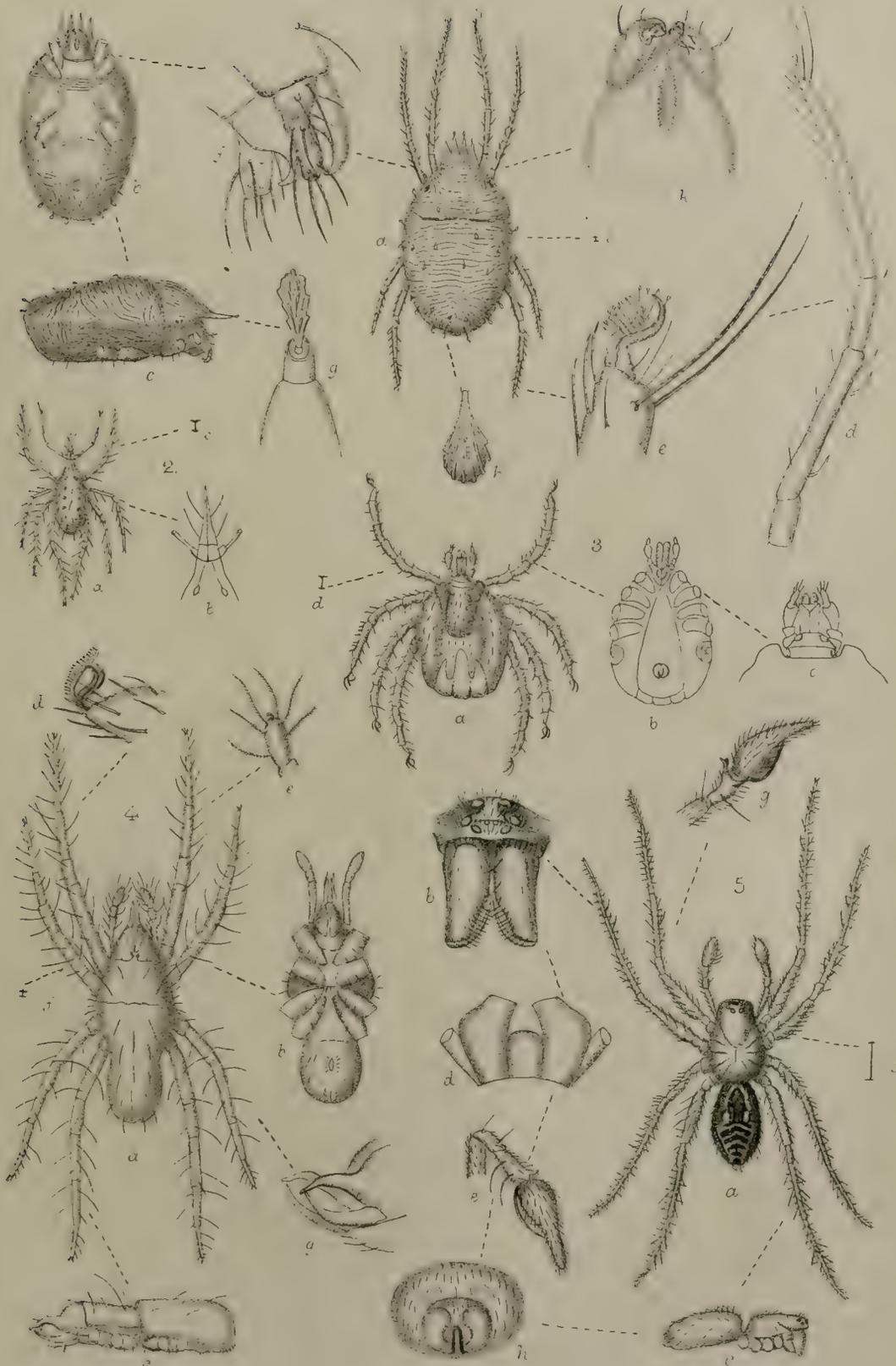
The following papers were read:—

1. On a new Order and some new Genera of Arachnida from Kerguelen’s Land. By the Rev. O. P. CAMBRIDGE, M.A., C.M.Z.S., Hon. Memb. New-Zealand Institute.

[Received January 15, 1876.]

(Plate XIX.)

The few examples of Arachnida found during the late Transit-of-Venus Expedition to Kerguelen’s Land, and kindly sent to me by the Rev. A. E. Eaton, I propose now to describe and figure. Almost





all of them are remarkable; all appear to be new to science; and one, indeed, at present seems to me incapable of inclusion in any hitherto recognized order of Arachnids. The whole collection consisted but of five species; one of Araneidea and three of Acaridea, the fifth being that upon which I propose to found a new genus, family, and order. At first sight this delicate little Arachnid gave me the idea of a Chelifer deprived of its forcipated palpi; but a subsequent examination with a stronger lens showed me that it possessed palpi of an entirely different character from those of the pseudo-Scorpionides; and a final scrutiny under a still higher power led to the detection of the eyes: in the number and position of these there is a remarkable similarity to the Solpugidea, while there are not wanting some general indications of affinity to the Araneidea. Its small size and general appearance when alive would probably induce one to place it among the Acaridea; but the structure of the mouth-parts, the distinct cephalothorax and abdomen, and especially the character of the eyes seemed to preclude this allocation. It is possible, however, that when the Acaridea have been more thoroughly worked out by some future arachnologist, the present anomalous little creature may become the type of a suborder, or perhaps only of a family of that order. Meanwhile in forming a distinct order for its reception, I desire to obtain the free criticism and opinion of arachnologists more conversant than myself with some obscure groups of Acaridea, as to its true systematic position.

### Order ACARIDEA.

#### Fam. ACARIDES.

#### Gen. nov. TORYNOPHORA.

*Body* oval; a slightly indented transverse line towards the fore part on the upperside appears to mark the junction of the cephalothorax and abdomen.

*Mouth-parts* almost soldered together, leaving only the short palpi and the extremities of the falces traceable.

*Legs* 8, slender, in 4 pairs (1-2 and 3-4 on each side), 5-jointed, and terminating with two somewhat S-curved claws springing from a small supernumerary or heel-joint.

*Eyes* four, in two pairs, one pair on either side of the caput.

*Falces* armed on the underside with serrated opposed edges.

*Palpi* short, strong, 4-jointed, with a single strong curved jaw-like claw springing from its base on the upperside.

#### TORYNOPHORA SERRATA, sp. n. (Plate XIX. fig. 1.)

Length  $\frac{1}{4}$  line.

This minute Acarid is of an oval form, tolerably convex above, and of a uniform pale luteous colour. From the fore part of the cephalothorax four pointed processes project, each one terminating with a very small joint, from which springs a curious clavate or spoon-shaped bristle or tag; a few with a somewhat similar tag are dispersed thinly over the upper surface of the body, which is closely wrinkled,

the wrinkles taking different but regular directions on the different parts of the body.

The *eyes* are very minute, in two pairs, one on either side of the caput; those of each pair are near together but not contiguous.

The *legs* are 5-jointed, slender, and not very long; they are armed with fine spines, bristles, and hairs, and terminate with two tarsal S-shaped claws, springing from a small terminal joint, and furnished beneath with some slender prominent clavate hairs. The legs are in pairs, the first and second, and third and fourth legs on each side having their basal joints respectively contiguous to each other, as in the genus *Trombidium*, and articulated to the fore half of the lower surface of the body.

The *palpi* are short, strong, 4-jointed; and to the upperside of the base of the digital joint is articulated a strong curved claw.

The *maxillæ*, *labium*, and *falces* coalesce and form a kind of succtorial apparatus, towards the fore part of which on the underside are two opposed curved saw-edged processes.

Several examples of this curious Acarid, found under stones, were contained in the Rev. A. E. Eaton's Kerguelen's-Land collection. Being so very minute and delicate, they had suffered considerably by being preserved in strong spirit.

#### Fam. BDELLIDES.

##### Gen. SCIRUS, C. Koch?

##### SCIRUS PALLIDUS, sp. n. (Plate XIX. fig. 2.)

Length  $\frac{1}{2}$  a line.

As far as I could ascertain from the single example contained in the Kerguelen-Island collection, this small Acarid is an undescribed species of the genus *Scirus*. Its colour is a dull yellowish white; and there are a few obscure blackish markings in two parallel longitudinal lines along the upperside of the abdomen. The body and legs are furnished with a few longish pale semidia-phanous hairs. The *eyes* are in two pairs, those of each pair contiguous, and in the position indicated by the two small oval markings in figure 2 *b*. The only example received was injured by the action of the spirit in which it had been preserved, so that the exact details of its structure could not be satisfactorily observed; in the general appearance, however, of the beak-like mouth-parts there seemed to be but little difference from the genus *Bdella* and others nearly allied.

#### Order ACARIDEA.

##### Fam. IXODIDES.

##### Gen. HYALOMMA, C. Koch.

##### HYALOMMA PUTA. (Plate XIX. fig. 3.)

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

Body oval. *Cephalothorax* yellowish brown, strongly tinged with red on either side of its fore part and on the fore part of the caput.

*Abdomen* dark yellow-brown, and (as well as the cephalothorax) thinly clothed with short pale hairs; the hinder part of the abdomen is of a pale dull yellowish hue, and its margin is indented with four small elongate notches. On each side of the underpart, just behind the basal joints of the 4th pair of legs, is a roundish patch, whose surface appears to be covered with minute points, which may possibly be the plates of spiracular organs.

The *legs* are moderately long and tolerably strong, 7-jointed, the last or tarsal joint being very small; they are of a pale yellowish colour, marked underneath with patches of a bright shining orange red, and furnished with a few short hairs; each tarsus terminates with two curved diaphanous claws springing from a small claw-joint; and beneath them is an oval sucker-like pad.

The *palpi* are five-jointed (including the basal joints or maxillæ); these latter are of a reddish colour and soldered to the labium; the colour of the palpi is similar to that of the legs; the terminal (or digital) joint is short and small; the next to it (or radial) is large and tumid, the other two joints short. The length of the palpi slightly exceeds that of the falces.

The *falces* are porrected in the form of a beak, and are armed beneath with numerous sharp hooks or teeth directed backwards.

Several examples of this Acarid were found by the Rev. A. E. Eaton on a Penguin (*Pygosceles tæniatus*) in Kerguelen's Land.

#### Ordo nov. ? PÆCULOPHYSIDEA.

*External Characters of the Order*:—*Cephalothorax* and *abdomen* covered with a continuous epidermis of a rather slight texture, unsegmented, and united to each other throughout their whole breadth, the point of junction being clearly indicated by a transverse line or suture. *Palpi* filiform, and terminating with a single minute claw. *Legs* eight in number, their basal joints closely grouped together on the sternal surface of the cephalothorax, the tarsi terminate with two claws, between which is a slender pectinated style. *Falces* didactylous. *Maxillæ* coalescing at their base. *Labium* (properly so called) wanting. *Eyes* two.

#### Fam. PÆCULOPHYSIDES.

In its *general appearance* this curious little Arachnid seems to be a compound of the Spiders, Solpugids, Chelifers, and Acari. On its upperside it reminds one strongly of the Solpugidea, both in the massive falces, and its two eyes on a small tubercle at the fore extremity of the caput; its underside bears a strong resemblance in the maxillæ and palpi to the Araneidea; its profile resembles that of the pseudo-Scorpionides, while in its small size, continuous, delicate epidermis, and closely approximated thorax and abdomen it shows a strong likeness to the Acaridea.

#### Gen. nov. PÆCULOPHYSIS.

*Eyes* two, closely grouped on a small tubercle at the fore extremity of the caput, just between and above the base of the falces.

*Falces* massive, as long as the cephalothorax, two-clawed, the upper claw fixed, the lower movable, and both curved.

*Maxillæ* large, coalescing at their base, and produced at their inner extremity into a strong angularly pointed projection.

*Labium* none, and *sternum* none, properly so called, the basal joints of the legs being articulated to the inferior surface of the cephalothorax.

*Abdomen* longer than the cephalothorax. A small elongate oval aperture towards the hinder part of the underside is probably the genital opening, while a still more minute orifice beneath its extremity is probably the anal aperture.

*Legs* moderately long and tolerably strong; they are 6-jointed, furnished with long bristles, and terminating in two S-curved claws, beneath which is a longish, slender, slightly upturned style, plumose or finely pectinated along its underside.

*Palpi* 4-jointed, similar to the legs in armature; the terminal (or digital) joint ends with a small hooked claw; and the bristles or hairs on it are long and plumose.

PÆCILOPHYSIS KERGUELENENSIS, sp. n. (Plate XIX. fig. 4.)

Adult female. Length  $\frac{1}{2}$  line.

The *cephalothorax* is of a somewhat quadrate form, narrower before than at its junction with the abdomen; it is moderately convex above, and has a few long pale hairs or slender bristles directed forwards on its upperside: its profile line is nearly level; and the colour of the cephalothorax and abdomen is pale yellow, the legs and other parts being of a whitish hue.

The *eyes* are small, but close together near the hinder part of a small roundish tubercle or eminence, at the middle of the fore extremity of the caput.

The *legs* are 6-jointed, rather long, tolerably strong, not greatly differing in length, their relative length being 1, 4, 2, 3; they are furnished with long pale bristles; and the tarsi, which are undivided and with two claws, are curved somewhat in the form of an S: beneath them is a largish bristle or style, pectinated or plumose on its inferior side. The joints do not differ greatly in length, the first two or basal ones being the longest, and the rest nearly equal.

The *palpi* are similar, in their general armature, to the legs. The digital joint is longer than the radial, and of an ovoid form; its hairs are plumose, and the single terminal claw is sharply hooked and minute.

The *falces* are as long as the cephalothorax, very massive at the base and didactyle, the lower claw being movable and opposed to the upper one; both claws are curved, but project in the same straight line and in the same plane as the cephalothorax, which the falces equal in length.

The *maxillæ* are long, their inner extremities considerably produced into an angularly pointed form, and extending close beneath the falces, to about two thirds of their length.

The *abdomen*, looked at in profile, is higher and more convex than

the cephalothorax, and about double its length; its fore extremity is conterminous in its breadth with the cephalothorax, but is constricted laterally near the middle, the hinder extremity being rounded and obtuse; its upper surface is furnished with a few long pale hairs or bristles.

Several examples of this minute but most interesting Arachnid were found under stones in Kerguelen's Land by Mr. Eaton. Unfortunately, from their extreme delicacy and small size, they had suffered severely from the action of the strong spirit in which they were immersed.

Order ARANEIDEA.

Fam. AGELENIDES.

Gen. nov. MYRO.

*Cephalothorax* oval, roundly truncated before, and moderately constricted on its lateral margins at the caput. Upper convexity moderate; profile-line slopes very gradually in a slightly curved line from the hinder slope to the ocular region; clypeus unusually narrow, almost obsolete. Spinners short, those of the inferior pair longest and strongest.

*Eyes* eight, unequal in size and forming a rather large and somewhat oval area, enclosed by two longitudinal curved rows of three eyes each; the curves directed from each other; within this area, and towards its fore part, are two minute eyes near together in a transverse line.

*Legs* not greatly different in relative length, which is 4, 1, 2, 3. Each tarsus terminates with three claws.

*Maxillæ* large, curved towards the labium, much and roundly protuberant on the outer sides towards their extremity, which is rather obliquely truncated; the palpi issue from unusually near their lower extremities.

*Labium* rather more than half the length of the maxillæ, very difficult to be seen clearly; but its form is apparently oblong, slightly rounded at the apex.

MYRO KERGUELENENSIS, sp. n. (Plate XIX. fig. 5.)

Adult male. Length nearly  $2\frac{1}{2}$  lines.

The *cephalothorax* is of a yellow brown colour, the margins surrounded with a fine black line; the normal grooves and indentations are well marked, and suffused with dusky black, giving the thorax somewhat the appearance of radiating markings; the ocular region is furnished with some bristly black hairs; and some longer and finer ones are distributed along the central longitudinal line to the hinder slope.

The *eyes* are unequal in size and form a largish hexagonal area on the fore part of the caput close to its fore margin; they may be described either as in two longitudinal curved rows of three eyes each, with two minute ones in a transverse line towards the fore extremity of the enclosed area, or as four pairs, a hinder pair, two fore lateral pairs, and a fore central pair; those of the hinder pair are sepa-

rated by an interval of an eye's diameter, and each is also divided by an equal interval from the hinder eye of the lateral pair on its side; the eyes of each lateral pair are separated by a slight interval, not exceeding half the diameter of one of the fore central eyes; the hind laterals are the largest of the eight; and the interval between the fore laterals is equal to about  $1\frac{1}{2}$  diameter; the interval between the eyes of the fore central pair is equal to a diameter, the distance of each from the fore lateral on its side being rather greater; and that of each from the hind lateral is equal to the diameter of the latter; the interval between the fore lateral eyes and the fore margin of the caput is very slight indeed, being less than the diameter of one of the central eyes.

The *legs* are moderately long and strong; their relative length does not differ greatly, being 4, 1, 2, 3. They are of a brownish yellow colour, faintly and imperfectly annulated with dusky brown; the annulations are scarcely perceptible in some examples. They are furnished with spines, bristles, and hairs, some of the latter being at right angles to the different joints; each tarsus terminates with three curved claws, of which the inferior is much the smallest, and sharply bent downwards.

The *palpi* are similar in colour to the legs; furnished with hairs and a few bristles, and of moderate length and strength. The cubital joint is short and bent; the radial is slightly longer and spreads out gradually on its outer side into a somewhat irregularly shaped prominent but not very large apophysis at its fore extremity; the digital joint is long and rather narrow, similar in form to that of some species of *Tegenaria*; the palpal organs are simple, and have a long curved filiform spine connected with them, and by which they are very nearly encircled; this spine issues from the base of the palpal organs, and curving first round their inner margin terminates on the opposite side.

The *falces* are long, strong, and vertical, prominent near their base in front, and similar in colour to the cephalothorax.

The *maxillæ* are similar in colour to the falces; their form has been already described above.

The *labium* has also been described. Its colour is dark blackish brown.

The *sternum* is heart-shaped, similar in colour to the legs, and furnished with hairs.

The *abdomen* is oval, moderately convex above, and does not project greatly over the base of the cephalothorax. It is clothed with hairs, some on the fore part of the upperside being prominent and of a bristly nature. Its colour is brownish yellow mixed with brown and black, a tolerably distinct pattern being visible on the upperside; that on the fore half consists of two longitudinal curved rows, each of three irregular yellowish spots, followed (on the hinder half) by a series of alternate yellowish and black angular bars or chevrons, the angles directed forwards; or the hinder half may be described as of a yellowish colour marked with a series of four or six black angular bars, which diminish in size towards the spinners; the





G.Sowerby lith.

M&N Hanhart imp.

underside of the abdomen is of a uniform blackish brown colour with an indistinct pale longitudinal line on either side.

The spinners of the inferior pair are strong but short, though longer than those of the superior pair.

The *female* resembles the male in general colour and markings; the sides of the abdomen, however, on the hinder half are paler than those of the male, and are marked with two differently sized oblique irregular blackish markings; the genital aperture is simple, but of a distinctive form.

Eight males and one female were received from the Rev. A. E. Eaton, by whom they were found on Kerguelen's Land under stones, and running also at times on the ground.

This spider (as above observed), the only one found on the island, is of great interest, being unmistakably allied to *Tegenaria* and *Agelena*, though quite distinct from both.

#### EXPLANATION OF PLATE XIX.

Fig. 1. *Torynophora serrata*, sp. n.

*a*, upperside, highly magnified; *b*, underside without the legs; *c*, profile; *d*, leg of first pair; *e*, extremity of tarsus of ditto; *f*, palpi; *g*, extremity of one of the cephalic projections, highly magnified; *h*, one of the clavate hairs on abdomen, highly magnified; *k*, mouth-parts on underside, highly magnified; *o*, natural length.

Fig. 2. *Scirus pallidus*, sp. n.

*a*, upperside; *b*, upperside of caput and mouth-parts, more enlarged, showing the position of the eyes; *c*, natural length.

Fig. 3. *Hyalomma puta*, sp. n.

*a*, upperside; *b*, underside without legs; *c*, caput, palpi, and falces, more enlarged; *d*, natural length.

Fig. 4. *Pæcilophysis kerguelenensis*, sp. n.

*a*, upperside; *b*, underside without legs; *c*, profile without legs or palpi; *d*, extremity of tarsus of leg of second pair; *e*, digital joint of palpus; *g*, portion of falces and maxillæ in profile; *f*, natural length.

Fig. 5. *Myro kerguelenensis*, sp. n.

*a*, upperside; *b*, fore part of caput and falces, from the front, showing the position of the eyes; *c*, profile; *d*, maxillæ and labium; *e*, *g*, left palpus in two positions; *h*, genital aperture (♀); *f*, natural length.

## 2. Descriptions of Four new Species of Helix; with some notes on *Helix angasiana* of Pfeiffer. By GEORGE FRENCH ANGAS, F.L.S., C.M.Z.S.

[Received January 26, 1876.]

(Plate XX.)

HELIX BEATRIX, n. sp. (Plate XX. figs. 1 to 5.)

Shell narrowly perforate, ovately conical, rather thin, not shining, finely obliquely striated, variously coloured; spire conoidal; whorls  $6\frac{1}{2}$ , rounded, narrowly margined at the sutures, the last non-descending, somewhat inflated and obtusely subangulated at the periphery in front, moderately convex at the base; aperture subcircular; the

outer lip very slightly expanded and reflected; the collumella descending vertically and callously reflected over the perforation.

Diam. maj. 10, min. 8, alt. 13 lines.

*Hab.*? Solomon archipelago.

Var. *a.* Rich orange-yellow throughout, inner lip white, apex sometimes of a carnelian color.

Var. *b.* Bright yellow, apex orange, with a narrow black band immediately below the suture of the last whorl, lip black.

Var. *c.* Pellucid white, upper whorls yellow or orange.

Var. *d.* Upper whorls white, last whorl light brown, with a narrow pale band below the suture, lip white stained inside with purple.

Var. *e.* Very dark purplish chocolate-colour, reddish towards the apex.

This shell, like *Helix meta*, Pfr., is subject to remarkable variations in colour, but may at once be distinguished by its smaller size, the convexity of the whorls, and the roundness of the aperture, in which the subflexuous outer lip and diagonal form of *H. meta* are wanting. The general form of the shell presents somewhat of a *Paludina*-like aspect. The outer lip is much less expanded and reflected than in *H. meta*, and the texture less glossy and shining.

#### HELIX RAMSDENI, n. sp. (Plate XX. figs. 6, 7.)

Shell imperforate, turbinate, rather solid, obliquely faintly striated, white, ornamented with a narrow brownish-black band on the lower part of the penultimate whorl, and two broader black bands, one above and the other below the periphery of the last whorl, the central band being irregularly marked with diaphanous white spots; base tinged more or less with suffused chestnut next the columella; spire conical, apex rather obtuse; whorls  $5\frac{1}{2}$ , convex, the first three somewhat pellucid, the last descending in front; aperture very oblique, truncately oval; peristome white, the right margin expanded, sinuous, and reflected; the columellar margin obliquely descending, flattened and expanded, slightly grooved in the middle, and furnished with a long straight callus terminating abruptly within the aperture.

Diam. maj.  $12\frac{1}{2}$ , min.  $10\frac{1}{2}$ , alt. 13 lines.

*Hab.*? Solomon archipelago.

This beautiful shell is somewhat allied to *H. boivini* of Petit (*H. subrepta* of Quoy), but it exhibits certain differences so marked as to induce me to characterize it as a distinct species. The whorls of *H. ramsdeni* are more rounded, the last whorl is smaller, and the shell generally somewhat more conical than in *H. boivini*; whilst the peculiar white spots on the central black band remind one of similar markings in *H. ambrosia*, Ang. The beautiful scarlet outer lip so constant in *H. boivini* is entirely absent in the present species; and the shell is of an almost bluish white, while *H. boivini* has a warm yellowish tinge.

I have named this shell in memory of the late Lady Harriet Ramsden, from whose collection the typical specimen originally came.

**HELIX MORESBYI**, n. sp. (Plate XX. figs. 8, 9.)

Shell umbilicated, globosely conical, moderately solid, finely and irregularly obliquely striated, fulvous chestnut, paler at the apex, with various broad and narrow bands of deep brown, darker below the sutures; spire conical; whorls 6, convex, the last somewhat flattened at the base and excavated towards the umbilicus; aperture oblique, sublunate, within glossy and of a pale purplish hue, lips black, margins approximating and joined by a thin callus, outer margin expanded and subreflexed, columellar margin dilated, partly concealing the umbilicus.

Diam. maj. 23 min. 14, alt. 23 lines.

*Hab.* Port Denison, Northern Queensland.

In its general character this species comes nearer to *H. yulei*, Forbes, than to any other; but it differs in being larger, very much more conical, and in having the base of the last whorl peculiarly flattened.

**HELIX RHODA**, n. sp. (Plate XX. figs. 10-12.)

Shell deeply and profoundly umbilicated, depressedly convex, moderately solid, finely obliquely irregularly striated, fulvous brown, scattered with pale, diaphanous, oblique stripe-like spots, with a suffused brown band below the suture, and another darker and narrower band above it, also a narrow dark band on either side of the keeled periphery; spire depressedly conical, apex obtuse; sutures narrowly margined; whorls 6, convex, the last not descending, moderately keeled at the periphery and a little flattened at the base; aperture oblique, truncately ovate, right margin rather sinuous, very slightly expanded and subreflexed, the basal a little thickened, somewhat reflexed, and white.

Diam. maj. 10, min. 9, alt. 5 lines.

*Hab.* San Christoval, Solomon archipelago.

This shell belongs to the *Trochomorpha* group, its nearest ally being *H. merziana*, Pfr.

**HELIX ANGASIANA**, Pfr. (not Newcomb, in Ann. Lyceum Nat. Hist. New York).

This characteristic species (first described in the French 'Journal de Conchyliologie,' 1862, p. 228, by Dr. Pfeiffer, from a dead and bleached specimen in a chalky condition, that was sent home by me from the neighbourhood of Lake Torrens, in the interior of South Australia) has been the cause of some confusion amongst conchologists, which I desire to rectify. On my subsequently obtaining living specimens of this species from the same locality I wrote to M. Crosse, the editor of the Journal, stating that the diagnosis should be modified, the specimen figured having lost all its colour and become thickened by exposure to the influences of the atmosphere. This note was published by M. Crosse in the Journal for 1863, in which the colours of the living shell were given. Notwithstanding this, Dr. Cox, of Sydney, in his 'Monograph of the Australian Land Shells,' states that M. Crosse is mistaken, and that the

coloration he gives is that of *H. biteniata*, Cox, also from South Australia, and persists in regarding the normal state of *H. angasiana* as "solid, white, and porcellaneous," and furthermore gives "*H. angasiana*, not Pfeiffer," as synonym of *H. biteniata*, Cox, in his 'Monograph.' The coloration of *H. angasiana*, when fresh, is singularly like that of *H. biteniata*, although the form and characters of the two species are extremely different. I have therefore given a figure of both the species on the accompanying plate, which ought to set the matter definitively at rest. I may add that *H. biteniata*, Cox (1868), is a synonym of *H. flindersi*, A. Ad. & Ang., (P. Z. S. 1863), the description of which was unfortunately also taken from a bleached specimen from which the bands had disappeared.

The shell described and figured as *H. angasiana* by Dr. Newcomb in the 'Annals of the Lyceum of Natural History of New York,' in May 1860, must stand as *H. bougainvillei*, it having been described and figured under the latter name by Dr. Pfeiffer in the 'Proceedings' of this Society in February 1860 (see P. Z. S. 1860, p. 133).

#### EXPLANATION OF PLATE XX.

Figs. 1-5. *Helix beatrix*.

Figs. 6, 7. *Helix ramsdeni*.

Figs. 8, 9. *Helix moresbyi*.

Figs. 10, 11, 12. *Helix rhoda*.

Figs. 13, 14. *Helix angasiana*.

Figs. 15, 16. *Helix biteniata*.

3. Notes on some of the Blue Crows of America. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.R.S.

[Received January 9, 1875.]

The typical Crows (*Corvus*) are, as is well known to naturalists, in the New World essentially a northern form, and have only penetrated into the Neotropical Region as far south as the highlands of Guatemala and the northern Antilles. Several genera of Blue Crows take their place in Central and Southern America. Of these, in our 'Nomenclator,' we enumerated 32 species as autoptically known to us. But during the past three years the receipt of additional specimens and examination of others in different collections has enabled us to add slightly to the number, and to make certain rectifications in our own list. These we beg leave to submit to the Society.

#### 1. CYANOCITTA\* ARGENTIGULA.

*C. argentigula*, Lawr. Ann. Lyc. N. Y. xi. p. 88 (1875).

Under this name Mr. Lawrence has recently described a Jay from Costa Rica with which we are not yet autoptically acquainted. It is apparently a well-defined species, belonging to the group containing

\* The type of the genus *Cyanocitta* of Strickland is *Garrulus cristatus*, Linn., as stated in precise terms by the founder of the genus (Ann. Nat. Hist. xv. p. 261, 1845); and we therefore cannot understand why the authors of 'North American Birds' and other American writers persist in giving the type as *Garrulus*

*C. nana* and *C. pumilo*, and partakes to some extent of the character of both, in having the crescentic white frontal and superciliary marks of the latter, and the throat coloured as in the former species. It is probably the representative in Costa Rica of the Guatemalan *C. pumilio* and the Mexican *C. nana*.

2. *CYANOCITTA BEECHEII* (Vig.): *Sci. et Salv. Nomencl. p. 39.*

There are three somewhat similar species of *Cyanocitta* of a uniform black below, two only of which are inserted in the list in our 'Nomenclator' under the names *C. beechei* and *C. crassirostris*. These three birds may be readily distinguished as follows:—

- a.* Frontis crista tenui elongata nigra..... 1. *sanblasiana*.  
*b.* Frontis plumis brevibus erectis, crista nulla.  
*a'*. Major: dorso late cæruleo, naribus plumis frontalibus omnino tectis 2. *beechei*.  
*b'*. Minor: dorso viridi-cyaneo, naribus plumis frontalibus dimidio tectis 3. *germana*.

The synonymy of these species should stand as follows.—

*CYANOCITTA SANBLASIANA.*

*Geai de San Blas*, Néboux, *Rev. Zool.* 1840, pp. 290, 323.

*Pica sanblasiana*, Lafr. *Mag. de Zool.* 1842, *Ois.* t. 28.

*Cyanocorax de San-Blas*, Prév et Desmurs, *Voy. 'Vénus,'* v. p. 200.

*Cissilopha sanblasiana*, Bp. *Consp. i. p.* 380; Lawrence, *Mem. Boston Soc. N. H.* ii. p. 284.

"*Cyanurus geoffroyi*, Bp." Gray, *Hand-list*, ii. p. 4, et in *Mus. Brit.*

*Hab.* Western Mexico: San Blas (*Néboux*); Acapulco (*Leclancher*); Plains of Colima, Manzanilla Bay and Las Trochas (*Xantus*).

*Mus.* S.G., Acad. Philad., Brit.

Except as regards its thin frontal crest, this bird does not differ materially in form from its allies; and we see no reason for making a genus of it, as proposed by Bonaparte. The species is rare in European collections. Messrs. Salvin and Godman's specimen is one of Xantus's collection from the plains of Colima, and was presented to them by the Smithsonian Institution. There is a single mounted example in the Gallery of the British Museum, marked *C. geoffroyi*. In the Jardin des Plantes there is also one mounted specimen of this species.

It should be noticed that the figure of this bird in the 'Magasin de Zoologie' gives the bill yellow, showing that in this species, as in its two allies, this is a variable character, probably depending on sex.

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*californicus*. Again, the type of *Cyanurus*, Sw., is not *Garrulus cristatus*, as given in the above mentioned work, p. 271. This error was caused by Mr. G. R. Gray's unauthorized assumption that the first species in any author's list must necessarily be his type. But Swainson himself tells us that the first three species which he mentions (i. e. *C. cristatus*, *C. stelleri*, and *C. sordidus*) are "aberrant," and that the "typical" species are only found in the "tropics of America and India." It is obvious therefore that *Cyanurus*, Sw. (1831) = *Cyanocorax*, Boie (1826), as stated by Strickland *l. s. c.*, and that *Cyanocitta* is the proper generic name for the "Blue Jays" of America, as used by us in our "Nomenclator."

## CYANOCITTA BEECHEII.

*Pica beecheii*, Vig. Zool. Journ. iv. p. 353 (1829), et Beechey's Voy. Zool. p. 22, pl. 6.

*Cyanocitta crassirostris*, Bp. Consp. i. p. 378 (1850).

*Cyanocorax geoffroyi*, Bp. C. R. xxxi. p. 564 (1850).

*Cyanocorax beecheyi*, Finsch, Abh. Nat. Ver. Bremen, vol. ii. p. 333.

*Cyanocitta beecheyii*, Lawr. Mem. Boston Soc. N. . ii. p. 283.

*Hab.* North-western Mexico; Mazatlan (*Grayson* and *Bischoff*); Tres Marias Islands (*Xantus*).

As far as can be told by the imperfect diagnoses in Bonaparte's 'Conspectus,' his "*C. beachii*" is founded on a yellow-billed specimen of the next species, and his *C. crassirostris* on a black-billed specimen of the present bird. Grayson says decidedly that the colour of the bill in the present bird is a sexual character; and there is not much doubt that he is correct. Bonaparte's *C. geoffroyi* is also undoubtedly based upon an individual of this species.

There is no example of the true *C. beecheii* in the British Museum. In the Galerie of the Jardin des Plantes there are four, all labelled "*Cyanocitta geoffroyi*, Bp." Two of these are from the Voyage of the 'Venus,' from San Blas and Mazatlan respectively, that from San Blas being doubtless Bonaparte's type.

## CYANOCITTA GERMANA, sp. nov.

*Cyanocitta beachii*, Bp. Consp. i. p. 378. (nec. Vig.).

*Corvus (Pica) beecheii*, Eyd. et Gerv. Mag. de Zool. 1836, pl. 72, et Voy. 'Favorite,' pl. 20.

*Cyanocitta crassirostris*, Salv. Ibis, 1861, p. 353; Moore, P. Z. S. 1859, p. 57; Lawrence, Ann. L. N. Y. ix. p. 201.

*Cyanurus beecheii* et *C. crassirostris*, Gray, Hand-list, ii. pp. 4 & 5.

*Hab.* Belize (*Salvin*, *Dyson* & *Leylan*); Peten (*Morelet*); Merida, Yucatan (*Schott*).

We have already stated that this bird is probably the *C. beachii* of Bonaparte's 'Conspectus.' Dr. Pucheran first pointed out the difference between the figure of Eydoux and Gervais in the 'Magasin de Zool.' (which we suppose to be also intended for it) and that of Vigors representing the true *beecheii*, and associated the former with Morelet's specimens from Yucatan.

Not having looked sufficiently deeply into the complicated errors of previous workers, we have hitherto used the term *crassirostris* for the present bird, and have been followed therein by other writers. But, as hinted by Pucheran\*, there can be little question that the insufficient diagnosis of Bonaparte's *C. crassirostris* was really taken from a black-billed *C. beecheii*.

As in *C. beecheii*, both yellow and black-billed specimens occur in the present species. Of two examples obtained by Salvin at Belize, one has a black bill and the other a yellow. The latter, moreover, has slight white tips to the lateral rectrices, which we look upon as a

\* Rev. Zool. 1858, p. 196.

characteristic of the female of this species. The *C. beecheii* of Gray's Hand-list is based upon three similar yellow-billed and white-tipped specimens, in the British Museum, two of which were obtained by Dyson in British Honduras.

In the Gallery of the Jardin des Plantes are two specimens of the bird. One of these, labelled "Mexique," has a yellow bill and white tips to the tail. The other is a partial albino, and has the black portions of the plumage, except the tibiae, white. It agrees with the short diagnosis given by Bonaparte of *Cyanocitta beachii*, jr. (Consp. p. 378), and is doubtless the bird from which it was taken. Amongst the skins at Paris is one example of this species from Merida (Yucatan), with yellow bill and white-tipped rectrices. This is marked in the handwriting of Jules Verreaux as the type of Bonaparte's *crassirostris*; but this is clearly an error. It is, no doubt, the specimen referred to by Pucheran (Rev. Zool. 1858, p. 196) as having been brought by Morelet from Guatemala.

CYANOCITTA JOLYÆA, Bp. Journ. f. Orn. 1853, p. 47; Tacz. P. Z. S. 1874, p. 524.

Of this rare bird we have never been able to procure specimens, but have examined that in the Paris Museum (probably Bonaparte's type) and convinced ourselves that it is an excellent species. There is likewise an example of it in the Copenhagen Museum, obtained by Prof. Reinhardt when at Lima, along with the specimen of *Iridornis reinhardti* (Ibis, 1865, p. 495, pl. xi.). We have not seen Taczanowski's specimens, but have little doubt that they really belong here, and that the bird is from the Junin district of Peru. Further south in the Cuzco district and in Bolivia *C. viridi-cyanæa* takes its place\*.

CYANOCITTA ARMILLATA, G. R. Gray.

The series of this bird in our collections present three recognizable forms, not including *C. turcosa*, Bp. These are from three different mountain-ranges of Columbia and Venezuela, namely the Andes of Merida, the central range of Bogota and Pamplona, and the Quindiu range, between the Cauca and Magdalena valleys. They may be distinguished as follows, but are hardly worthy of specific rank.

α. MERIDANA.

*Cyanocitta armillata*, ScL. et Salv. P. Z. S. 1870, p. 788.

In this form the whole upper surface is deep blue without any greenish tinge on the lower back and tail; the head is likewise barely lighter, not of a silvery blue as in No. 2. Below also the plumage is of a darker blue and quite uniformly coloured except on the throat, within the black neck-collar, where it is lighter, but not so bright as in the Bogota bird.

Of this form Goering obtained specimens in the upper wood-region of Merida, three of which are now before us.

\* Cf. P. Z. S. 1873, p. 185.

## β. BOGOTANA.

*Cyanocitta armillata*, G. R. Gray, in Gray & Mitch. Gen. of B. pl. lxxiv.; Wyatt, Ibis, 1871, p. 330.

This is the ordinary "Bogota" form, and is, we suppose, that figured by Gray and Mitchell, as above quoted; but no description is given. It is much nearer to the last than to the succeeding, having no greenish tinge to the blue. But the throat is lighter, the head paler, and the upper surface generally not quite so dark. Mr. Wyatt's skin from Pamplona belongs strictly to this form.

## γ. QUINDIUNA.

Of this form Mr. T. K. Salmon has lately sent us many examples from the Cordillera of Quindiu. The forehead is of a more intense blue than in the Bogota bird; and this colour is continued over the head and shoulders. The lower back, wings, tail and belly below are of a more greenish blue; but the throat within the black collar is of nearly the same tint as in β.

P.S.—Since this paper was written we have received from Mr. Lawrence a separate copy of his paper entitled "Description of a new Species of Jay of the Genus *Cyanocitta*, and of a new Species of the Genus *Cyanocorax*," read October 11th of last year before the Lyceum of Natural History of New York. So far as we can tell from Mr. Lawrence's description, his *Cyanocitta pulchra*, from Ecuador, there described, is a species with which we are not acquainted. But the *Cyanocorax*, for which the name *C. ortonii* is suggested (Ann. L. N. Y. xi. p. 166), is, in our opinion, none other than *Cyanocorax mystacalis*, Geoffr., of which name *C. uroleucus*, Heine, J. f. Orn. 1860, p. 115, is a synonym. Sclater's collection contains a skin of this species from Loxa in Ecuador, which agrees in every respect with Mr. Lawrence's description of his supposed new bird. The association of *C. mystacalis* with *C. cayanus* (by Bonaparte and others) is a great error, as may be seen by reference to the original types of the former now in the Paris Museum and Philadelphia Academy, both of which we have inspected, or even to the sufficiently accurate figure in the 'Magasin de Zoologie.' Whether *C. bellus* of Schlegel is really referable to *C. mystacalis* (as suggested, Ibis, 1868, p. 111) is perhaps not quite certain; for, as pointed out by Mr. Lawrence, Schlegel describes the outer tail-feathers of his *C. bellus* as having their bases blue. An examination of the typical specimen will be necessary to decide this question; but it will, in our opinion, probably turn out to be the case that the assertion made in the 'Ibis' is correct.

LIST OF THE PUBLICATIONS  
OF THE  
ZOOLOGICAL SOCIETY OF LONDON.

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March 7, 1876.

Dr. A. Günther, 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 February, 1876:—

The total number of registered additions to the Society's Menagerie during the month of February was 67, of which 36 were acquired by presentation, 21 by purchase, 5 by exchange, 3 were bred in the Gardens, and 2 were received on deposit. The total number of departures during the same period, by death and removals, was 111.

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

1. An example of the very singular Cervine form lately described by Mr. Swinhoe in the Society's 'Proceedings' as *Lophotragus michianus* (P. Z. S. 1874, p. 452).

This animal was procured by Mr. A. Michie, of Shanghai (the discoverer of the species), in the Ningpo district of China, and forwarded to this country for sale. We purchased it from his agent on the 12th ult. for £35.

The general appearance of the animal is very well indicated in the plate (P. Z. S. 1874, pl. lix.) prepared by Mr. Keulemans from



*Lophotragus michianus* ♂.

the flat skin upon which Mr. Swinhoe founded the species, and which is now in the Royal Zoological Museum of Berlin.

The animal is a male; and the canines project from the sides of the mouth as in *Hydropotes*. There are no external antlers; but there are hard projecting cores, sensible to the touch, beneath the elongated hairs which form a flattened disk on the forehead, as will be seen by the drawing (see woodcut, p. 273) which I exhibit.

Our Prosector will, no doubt, give us a complete account of this most interesting form when our specimen dies.

2. Two White-backed Pigeons (*Columba leuconota*), from the Himalayas, purchased 16th February; and

3. A Narrow-barred Pigeon (*Macropygia leptogrammica*), from Celebes, purchased 16th February. Both these Pigeons are new to the collection.

4. A Bay Bamboo-Rat (*Rhizomys badius*), from India, received the 16th February.

We have to thank Mr. Wood-Mason, of the Indian Museum, Calcutta, for his present of an example of this interesting Rodent, which is quite new to us.

5. A female Anderson's Kaleege (*Euplocamus andersoni*), from Burmah, presented by Mr. W. Jamrach, 18th February.

We have not previously received examples of this species of Kaleege, which is curiously intermediate between *E. nycthemerus* and *E. lineatus*.

---

Mr. Sclater exhibited a skin of a female of Anderson's Pheasant (*Euplocamus andersoni*, Elliot, P. Z. S. 1871, p. 137), which had been obtained alive from Burmah by Mr. W. Jamrach, along with another specimen of the same sex, which he had presented to the Society's collection.

Mr. Sclater stated that there could be little doubt that the *Phasianus crawfordii*, J. E. Gray, in Griffith's Cuv. Anim. Kingdom, vol. viii. p. 27, established upon a drawing in the possession of Mr. Crawford (which Mr. Gould had reproduced in his 'Birds of Asia' as the female of *E. prælatus*) was really the female of *E. andersoni*, which species should therefore, in strictness, be called *Euplocamus crawfordi*.

---

Dr. Günther exhibited specimens of *Antechinus minutissimus*, obtained by one of Herr Godeffroy's collectors in the neighbourhood of Rockhampton, Australia,—and called special attention to the great development of the genital organs, even in the young when in the pouch, by which the sexes might be distinguished at this early stage.

---

Dr. Günther also exhibited, and made observations on, specimens of a species of *Palythoa* (probably *P. actinella* of Oscar Schmidt) parasitic on a Sponge, which had been obtained at Naples by Dr. Balfour, and belonged to the Cambridge Museum.

---

The following papers were read:—

1. On the Anatomy of *Aramus scolopaceus*.

By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

[Received February 7, 1876.]

It being very seldom that an opportunity occurs for the study of the anatomy of *Aramus*, a form the exact relations of which are but little understood, I take the opportunity of describing this bird from a female specimen which reached the Society's Gardens alive, and died, much emaciated, within a few days, on Oct. 7, 1875. I may mention that the generic name *Scolopax* was applied to it by Linnæus, and that Lichtenstein termed it *Rallus gigas*. Mr. G. R. Gray\* places it among the Rallinæ, next to *Rallus aquaticus*, whilst Messrs. Sclater and Salvin† include it among the Alectorides, together with *Eurypyga*, *Cariama*, and *Psophia*. It seems to me, however, that, considering its different anatomical features, it is most intimately related to *Grus*, which, with it, is not distant from *Ibis*, *Platalea*, and *Eurypyga*.

With reference to the skeleton of *Aramus*, it may be mentioned that it is figured as a whole in Eyton's 'Osteologia Avium' (pl. xiv. K), and in the same valuable work (pl. 27. fig. 2) a front view of the sternum, and a back view of the pelvis are given, though the plate is incorrectly lettered.

In Audubon's 'Ornithological Biography' ‡ a full account of the viscera is given, with a woodcut of the alimentary canal. The author considers the bird to be most intimately allied to the Rails.

*Aramus* is a strongly schizorhinal bird§; in other words, the openings of the external osseous nares extend further backwards than the posterior ends of the nasal processes of the præmaxillæ. In this respect it agrees with *Grus*, *Eurypyga*, and the Limicolæ, but not with the Rallidæ, nor with *Cariama*, nor with *Psophia*.

As in *Grus*, *Ibis*, and *Platalea*, the lachrymal bones do not blend with the region of the skull where they are attached; in the true Limicolæ they do so. The palate is schizognathous, the maxillo-palatines long, the vomer pointed, and the pterygoids out-spreading at both ends exactly as in *Grus*. As in that genus, also, there is a pair of occipital foramina, like those in *Ibis*, *Platalea*, and the Limicolæ; but these do not occur in the Rallidæ, nor in *Cariama*, nor in *Psophia*. (Figs. 1, 2, and 3, p. 276, illustrate these points.)

The sternum is completely Gruine, as are the other parts of its skeleton.

The *pterylosis* of *Aramus* has been fully investigated by Nitzsch ||, who found that it agrees exactly with that of *Psophia* and *Grus*, and with no other bird. The peculiarities of the feathers themselves led that illustrious naturalist to place it with the Rails, from which it differs in more than one pterylographic particular.

\* Hand-list of Birds, vol. iii. p. 58.

† Nomenclator Avium Neotropicalium, p. 141.

‡ Vol. iv. p. 547 *et seq.* § Vide P. Z. S. 1873, p. 33.

|| Ray Society's English Translation, p. 125.

There are two carotid arteries; and the right jugular vein, as is frequently the case, is considerably the larger of the two.

The trachea is simple (the specimen is a female); the syrinx is somewhat dilated; and a single pair of intrinsic muscles is continued to the bronchial half-ring.

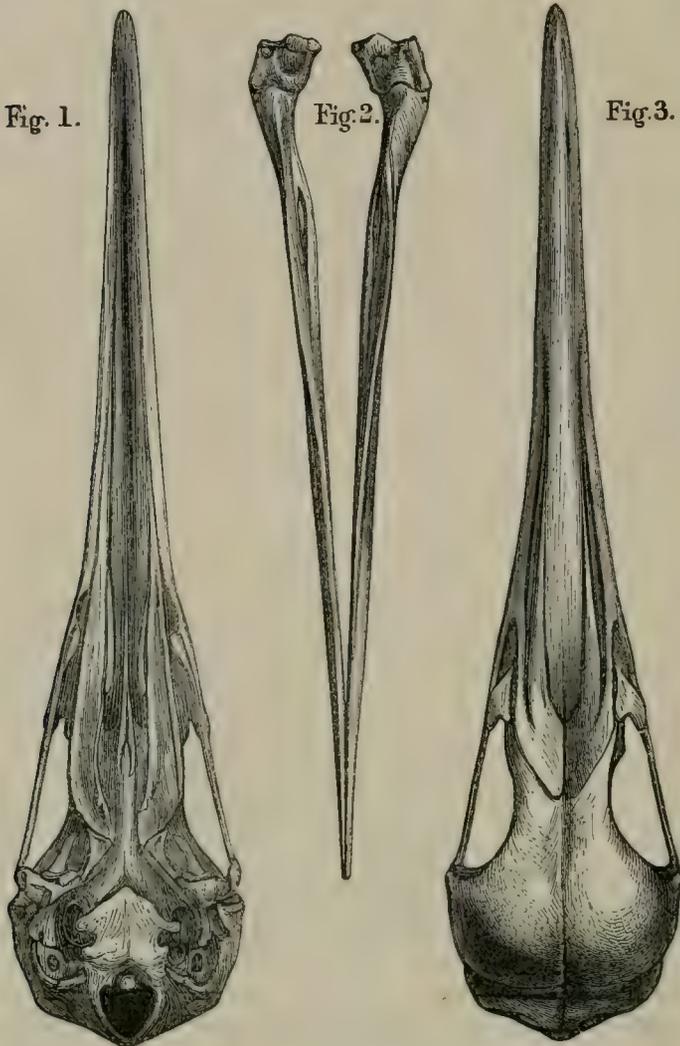


Fig. 1. Skull of *Aramus scolopaceus*, palatal view.  
 2. Ditto ditto lower jaw.  
 3. Ditto ditto top view.

*Myologically*, the ambiens muscle is strong; the femoro-caudal (A) is absent, the accessory femoro-caudal (B) is thin and small; the semitendinosus (X) and the accessory semitendinosus (Y) are fairly developed. Its muscle-formula\* is therefore B,XY. In *all* the Rallidæ the formula is AB,XY, the femoro-caudal being large. In

\* *Vide* P. Z. S. 1874, p. 111.

*Psophia* it is B,XY, as it is in *Cariama* (in *Chunga* B is also absent). In *Balearica regulorum* the formula is XY; in *Grus antigone* it is AB,XY, the femoro-caudal being reduced to almost a thread; in *Anthropoides virgo* the formula is AB,XY, as it is in *Ibis* and *Platalea*, as well as in *Eurypyga*. Myology therefore does not militate against the Gruine affinities of *Aramus*.

Further, as in *Grus*, the tensor fascia covers the *biceps cruris*; the *biceps humeri* muscle sends a special belly into the patagium; the *expansor secundariorum* is Ciconine; the obturator internus has a triangular origin\*.

*Alimentary canal.*—The *tongue* is  $2\frac{1}{2}$  inches long, very slender, quite smooth, nearly cylindrical, and tapering to a fine point in front. It has a slight papillary fringing at its posterior edge. The *oesophagus* is very capacious, although no crop is developed. The *proventriculus* is zonary; its glands are cylindrical and short. Between it and the gizzard is a capacious dilatation of the termination of the gullet, lined, apparently, with squamous epithelium, the volume of which is greater than that of the interior of the gizzard itself. The gizzard is not large, and its muscular walls are not thick. The *liver* has the left lobe a little larger than the right, a condition far from common among birds; the gall-bladder is present. The average-sized, or slightly narrow, *intestines* are 40 inches in length. The *cæca* are somewhat dilated toward their blind ends; they are 2 and  $2\frac{1}{4}$  inches long. They are peculiar in being situated laterally, and close together, instead of opposite one another, a condition approximated to in most of the non-columbine Schizorhinal birds, and in them only; the small intestine therefore enters the colon by a lateral, slit-like opening. In the Cranes the *cæca* are generally between 5 and 6 inches long; and they being so much larger, the comparative size is much the same. In *Ibis*, *Platalea*, and *Eurypyga* they are very much shorter; in *Cariama* they measure 10 inches, whilst in *Psophia* their length is much the same as in *Aramus*.

## 2. On the past and present Geographical Distribution of the Large Mammals of South Africa. By T. E. BUCKLEY, B.A., F.Z.S.

[Received February 7, 1876.]

After I had made arrangements for an expedition to South Africa, principally for the purpose of sport, in 1873, the University of Cambridge offered me a grant from the "Wort's Fund," on the condition that I should send home a collection of specimens equal in value to the amount of the grant, and should also make a report to the Vice-Chancellor, detailing any observations that I thought of sufficient importance to be preserved.

As the larger Mammals are yearly receding further into the interior, and as their total extinction is only a question of time, I thought I

\* For further reference to these points, *vide* P. Z. S. 1876, p. 195.

could not do better than set down the limits of each of the most important species at the time of my visit, as accurately as it was in my power to ascertain them, adding thereto such particulars as could be obtained from the accounts of former travellers, as to the range of the species at the time of their visit.

Considering the number of people who year by year visit South Africa for the purpose of shooting, it is wonderful how very little, comparatively speaking, has been written on its zoology. Many books on the sport to be met with there have appeared at different times; and from these a great deal may be learnt; but this information requires a vast amount of collating and sifting. On the larger mammals, of which we are now alone speaking, Harris's 'Wild Animals of Southern Africa' is perhaps the best book, giving, as it does, a plate and description of all those met with by the author. Dr. A. Smith's work on the Zoology of South Africa gives us descriptions and plates of only ten of the larger animals: the plates are decidedly inferior to those of Harris; and the colouring in one or two instances is wrong. These two are the latest works on South-African mammals; and when we consider the enormous number of animals killed year by year there, and the consequent impending extermination of these creatures, some of which even now are extremely scarce, it is to be hoped that some one will before long take in hand to set forth their complete life-history.

I am glad to say that now there are game-laws both in Cape colony and Natal, which, late though it is, will at least preserve a remnant of some of the larger animals, such as the Hartebeest and Eland. Of the smaller Antelopes there are still plenty; the existence of any of the larger species in the colonies will be noticed under the proper heading, when I could get reliable information concerning them.

The Tsetse fly has been of great service in preserving animals, comparatively few hunters caring to shoot on foot in such a hot climate. This is the reason why the Zulu country has so long held large game, its southern boundary being only some seventy miles from D'Urban; but now, since it has become the fashion for the hunters to arm natives to shoot for them, even in this country, favoured as it is by abundance of grass, water, and shelter, extermination is going on rapidly—so much so that a friend writes me saying that after next winter he does not think that it will be worth his while going to hunt in his old haunts; and yet this very country only some ten or fifteen years ago swarmed with game to an incredible extent. The result of the extermination of the game is that the Tsetse disappears, thus giving a greater extent of country for the rearing of domestic cattle.

The Tsetse appears to be found mostly where there are large herds of buffaloes, and is said, in some cases, even to migrate with these animals; at other times it appears a very local insect,—in one case a well-beaten road up country passing very close to its haunts; and, I believe, at night cattle may be driven through these localities with perfect safety, care being taken to be outside before the break of day.

My route from Natal was as follows:—I left Pietermaritzburg on the 15th of May, crossed the Drakenberg range on the 6th of June; on the 8th the bullocks were lost, which delayed me about a week; but I reached Pretoria on the 28th of June. I left again on the night of the 30th, and struck the Crocodile or Limpopo river on the 10th of July, and travelled slowly along the river for the sake of some shooting. Bamangwato was not reached until about the 5th or 6th of August. I was detained here about a week, but at last left on the 12th. Unfortunately I took a wrong road on the way to the Tati, and had to retrace my tracks for some considerable way, which delayed my arrival there until the 28th of August. I left the Tati on the 1st of September, and reached the Samouqui river, my furthest point, about the 12th of the month. The route on my return journey was precisely the same, but took less time, owing to the much lighter load to be carried down. My waggon arrived in Pietermaritzburg on the 3rd of January 1874.

My stay in the country having been very short, from the end of April till the middle of the following January, and not much more than the half of that time having been spent in a game country, my notes cannot be very extensive. I shot twenty-two different species of animals, and saw others,—a fair number, considering I had to do all my shooting on foot, and with very little aid from the natives.

I have been aided in my notes by friends whose experience was much greater than mine, and also by such books as I could get; but, being so far away from a library, there were, of course, many to which I could not refer: this must be taken as an excuse for many errors into which I may have fallen. I have purposely avoided giving descriptions of any animals, as they are mostly described in Harris's book from actual specimens.

In the Table exhibited (see pp. 291, 292) I have endeavoured to give the geographical distribution of these larger animals in Southern Africa, as far as I could gather it, both at present and formerly; but I could get no information concerning Natal and the countries immediately south of it, though it is probable that the coast-line, where it represents the Zulu country, would be occupied by the same animals.

Apparently most of the South-African Antelopes have their representatives to the north and west; thus the Waterbuck is represented by the Sing-Sing on the west, and the *Méhédet* of Baker on the north. Many other instances might be mentioned. Some species, again, are common to the whole of Africa, as the Giraffe and one species of Black Rhinoceros; others, again, are very limited in range, as the Blesbock.

The horns of all species of Antelope, whatever their shape may be hereafter, are the same when young, and consist of two small stumps three or four inches long, standing almost straight up. While the horns are growing, especially during summer, their bases are quite soft, and for a considerable way up can be pulled off in flakes.

#### 1. *ELEPHAS AFRICANUS*. (The Elephant.)

Excepting the few still preserved by Government in the Knysna

Forest, the Elephant may be considered extinct in the Cape colony and Natal. Seven and twenty years ago it was found in the bush around the town of D'Urban in the Natal colony, but now is almost exterminated even in the Zulu and Amaswazi countries. In the great reed-beds that exist in the neighbourhood of Santa-Lucia Bay in the former country, a few still remain, owing to the almost impossibility of getting at them; and in the Amaswazi country a few, I am told, are occasionally found under the Bombo Mountains. North of Delagoa Bay they get more numerous, especially so, I am told, in Umsila's country. In the Matabili land the Elephant is to a certain extent preserved, no one being allowed to hunt these animals without the permission of the king. North of the Zouga they are still fairly numerous; but with the immense number of hunters and traders, the destruction must be great indeed, and bids fair to exterminate the race in South Africa altogether, especially when we consider the very slow rate at which these creatures increase, and that cows and bulls are shot indiscriminately.

North of the Zambesi the Elephant is found through Central Africa into Abyssinnia, and along parts of the west coast. In some places they occur in vast herds, as seen by Livingstone (Zambesi Tributaries, p. 134), cows and bulls together. The number of trees destroyed by these animals is enormous; along the rivers Makloetze and Shashai, in the Bamangwuto district, the thick mimosa-groves which border their banks have been altogether destroyed by the ravages of these creatures.

The tusks of the cow Elephant are much thinner than those of the bull; but the hollow inside does not extend so far down. The largest tusk I heard of was one brought from Lake Ngami in 1872; this weighed 170 lb.; but its fellow was rotten and worthless. I have seen a pair weighing 90 lb. each; but such a perfect pair are, I believe, not common.

When Elephants are disturbed by shooting now, they often go great distances, passing through a large extent of thirst-land to a distant water; so fearful are they of fire-arms.

## 2. RHINOCEROS KEITLOA. (The Keitloa Rhinoceros.)

## 3. RHINOCEROS SIMUS. (The White Rhinoceros.)

Of African Rhinoceroses there are at least three distinct species, the fourth, *R. oswellii*, being, I fancy, rather a doubtful one. The two "black" species are *R. bicornis* and *R. keitloa*; they may at once be distinguished from the White Rhinoceros by their overhanging upper lip, which enables them to grasp the bushes on which they, I believe, exclusively feed. The only black species I met with was *R. keitloa*, observed on two occasions—once singly, another time an old female and her calf about half-grown, which latter was secured. Owing to incessant persecution these animals are now getting scarce, eight Rhinoceroses only having been seen by our party. At one time they must have been extremely common, judging from the number of skulls seen lying about. Harris, in his description of *R.*

*simus*, mentions having seen eighty of these animals in a day's march; and on one occasion in the space of half a mile he saw twenty-two and had to kill four in self-defence. A friend of mine whom I met on his way down from the Zambesi, told me he had only seen five, all *R. simus*, and all of which he secured.

At one time it was not at all uncommon to see *R. simus* with the anterior horn close on 3 feet and upwards in length; now, however, such animals are rare, most likely from the animal being shot down before it arrived at its full size. The dung of the black and white species differ materially; for whereas that of the former is light-coloured, more resembling that of an Elephant, that of the latter is very dark and much softer: thus a hunter, should he not be experienced enough in "spooring" to know which species he was after, would immediately do so on seeing the dung. Each species of Rhinoceros drinks every night, as may be seen by going in the morning to a waterhole, where their fresh spoor may be found, and the water is generally churned up into a filthy mass of mud. After leaving the water they go a long distance in Indian file should there be two or three together, when they spread out and begin to feed. Having had sight, by studying the wind and quietly (for a Rhinoceros is very quick at hearing) placing one's self near the line in which they are advancing, one may get an easy shot at any distance.

Nearly every Rhinoceros is accompanied by a few individuals of *Buphaga africana*, which rid it of its parasites and give it timely warning of danger. When the animal runs, these birds accompany it, hovering over it like flies above a horse's head, uttering a note something like *chirri-chirri-chit-chirri* all the time. The White Rhinoceros may often be found standing under a tree in the open plains; and at such places the dung collects into enormous masses, showing that the beast comes to the same tree day after day; when the mass gets very high the animal levels it with its horn. The Boreli (*R. bicornis*) always lives in the bush, and is one of the few animals that will charge and hunt a man unprovoked; this species often has a sore place behind the shoulder, which is supposed by the natives to be one of the causes of its savageness. *R. keitloa* is generally known to the hunters by the name of the Blue Rhinoceros.

#### 4. EQUUS QUAGGA. (The Quagga.)

The animal commonly so called, is Burchell's Zebra; the true Quagga I never saw, though Harris mentions it as occurring in great herds, but only to the south of the Vaal river. Whether, since his time, it has become extinct or not is a question; but the few animals of this genus that were seen on the open plains were all clearly Burchell's Zebra. Some few years ago the three species of this genus were in little repute for their skins as compared with the Wildebeest and Blessbok; but of late years it has been discovered that they are of great use for, I believe, connecting-bands for machinery; at any rate their value increased so much that they have been shot down, until you may go for a week through the "High Veldt" and not see one, although there will be thousands of other animals.

5. *EQUUS MONTANUS*. (The Zebra.)

This species is said still to occur in the Hottentot Mountains near Cape-town; but it was not observed by us, nor did we see a skin during the time we were in Africa; however, as we did not ascend any mountains, where alone they are said to be found, we had no opportunity of judging whether or not they were rare.

6. *EQUUS BURCHELLII*. (Burchell's Zebra.)

One of the commonest animals throughout South Africa, more especially in the wooded parts. A few years ago it was equally common on the plains even in the north of Natal, but now has either been shot out or driven back by the hunters. This is the Quagga *par excellence* of South-African sportsmen, by whom it is killed, both for its skin, which is now extremely valuable, and also for its meat, which is one of the most palatable morsels you can give to your native servants; but there is a sort of smell about it which, with its dark colour and yellow fat, make it any thing but tempting to most white men. These animals are generally found, at least in the bush, in small parties of from eight to ten, frequently in company with Blue Wildebeests. The largest troop I ever saw contained probably about forty individuals. They are generally in good condition. This species, I believe, when possible, drinks every day; I have seen them at the water at midday, and also coming down again to it in the evening.

Their geographical range is wide: Speke and Grant found them north of Uganda; and at the present time they are common animals in the Zulu country. Their note is a sort of bark, like the Dutch pronunciation of the word Quagga, whence, most probably, came the name. They utter this constantly after being disturbed by a shot, especially if one is wounded and lags behind.

Out of five of these animals shot in one herd, there were individuals showing every variation of colour and marking, from the yellow and chocolate stripes, to the pure black and white, the stripes in some ceasing above the hock, and in others being continued distinctly down to the hoof. I saw a young foal in September, the only one I remember to have seen.

7. *GAZELLA EUCHORE*. (The Springbuck.)

Still common in Cape colony, and more or less abundant through South Africa up to the Zambesi; it does not, however, occur in the Zulu and Amaswazi countries. Small herds of this species are generally seen mixed up with the Blesbocks and Wildebeests. When disturbed they go off in a series of bounds, opening the white line that extends halfway down the back to the rump, making the animals appear as if wholly white. When they come to a road, they usually spring right across it. Both male and female have horns, those of the latter, however, being much smaller and thinner. The calves are dropped about November, and are then cream-coloured. Gordon Cumming gives an interesting account of the periodical migrations of this Antelope in his work on South-African hunting.

8. *ÆPYCEROS MELAMPUS*. (The Pallah.)

This graceful Antelope occurs in all suitable localities, from the Zulu country far into Equatorial Africa. In the winter it is found in large herds; but in the summer these generally break up; and they may often be seen in family parties of three—an old ram and doe, and a young one. They seem to be fond of the vicinity of water, far from which I never observed them; when disturbed, they often bound off like a Springbuck. The male alone has horns, which are large for the size of the animal; the skin is much used by the natives for making karosses, at which the Bechuanas are very expert. The Pallah is essentially a wood-loving animal, never being found in the open country. Dr. Burchell seems to have been the first to make this species correctly known; in the second volume of his 'Travels,' p. 301, he gives a description of one that was obtained near Kuruman, where he first met with it.

9. *NANOTRAGUS OREOTRAGUS*. (The Klipspringer.)

The Klipspringer occurs in greater or less abundance throughout the whole of South Africa. I met with them in the Matabili country, haunting the rocky mounds that rise up so suddenly from the level ground, called "Kopjes" by the Dutch, generally in small parties of three. Their hair, which is long and bristly, is much used by the colonists for stuffing saddles. When alarmed at the foot of a Kopje, they at once ascend to the top; should, however, the hill be a small one, they soon take off across the country if pursued.

The Klipspringer does not invariably stay among rocks and high ground, though it always remains close by, as on three occasions I found them on the level ground at the foot of the stony rises that are so common in the African bush.

10. *NANOTRAGUS TRAGULUS*. (The Steinbock.)

This species was very common after passing Pretoria, the capital of the Transvaal, into the Matabili country; it is found in the Zulu and in Damara land, and seems spread through the whole country south of the Zambesi. They live either singly or in pairs, often in the driest situations, as they appear to require very little water.

One that I surprised suddenly in the sandy bed of a river lay close like a hare in its form until it considered me too near, when it ran off; they almost invariably stop, however, when they have gone a certain distance—a habit which often leads to their destruction.

The Steinbock feeds in the early morning, when it may often be seen creeping among the bushes; during the middle of the day it lies in a sort of form, and does not stir again until evening.

11. *CEPHALOPHUS GRIMMIA*. (The Duiker.)

The Duiker is met with through Natal and the Zulu country up to the Matabili country, but is not mentioned by either Andersson or Baines as occurring in Damara land. It is generally found in the bush-country solitary; when disturbed it rarely stands again, as a

Steinbock does, but goes off at once; when wounded it screams like a hare. Like the Steinbock the Duiker lives in the most arid country, seeming to be quite independent of water.

#### 12. *CORUS ELLIPSIPRYMNUS*. (The Waterbuck.)

A common species, extending from the Zulu country through the east of Equatorial Africa into Abyssinia, as mentioned by Grant and Baker. It seems never to be found far from water, through which it does not hesitate to go when alarmed; it lives in herds of from three or four to as many as twenty, though the old males generally live a solitary life, at least not more than one being found with a herd of females and young. The younger males herd by themselves, as I have shot two out of a small lot of six or seven, their horns then not being more than four or five inches in length. The females are hornless. The Waterbuck is found abundantly through the Zulu and Amaswazi countries up to the Limpopo and Mariqua, which seem to be its boundary in a south-west direction; it is found on the Zambesi, and at least as far to the west as the Botletlie river, where Chapman mentions killing one; but here its place is mostly occupied by the Leché. The flesh of the Waterbuck is so coarse, poor, and tasteless that even the natives do not care for it. From the white ring round its rump the Dutch have given it the name of Kringhat.

#### 13. *STREPSICEROS KUDU*. (The Koodoo.)

Once common in the Cape colony, the Koodoo, unless there be a very small remnant indeed, is not found now nearer than the Zulu country. Here it yet holds its ground in spite of the yearly persecution of the hunters, by whom it is killed on account of the value of its skin, which is fine, but at the same time tough and durable. It has a wide range, being found through Central Africa into Abyssinia, as recorded by Speke and Baker; but it is remarkable that the finest specimens come from the Zulu country, even animals killed near the Zambesi not having such fine horns; possibly this may be accounted for by the Zulu country possessing better pasturage. The males alone possess horns; the females and young go about in small herds of seven and eight, sometimes one old male accompanying them; this would probably be in the rutting-season; I have also seen a small herd of young males only. This species frequents the bush country exclusively, and seems to prefer that part where there are many stony rises; the tips of the horns of the old males glance in the sun almost like the points of bayonets. The Koodoo is supposed to be able to do with less water than many of the other antelopes; but I have seen them drinking in the middle of the day; they are difficult animals to spoor, as they feed in a scattered manner, sometimes returning on their own tracks a short distance, in a way different from other antelopes; young calves well grown were seen following their dams in September.

#### 14. *OREAS CANNA*. (The Eland.)

Of all antelopes inhabiting Southern Africa the Eland is the one

most liable to extermination; easily ridden down, the best and fattest of all animals, the skin of value as well, it is year by year diminishing in numbers. Throughout my travels I only saw them on two occasions, and never obtained a specimen; I have at different times seen their fresh spoor (which resembles that of the buffalo, but is rather smaller and rounder) in the driest spots through which we passed; and it is said they require very little water. Harris speaks of these animals as occurring in vast droves in the open country south of the Vaal river; now the Eland is only to be found in the more remote wooded country. A few yet remain in certain parts of Natal, one locality being Bushman's River, where, luckily, they are now carefully preserved.

15. *TRAGELAPHUS ANGASI*. (The Inyala.)

This fine Bush-buck inhabits the bush bordering the sea-coast along the Zulu and Amaswazi countries, from the Inyalazi river (its southern boundary), as far north at least as Delagoa Bay, probably beyond this. It appears to be very local, never, as far as I could hear from the hunters, being found out of this limit. The Inyala lives in small herds, the old rams being generally solitary; but the younger ones accompany the females. They inhabit the very thickest bush.

16. *ALCELAPHUS CAAMA*. (The Hartebeest.)

Why the Hartebeest should have become so rare is a matter of conjecture; but from being one of the commonest animals throughout the Cape colony (according to Harris, up to the tropic of Capricorn), it is now one of the rarest of the antelopes. We observed it only on three or four occasions, once just before reaching the Crocodile River, and once or twice in the colony of Natal, where, being preserved, it is now becoming fairly common. At the time of Harris's visit to South Africa it seems to have been extremely abundant, mingling with the vast herds of Blesbocks and Wildebeestes. A few are met with about the Bamangwato hills; Col. Grant mentions having met with this species as well as *A. lichtensteini* in Equatorial Africa. A friend tells me, however, that he never met with it from Shoshong (the capital of the Bechuanas) to the Zambesi. It is not mentioned by Baines, Andersson, or Chapman as occurring in South-west Africa. In the south-east, again, a few still remain in the Zulu country, as well as in Natal; but I could not hear of it as occurring in the Amaswazi country, where its place is taken by the Sassabye. The Hartebeest prefers the open country or where the bush is, at best, very scanty: the three or four we saw near the Crocodile River were very shy, not allowing us to approach nearer than five or six hundred yards.

17. *ALCELAPHUS LUNATUS*. (The Sassabye.)

Although, in Harris's time, the Sassabye appears to have been common on the plains, at the present day it is essentially a bush-loving animal. According to Dr. O. Smith the Sassabye was rarely known to advance to the south of Latakoo; at present its southern

limit appears to be the Amaswazi country ; along the Limpopo it is very common, and continues so into the Matabili country up to the Zambesi. The old males do not seem to associate with the females ; nor do they appear so common, as out of nearly a dozen obtained by us only two were males, and one of these was immature. We observed very young calves in October. The Sassabye runs with a peculiar gait, reminding one of a rocking-horse ; its shoulders are very high, sloping away to the rump ; it does not seem to be a very shy animal.

#### 18. ALCELAPHUS ALBIFRONS. (The Blesbock.)

Persecuted though it is, the Blesbock still continues to hold its ground, occurring through the Orange Free State and the Transvaal in countless numbers. In the winter they migrate south, a straggler coming even as low as Harrismith ; in the summer, again, they go north of the Vaal river. They do not seem ever to have occurred much to the west of  $24^{\circ}$  east long., or north of  $25^{\circ}$  south latitude ; on the east the Drakenberg range is the boundary. At one time they were found in the Cape colony, but were scarce there even in Gordon Cumming's time : the extensive plains in the Orange Free State and the Transvaal, however, were probably always the headquarters of this species. Why the Blesbock should still be so numerous, and the Bontebock, *D. pygarga*, almost extinct whereas, according to Harris, in 1836 it was almost as common as the Blesbock, is a problem not easily solved, inhabiting as they did the same localities, and feeding over the same ground. In habits, size, and appearance the Bontebock is almost identical with the Blesbock ; yet out of the vast herds of the former all that remain are a few individuals carefully preserved in the old colony near Cape l'Agulhaz. The Blesbock calves in November, the young at first being a sort of creamy brown colour ; the males and females live together in the same herds : these, when disturbed, invariably run up the wind, carrying their heads down.

#### 19. CATOBLEPAS GNU. (The common Gnu.)

When Harris first entered the colony in 1836, the common Gnu was met with in Graaf Reinet ; now, however, their numbers are so much reduced by continued hunting, that it is not until we come to about fifty miles south of the Vaal river that any are seen. In winter a few wander to within a few miles of Harrismith ; but in summer as we were coming to Natal we only saw them after crossing the Vaal. On the 20th of June I saw quantities of Wildebeest and Blesbocks that were spreading themselves over the plains south of the Vaal ; and this is the time when they are most persecuted, as they are then very poor in condition, and with a good horse may easily be ridden down, especially in the early morning, when they are stiff with the frost and cold. Their skins are valuable, and form one of the chief exports of Natal ; and their flesh is converted by the Dutch boers into "beltong." Both sexes have horns ; but those of the female are much lighter and do not meet so closely over the forehead.

In summer the colour of their skin is a dark brown ; but in winter this turns to black. On taking out the brains when preserving a head there is generally found a quantity of a large white maggot, more like an exaggerated woodlouse than the common maggot ; the Blesbock too seems equally afflicted with these creatures. In December we observed lots of young calves ; they resembled their mothers in colour ; at this time the old bulls lead a solitary life, and seem to be much tamer, as I one day walked up to two on open ground to within one hundred and fifty yards, whereas they will scarcely allow one within five hundred on ordinary occasions. This species is liable to an epidemic which at times, I believe, makes great havoc amongst them ; I saw a young one in this condition : all the hair was off as if it had been burnt ; and it was unable to rise. It is very amusing to watch the antics of a herd when aroused or excited ; when approached to within five or six hundred yards they chase one another round and round for a short time, stand, stare, and paw the ground, then lashing their long white tails against their sides, set off as hard as they can go. They go in herds of from eight to fifty ; but I never saw them in such masses as the Blesbocks. They exhibit a good deal of curiosity ; three approached our waggon one day when outspanned close enough to allow of my shooting one of their number from the waggon-box, where I was sitting writing.

Although the Orange Free State and the Transvaal are the headquarters of this animal, yet they are found considerably to the north and west of this, as Chapman mentions meeting with this species on the Chobi river, which is in  $18^{\circ}$  S. lat., and  $25^{\circ}$  E. long. ; Baines and Andersson mention it as common in some parts of South-west Africa through which they travelled.

In summer the old males separate from the herds and live solitary. At this time they fix on one spot, making a sort of lair, to which they will return after feeding or being disturbed. This sometimes leads to their destruction ; for if two or three men go together, the old bull immediately gets up and goes away ; on this one of the party lies down in the spot lately occupied by the beast, the other two then retire. The Wildebeest thinking every thing is now safe goes quietly back to his particular spot, and is then shot at by the man who is lying down.

#### 20. CATOBLEPAS GORGON. (The Brindled Gnu.)

The Blue Wildebeest, as it is generally called in S. Africa, was at one time found in abundance almost to the borders of Cape colony ; but it does not seem to have entered it, according to Dr. Smith's account of that animal ; it is yet found in the Zulu country ; and, according to Baines and Andersson, it is common in Damara-land. In Col. Grant's 'Observations' sent to the Geographical Society he says:— "This Gnu was found in large herds in Khutu, in the western borders of Uyaramo. It inhabits the park-like country adjoining the river Kingani, and was not seen after crossing the east coast range." It is a common species through S. Africa, very often being in company with Burchell's Zebra. About November the old bulls separate from the

herds and go singly ; one that I shot about that time had its head plastered with mud, as if it had been using its horns on a bank, like we see the Stags in Scotland during the rutting-season. At one time the Blue Wildebeest inhabited the plains equally with the common Gnu ; now, however, it is rarely seen except in the bush-country ; like it, too, it generally makes one or two wheels round, when disturbed, before it takes to flight.

#### 21. HIPPOTRAGUS EQUINUS. (The Roan Antelope.)

This Antelope (except the Eland, the largest of the family) was at one time, according to Dr. Smith, found within the Cape colony ; but now its furthest range south seems to be the Amaswazi country, where it is still occasionally shot. It is probable that the Kalahari desert is its south-western boundary, as it is not mentioned by either Baines or Andersson in their works. Dr. Livingstone met with it in large herds on the Leeba ; and Schweinfurth shot it in the Djoor district. The Roan Antelope is probably the rarest of the genus ; nowhere does it appear very common ; Harris in his 'Southern Africa' mentions killing several males of this species, but never seems to have procured a female, as he says in his description of this animal that it is hornless, a mistake copied also by Chapman ; this is not the case, as the female has horns almost as long as the male. The only specimen I procured was shot standing in the middle of a sand river in company with a solitary Sassabye. Both this and the Sable Antelope will charge savagely when brought to bay ; their cry of danger or anger is a kind of hissing snort, different from that of other antelopes. Their Bechuana name is "Qualata." From the accounts of natives this species seems to be most common in Umsila's country, which lies to the east of the Matabili.

#### 22. HIPPOTRAGUS NIGER. (The Sable Antelope.)

This splendid Antelope was first discovered in 1836 by Capt. Harris on the Magaliesberg hills, where, it is said, one or two still linger ; this would seem to be their southern limit, as the species is not found in the Zulu or Amaswazi countries ; it is found however at Zoutpansberg, in the north-east of the Transvaal, and probably would be found to extend as far as the coast. To the west Livingstone met with it on the river Leeba, which is in long. 23° E., lat. 12° S. ; but it is not mentioned by either Andersson or Baines as occurring in the south-west. To the north, the head of a young one was brought home by Speke, which Grant shot at Ukutu, which would be near the latitude of Zanzibar. The Matabili country is perhaps the locality where it is most numerous ; we first met with traces of it near the Makloutze river, where we saw the skin of a large male in the possession of some natives. This species goes about in herds, sometimes very large. I have seen about fifty together ; but there are not many old males among them ; they are mostly females and young, the adult males generally leading a solitary life. The females of this species carry horns, but not so long as the old males : the colour of an adult female is dark chestnut, white underneath, with a mane

reaching to the shoulders; the young are much lighter in colour, whereas an old male is as black as jet. In running, the neck is arched, which throws the horns forward. The Sable Antelope is said to be able to defend itself from a Lion by striking sideways with its powerful horns. Mr. Baines has informed me that he has picked up horns covered with the hair and blood of a Lion. He himself saw a dog pierced through from chest to flank by an old male of this species that was wounded near his waggons.

### 23. ORYX CAPENSIS. (The Gemsbock.)

At one time common in Cape colony, Gordon Cumming having killed it not far from Colesberg, the Oryx or Gemsbock is now, I believe, restricted in that district to a locality not far from Cape L'Agulhaz, where a small remnant are now carefully preserved. It seems never at any time to have spread far to the east, at least not to the Zulu and Amaswazi country, according to the testimony of hunters there; nor does it seem to be common in, if even an inhabitant of, the Transvaal. To the west of that country, however, it is common, being found through Secheli's and Sicomos's territories. The borders of the Kalahari desert, by the Zouga up to Lake Ngami, and Damara Land seem to be the stronghold of this animal. Palatzi, a small water-hole in the Bamangwato district, about 27° E., was the only place where I myself observed this animal; but, being disturbed by some Giraffes, I was unable to get a shot. From what I learnt from hunters at Shoshong, however, it occurs east of this again, but sparingly. A friend told me that he never observed this species either going to or coming back from the Zambesi. I have heard that the Matabili have no name for this animal; but the Bechuana term is "Kokama." A good description of the habits of the *Oryx* is given by Andersson in his 'Lake Ngami.' It may be mentioned that both sexes have horns, these being longer in the female.

### 24. BUBALUS CAFFER. (The Cape-Buffalo.)

At one time abundant all through the Cape colony, the Buffalo now is found no nearer than the Zulu country; and even there it is getting very scarce. I heard that a small herd exists in Natal, near Bushman's River, where it is very strictly preserved. The largest herd we met with consisted of at least two hundred individuals of both sexes. The value of their hide has led to their gradual extermination in the more accessible parts, and even far in the Matabili country there were hunters killing them for this only. One man, we heard, had got upwards of a hundred in a month; surely no animal can long withstand such slaughter.

On approaching a herd the noise made by the animals rubbing their horns against the trees is very audible, as well as a rumbling sound. There is little danger in attacking a herd, as on the first shot there is a general stampede; but a wounded animal and a solitary old bull are very dangerous; often a solitary animal will charge down in the direction of the smoke of a shot, or after running a certain

distance will turn out of the way, and, retiring quietly in the bush alongside its own tracks, will charge on the unsuspecting hunter; and there are few who have not had several narrow escapes from these animals.

We saw very young calves of the Buffalo towards the end of September; and there was a full-grown foetus in a cow which we killed about that time; when first born they are of a dark brown colour. Buffaloes require water at least once in the twenty-four hours, generally drinking at night, but sometimes in the afternoon; they feed in the morning and evening, but lie still during the heat of the day, in the shade.

Attempts have been made to domesticate the Cape-Buffalo, but they appear to have resulted in failure; not only is the animal too uncertain in temper, but, just as in the wild state it goes to rest during the heat of the day in the shade, so it is that from this reason the Buffalo is less hardy than the Ox, as it is unable to work during a great part of the day.

#### 25. CAMELOPARDALIS GIRAFFA. (Giraffe.)

From all accounts it would appear that the Giraffe never occurred south of the Orange River. Sparrmann mentions it as occurring to the north and north-west of the colony in 1772, but seems not to have obtained a specimen. Paterson, in his 'Journey,' published in 1789, mentions that a friend of his killed one just north of the Orange River, which was devoured, however, by lions before he had a chance of inspecting it. Later on he was more fortunate; and at p. 125 he gives a description of one, and a very fair drawing also. To the east, I am informed that, although no longer inhabiting their country, the Zulus have a name for the Giraffe: their country lies between 27° and 29° south; so that 28° would be about their southern range.

At present I should say that the Giraffe does not occur much further south than 24°; it was about in this latitude, where the road leaves the Limpopo river on the way to Shoshong, that we first saw its spoor. Being rarely killed except from horseback, the Giraffe yet holds its own in the "fly"-country, where the Horse cannot enter, and from its enormous length of neck is able to take good care of itself from any one trying to stalk it on foot.

The flesh of a young cow is very good, and the marrow-bones excellent; its skin is used by the natives for making sandals, and by hunters and traders for making reins.

The Giraffe lives in small herds of from three to twelve; it inhabits the driest country, feeding on the young shoots of the mimosa trees, and occasionally on a small green fruit resembling an apple. When hunted they go off at a great pace, though it does not appear so, their long necks oscillating like a pendulum, and their tails screwed up over their rumps.

The following Table gives a summary of my conclusions:—

NAME.	PRESENT DISTRIBUTION*.	PAST DISTRIBUTION.
1. <i>Elephas africanus</i> .	A few still found in Cape colony, in the Knysna forest.	Common through the whole of S. Africa.
2. <i>Rhinoceros keitloa</i> .	Found in the Zulu country, in places similar to those of the White Rhinoceros.	No information, as this species was not distinguished from <i>R. bicornis</i> until about 1836 by Sir A. Smith. He says, "We may infer that the Keitloa has not, at least for many years, been in the habit of generally extending his range higher than about 25° S. lat."
3. <i>R. simus</i> .....	Still found in the Zulu country about lat. 28°, not further west than long. 31°, until we come to lat. 24°; there found everywhere more or less commonly in suitable localities.	First found by Burchell at Latakoo in 1812, lat. 27°, long. 24°, said by the natives at that time to have occurred frequently even south of this.
3 a. <i>R. bicornis</i> .....	Same as preceding species, but probably extends westwards a little sooner than it does.	In 1652 common on Table Mountain; in 1775 found by Sparrmann in lat. 32°; in 1812 mentioned by Dr. Burchell as almost exterminated in that latitude. Last one in Cape colony seen in 1849 in the Zuurberg and Addo bush ( <i>vide</i> Gordon Cumming's book, vol. i. p. 48). Zuurberg is in lat. 33°.
4. <i>Equus quagga</i> .....	Unknown apparently, the Quagga so often mentioned by African hunters being <i>E. burchellii</i> .	At one time very common through the colony up to the Vaal river, which is said by Harris to be its northern limit. In his time it was very numerous in the extensive plains north of the Vaal river, in 1836.
5. <i>E. montanus</i> .....	Said still to occur in the mountainous districts of George (?), in the Cape colony. Mentioned by Livingstone as occurring on the Zambesi in about 1861, and by Baines in Damara Land in 1851; but its proper limits are very imperfectly known.	Probably the same limits as now.
6. <i>E. burchellii</i> .....	From 29° lat. in the Zulu country, in any place where there is any large game, but getting very scarce in the open places of the Transvaal and Orange Free State.	It is likely that this species only occurred to the north of the Orange River, taking the place of the real Quagga.
7. <i>Gazella euchoire</i> ...	Still found through the colonies, but sparingly in comparison to former years. Abundant in grassy plains through the Orange Free State and the Transvaal.	Extremely common everywhere in suitable localities, but not further east than the Drakensberg Mountains.
8. <i>Æpyceros melampus</i> .	Still inhabits the Zulu country, getting commoner the further north; very common on the Limpopo from about lat. 25° to the west. Mentioned by Baines in 1861 as being found first in long. 18°, lat. 22° 30'.	Found by Burchell at Kuruman in lat. 27° 6', long. 24° 39', who calls it one of the rarer Antelopes, probably did not occur much to the south in this part of Africa.
12. <i>Cobus ellipsiprymnus</i> .	Found in the Zulu country; common on the Mariqua and Limpopo rivers, lat. 25°. Probably does not extend much further west than long. 24°.	Seems not to have been found very far from its present limits.
12 a. <i>C. leachi</i> .....	To the west this species does not apparently advance beyond 26° 30' lat.; probable southern limit long. 21°.	In the same localities as at present.
13. <i>Strepsiceros kudu</i> .	Found in the Zulu country, not west of long. 30°, until we get between lat. 26° and 25°.	Common everywhere. A few in Cape colony in the Zuurberg in 1819.

\* In all cases when boundaries are mentioned, Petermann's map of South Africa is referred to.

NAME.	PRESENT DISTRIBUTION.	PAST DISTRIBUTION.
14. <i>Oreas canna</i> .....	A few preserved in Natal. Still found in Zulu Land, but not west of long. 30° until one comes to lat. 24°, or at least but rarely. On the west coast in Damara Land rarely seen so far south as 20°, according to Andersson, 1857.	Common through S. Africa.
15. <i>Troglaphus angasi</i> .	Inhabits the coast-line from the Inyalazi river in Zulu Land, as far north at least as Delagoa Bay.	Probably the same as at present.
16. <i>Alcelaphus caama</i> .	In parts of Natal; a few seen in long. 27°, lat. 25°; still a few found in the Zulu country. Its spoor seen in long. 27°, lat. 23°, but apparently getting very rare.	Common everywhere.
17. <i>A. lunatus</i> .....	In the Amaswazi Land, in lat. 27°; common on the Limpopo; beginning in lat. 25°, goes as far west as long. 25°.	First found about Latakoo in lat. 27°, long. 25°, by Dr. Burchell.
18. <i>A. albifrons</i> .....	Western boundary 28° long., eastern the Drakensberg range; an occasional one in winter found in the north of Natal. Probable boundary of its northern range lat. 35° 30'. Principal habitat the open country in the Orange Free State and the south of the Transvaal.	Found sparingly in the colony. In other respects its boundaries were the same as at present.
18 a. <i>A. pygargus</i> ...	In the Cape colony, in Breida's Farm at Cape L'Agulhaz, apparently the only place in which it is now found.	According to Harris, its limit north appears to have been 25° lat.; but its principal habitat was, according to the same author, the extensive grassy plains south of the Vaal river.
19. <i>Catoblepas gnu</i> ...	Not known apparently west of the Drakensberg range of hills; occurs yet through most parts of the Transvaal and Orange Free State in the open country; found again in lat. 22°, from about long. 26°, into Damara Land.	In much the same situations as now, but came much further north.
20. <i>C. gorgon</i> .....	Still found in the Zulu country. Does not begin to extend its range west until about lat. 25°.	Apparently never crossed the Vaal river into the colony, but common in all suitable localities to the north of it.
21. <i>Hippotragus equinus</i> .	Still found in the Amaswazi Land in lat. 27°; its probable range, besides, is most likely the same as that of the Sable Antelope.	According to Dr. Smith, once found in the old colony; but how far north is not known for certain. Gordon Cumming met with it just to the north of the Vaal river.
22. <i>H. niger</i> .....	Still said to linger on the Magaliesberg, where they were first found by Harris in 1836 or 1837. It probably does not extend further westward than long. 23°, lat. 21°, or further south than lat. 26°, and there only sparingly.	The same as at present.
23. <i>Oryx capensis</i> .....	A few still preserved at Cape L'Agulhaz, in Cape colony, on Breda's Farm. At present its furthest range east seems to be long. 27° nearly, yet found as far north as lat. 24°.	Found commonly in the Cape colony, but probably never further east than its present limit, being more of a western animal; or probably that part of the country was more suited to its habits.
24. <i>Bubalus caffer</i> ...	About lat. 28° in Zulu Land; a few still preserved in Natal, in those places not extending beyond 30° E. long. Begin to extend their range west about the Tropic of Capricorn.	Common through all S. Africa.
25. <i>Camelopardalis giraffa</i> .	On the east coast about lat. 25°, which is the probable latitude through S. Africa	About lat. 28°, to the west of long. 24°. The Giraffe probably never crossed the Orange River to the south.

In this Table, when latitude and longitude are mentioned, south latitude and east longitude are to be understood. When a species is stated to be common everywhere, suitable localities must be understood.

I have endeavoured to make this Table as accurate as possible; but there is little very recent information of the south-west parts, Baines's 'Explorations' in 1862 being the latest.

There is also no information to be got of the great Kalahari Desert, whither I believe many animals go during the rainy season, and where they are comparatively safe from pursuit, except from the Bushmen.

I have taken lat. 18° as my northern limit of S. Africa.

The following list of the specimens which I sent home, and which are now in the Museum of Zoology and Comparative Anatomy of the University of Cambridge, has been drawn up by J. W. Clark, M.A., F.Z.S., Superintendent of the Museum.

CAPE BUFFALO (*Bubalus caffer*), ♂, skeleton.

WATER-BUCK (*Cobus ellipsiprymnus*), ♂, skeleton. An unusually fine skeleton, with skin, of a completely adult animal.

ROAN ANTELOPE (*Hippotragus equinus*), ♂, skeleton, with skin.

IMPALLA (*Æpyceros melampus*), ♂, skeleton. The skeleton is of a very old animal. With it were sent a skin, also of a male, and a skin of a female.

BRINDLED GNU or }  
BLUE WILDEBEEST } (*Catoblepas gorgon*), ♂, skeleton, adult.

SASSABYE or }  
BASTARD HARTEBEEST } (*Alcelaphus lunatus*), ♂, skeleton.

KOODOO (*Strepsiceros kudu*), ♂, skeleton.

ELAND (*Oreas canna*), ♂, skeleton.

INYALA (*Tragelaphus angasii*), ♀, skin.

BURCHELL'S ZEBRA (*Equus burchellii*), skeleton, with skin.

LION (*Felis leo*), ♀, skeleton.

SPOTTED HYÆNA (*Hyæna crocuta*), ♂, skeleton.

SILVER JACKAL (*Canis mesomelas*), 2 skeletons, with skins.

BUSH-BABY (*Galago maholi*), skeleton.

3. Notes on Entozoa.—Part IV. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Correspondent of the Academy of Sciences of Philadelphia.

[Received February 14, 1876.]

(Plate XXI.)

The present series comprises a variety of new and interesting parasites, all of them belonging to the Nematode Order.

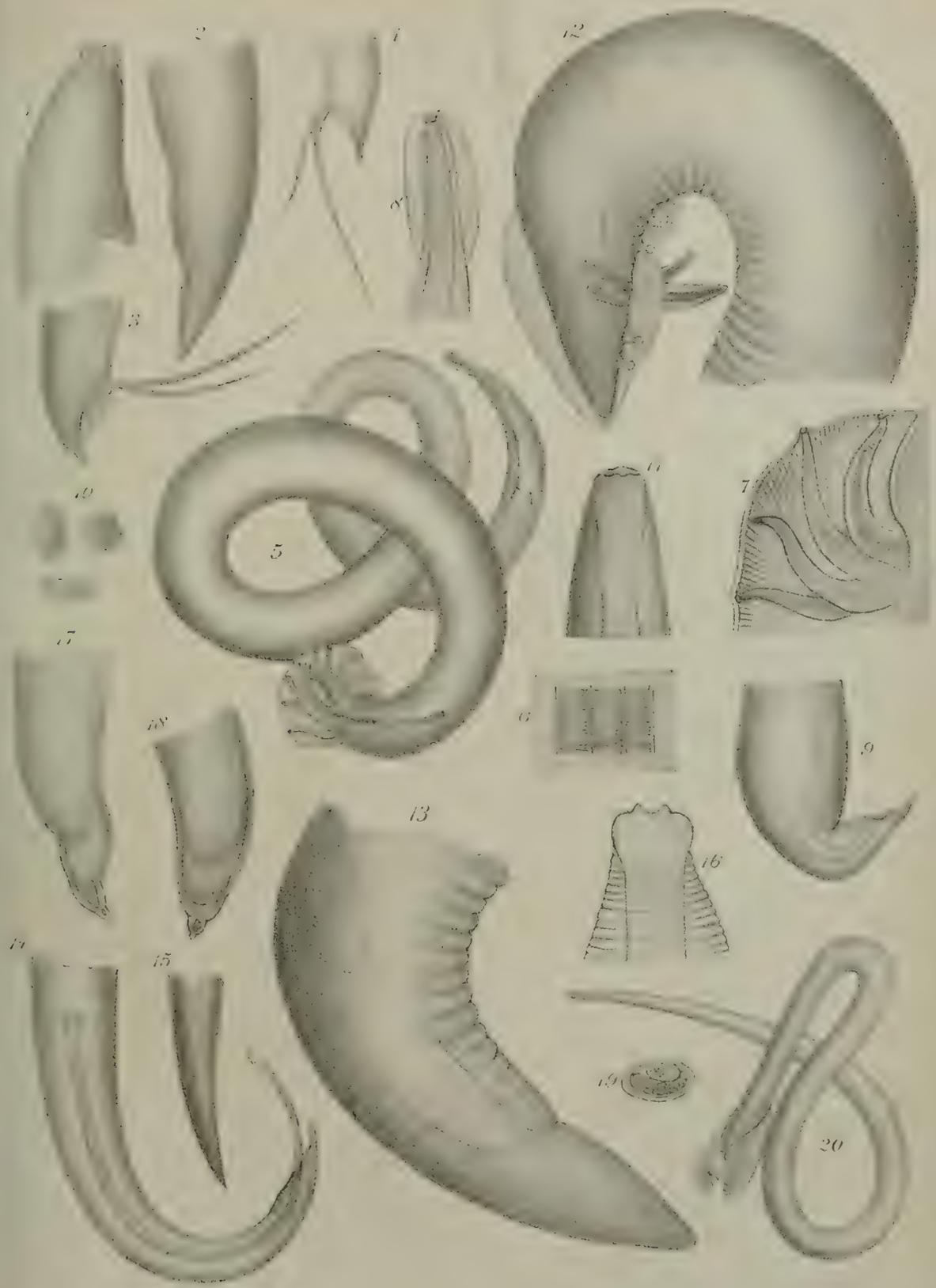
12. *ASCARIS CORNELYI*, nov. sp. (Plate XXI.)

On the 21st of December, 1875, I was requested to identify a nematoid which Mr. Sclater had only a few days previously received from Mr. J. M. Cornély, C.M.Z.S. As stated on the label of the bottle, the worms had been removed from the intestines of a Vulturine Pintado (*Numida vulturina*). At once making a pocket-lens examination of the parasites, I remarked that the species was probably new to science; and on the 30th of the same month this opinion was confirmed by careful investigation. In a more or less marked manner its characters differed from allied forms infesting fowls and game birds (such as *Ascaris compar*, *A. perspicilla*, *A. inflexa*, &c.); consequently I have ventured to name the worm *A. cornelyi*, after the discoverer. The bottle contained eleven specimens in all, eight of them being of the male sex. I think the worms must have been unduly shaken during transmission; for not only were they coiled together in a very complicated way, but at least three of the males had their exerted spicules broken. From the best examples I gathered the following diagnostic characters:—Head entirely naked and destitute of appendages, the dorsal lip being conspicuously larger than either of the two ventral lips; body much contorted and rather suddenly narrowed at either end, especially towards the head in the female; tail of the male appearing diagonally abrupt when seen in profile, and furnished with a sharply pointed subulate process at the tip, also presenting on either side a feebly developed but distinctly four-lobed membrane; spicules two in number, long and slender, unequal, the exerted portion of the longer one measuring fully  $\frac{1}{8}$  of an inch; tail of the female with an ensiform profile, sharply pointed and furnished with an extremely minute, distinct but scarcely separable process at the tip. Males up to  $\frac{3}{4}$  of an inch in length, the females being very nearly an inch long, with a breadth of  $\frac{1}{15}$  of an inch.

Of the accompanying figures, two of them illustrate the characters of the head and tail of a female worm, whilst the others show respectively right and left profile views of the tail of the male as exhibited by the two most perfect specimens (Plate XXI. figs. 1–4). The arrangement of the spicules in the fourth figure is clearly the result of artificial twisting.

13. *STRONGYLUS HEMICOLOR*, nov. sp. (Plate XXI.)

Nearly ten years back I received a batch of parasites from the



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Zoological Gardens. Some of these have been described in the Society's 'Proceedings;' and others have been publicly noticed elsewhere in a less formal manner.

Amongst the series in question was a bottle that contained three different species of nematoid parasites, all derived from one and the same host. The infested animal was a Lemur (*Pithecia leucocephala*) which appears to have died at the Gardens on the 28th of June, 1866. The worms were of three well-marked sizes. The largest species, represented by a single parasite and measuring  $8\frac{1}{2}$  inches long, could not be distinguished from the ordinary *Ascaris lumbricoides* of the human subject. It had been removed by Dr. Murie from the rectum.

The worms of intermediate size, numbering in all eleven specimens, were taken from the stomach and œsophagus; six of these were males averaging from an inch to an inch and a quarter in length. The five females varied from  $1\frac{1}{2}$ " to 2" in length. A pocket-lens examination at first suggested that they were examples of *Spiroptera dilatata* (a species that is common in the South-American Monkeys); but I have since determined otherwise. The smallest set of parasitic worms from the Lemur, of which there were no less than forty-four specimens in the bottle, proved to be new to science. These had been removed from the small intestine. In the condition in which I received them they were each thrice or four times coiled upon themselves, reminding one of the appearance so often seen in the encapsuled nematodes of fishes. After my original brief examinations, I put all the worms aside for future study; and it was not until the 16th of April, 1873, that I found the necessary leisure to work out the general structure of these elegant little parasites. Their minute size rendered them eminently favourable for microscopic examination; and in this way I obtained evidence of the existence of several peculiarities that I had not hitherto encountered amongst the nematodes. The following characters will form a ready means of identification:—Head well marked and furnished with a transversely striated bilateral membrane which projects beyond and contributes to the formation of the mouth; oral aperture simple and continuous with a long and moderately narrow œsophagus; body decidedly attenuated in front and almost uniformly thickened behind, its surface being marked by 12 or 14 conspicuous lines, forming in profile slightly raised parallel ridges extending from one end to the other; tail of the female suddenly narrowed to a conical point, the arms being placed within a very short distance of its extremity; tail of the male furnished with a large circular and apparently undivided hood, supported by ten rays; spicule solitary and rather long. Males only  $\frac{1}{5}$ , and females only  $\frac{1}{4}$  of an inch in length.

In addition to the above diagnosis I may add that I have named the species *hemicolor*, from the circumstance that the anterior half of the body in nearly all the specimens was a shade darker in colour than the posterior half. I have illustrated the structure of the worm by five figures. One of these affords a general view of the male parasite naturally coiled upon itself (Plate XXI. fig. 5). The longitu-

dinal lines are not represented here ; but they are separately shown in figure 6, where the quarter-inch glass also brought into view numerous transverse striæ between the ridges. Alterations of the focus, however, served to show that the transverse lines were continuous and not interrupted by the longitudinal lines. I am under the impression that these lines are due to the presence of water-vascular canals, but could not demonstrate the existence of a lumen with certainty. Another illustration shows part of the bursa highly magnified (fig. 7). The tubular character of the rays, with their finely granular contents, was well seen, the bursal membrane being itself marked by a series of perfectly distinct striæ radiating from the base to the outspread margin, the latter being distinctly bordered by a thin extension of the cuticular layer. In another drawing I have represented an enlarged view of the head of the male (fig. 8) ; and I have also given (fig. 9) a less magnified view of the tail of the female.

#### 14. SPIROPTERA MURIEI, nov. sp. (Plate XXI.)

The eleven nematodes above mentioned as being of intermediate size I have also determined to be new to science. As already stated, they were removed by Dr. Murie from the stomach and œsophagus of the Lemur (*Pithecia leucocephala*). The following characters will be sufficiently diagnostic in view of future identifications:—Head simple and unarmed, the mouth being bordered by six very slightly elevated papillæ; body uniform in thickness, but suddenly narrowed at either end, both sexes presenting a conspicuous gland opening at the ventral surface, about  $\frac{1}{20}$  of an inch below the oral margin ; tail of the male strongly curved, sharply pointed, and furnished with broad lateral folds, each about  $\frac{1}{16}$ " in length ; spicules two, scimitar-shaped, remarkably stout and short, the larger measuring not more than  $\frac{1}{30}$ " lengthways ; tail of the female comparatively blunt, the anus being placed about  $\frac{1}{24}$ " from the tip. Males up to  $1\frac{1}{4}$ " ; females  $1\frac{1}{2}$ " to 2" long.

The accompanying Plate (figs. 11–13) supplies three illustrations of this worm, showing all the more essential characters above described, and likewise, in addition, the presence of a supplementary caudal appendage in the male, besides several stalked gland-ducts connected with the lateral membranes.

#### 15. ASCARIS ANDERSONI, nov. sp. (Plate XXI.)

On the 27th of September, 1875, I received a small parcel containing entozoa from Dr. John Anderson ; and I was informed by letter that all the parasites had been obtained by the donor from hosts occupying the north-eastern province of India.

In the series in question there were six examples of a small nematode removed from the cæcum of a squirrel (*Sciurus* —?). Two of the specimens were males, four being females. Believing them to represent a new species, I append the following diagnostic characters:—Head simple, unarmed ; body finely drawn out in front and sharply pointed behind in both sexes ; tail of the male furnished with a minute oval-shaped spine at the tip, also with two long arcuate spi-

cules slightly winged at the extremity; tail of the female with the terminal spine continuous and scarcely distinct. Males measuring up to  $\frac{1}{2}$ " in length; females to  $\frac{3}{4}$ " long, with a thickness of  $\frac{1}{25}$ " at the widest part.

I have given two illustrations representing the tails of either sex (figs. 14 and 15). The profile view shows but one spiculum, the other being concealed by its side. I could not find the situation of the reproductive opening in the female. The uterine branches were filled with nearly spherical ova, measuring from  $\frac{1}{500}$ " to  $\frac{1}{100}$ " from pole to pole. The more advanced in development contained coiled embryos.

#### 16. ASCARIS SIMPLEX, Rud.

Dr. John Anderson's small but interesting collection of parasites also showed four characteristic specimens of this species. They had been obtained by the donor from the intestines of the Dolphin of the Ganges (*Platanista gangetica*). Singular to say, all the examples were of the female sex, the two largest measuring about  $1\frac{3}{5}$ " from head to tail. The smaller worms did not either of them exceed one inch in length. In connexion with these specimens, all of which were carefully examined by me on the 28th of last September, I have only to add that they presented the peculiarly flexed state of the chylous intestine or stomach as described by Dujardin. As that distinguished helminthologist had already accurately surmised, the *Ascaris delphini* of Rudolphi must clearly be regarded as identical with this species.

#### 17. ASCARIS LEPTURA, Rud.

In addition to the above-described species, Dr. Anderson's collection also shows three specimens of a small nematode taken from the intestine and cloaca of a tortoise (*Testudo elongata*). Two of them are of the male sex, measuring a trifle over half an inch, the female being nearly three quarters of an inch long.

#### 18. OXYURIS OBESA, Diesing. (Plate XXI.)

In the collection of entozoa which I received from Mr. Charles Darwin, F.R.S., in the month of August, 1862, there were five specimens of this nematode. Unfortunately Mr. Darwin's MS. has been mislaid. I have little doubt, however, that these parasites were obtained from the intestinal canal of a Capybara in the year 1832. All the worms were females, their heads displaying six very conspicuous papillæ, three of which I have represented in profile in the accompanying Plate (fig. 16). The point of the tail varied so considerably in form that I have added representations of it from two specimens. The extremity was in all cases marked by the presence of a small conical transparent process, the centre of which showed a distinct cavity containing fine granules (figs. 17 and 18). The eggs have a long, oval, almost elliptical form, some of them exhibiting a finely sculptured external envelope. Three membranes were distinctly visible (fig. 19). Some of them showed a distinct separation of the

yelk-contents into two masses, the smaller division being finely granular, whilst the larger mass was formed of moderate-sized corpuscles like those usually seen in the so-called mulberry-cleavage stage.

#### 19. *STRONGYLUS TUBÆFORMIS*, Zeder. (Plate XXI.)

In the small collection of parasites presented to me many years ago by Mr. Caleb B. Rose, F.R.C.S., I only recently noticed a little nematoid which is clearly referable to this species. It was entangled amongst a number of characteristic examples of *Ascaris mystax* of the Cat, and had consequently been overlooked. Being a solitary male specimen (since added to the special series of Entozoa contained in the Museum of the Royal Veterinary College), I did not make a very full examination of the worm; but on referring to my notes made on the 3rd of December last, I find that I have remarked upon the great size of the bursa, the rays of which were very conspicuous. I did not uncoil the specimen (represented in the accompanying Plate exactly as it appeared under Ross's  $\frac{1}{2}$ " objective), for fear of injuring it; but I judged the length to be about  $\frac{5}{8}$  of an inch. As it is the only specimen that has come under my notice, I have figured it (fig. 20).

#### EXPLANATION OF PLATE XXI.

- Fig. 1. *Ascaris cornelyi*: head of female, magn. 20 diam.
2. The same: tail of female, magn. 24 diam.
3. The same: tail of male, magn. 25 diam.
4. The same: tail of a rather smaller male.
5. *Strongylus hemicolor*: male, magn. 30 diam.
6. The same: section of surface, magn. 150 diam.
7. The same: part of bursa, magn. 150 diam.
8. The same: head of male, magn. 150 diam.
9. The same: tail of female, magn. 30 diam.
10. The same: three eggs, magn. 150 diam.
11. *Spiroptera muriei*: head of male, magn. 30 diam.
12. The same: tail of male, magn. 30 diam.
13. The same: tail of female, magn. 30 diam.
14. *Ascaris andersoni*: tail of male, magn. 25 diam.
15. The same: tail of female, magn. 25 diam.
16. *Oxyuris obesa*: head of female, magn. 23 diam.
17. The same: tail of female, magn. 24 diam.
18. The same: tail of another female.
19. The same: egg, magn. 122 diam.
20. *Strongylus tubæformis*: male, magn. 23 diam.

#### 4. Supplementary Notes on *Cervus mesopotamicus*.

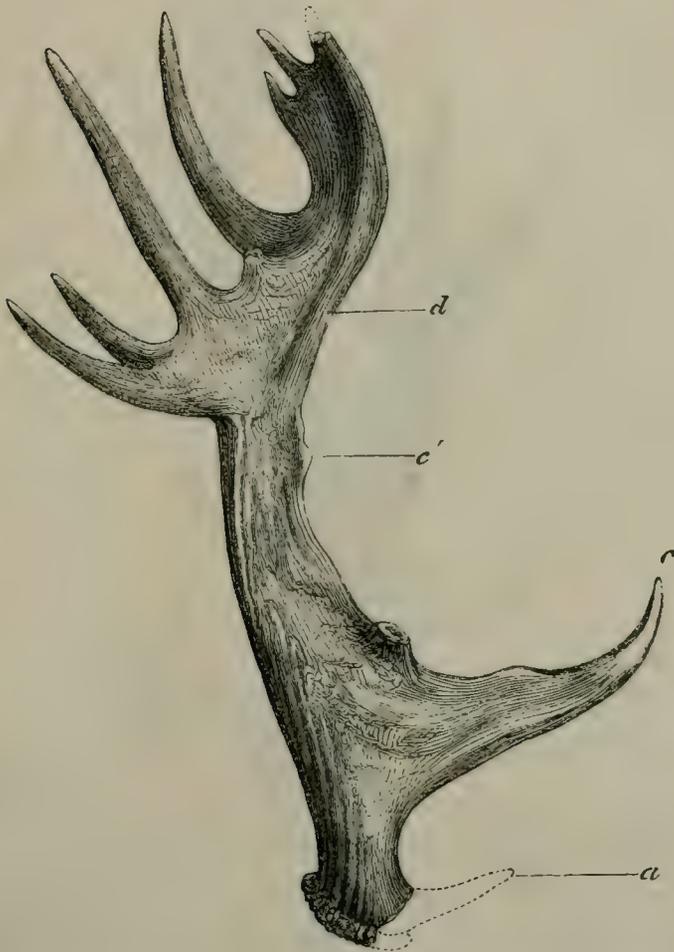
By SIR VICTOR BROOKE, Bart., F.Z.S.

[Received January 19, 1876.]

Having lately received from my indefatigable correspondent Mr. Robertson, H.B.M. Vice-Consul at Busrah, several fresh specimens of the horns of *Cervus mesopotamicus* (vide P. Z. S. 1875, p. 261, pl. 38), I hasten to lay before the Society some additional observations which these specimens have enabled me to make upon this interesting species.

The accompanying drawings, lettered according to the figures given in my original notice of the species (*l. c.* pp. 263 & 264, figs. 2 & 3) represent the left horns of four individuals; and all, with the exception of the largest (fig. 1), have been taken from the animals

Fig. 1.



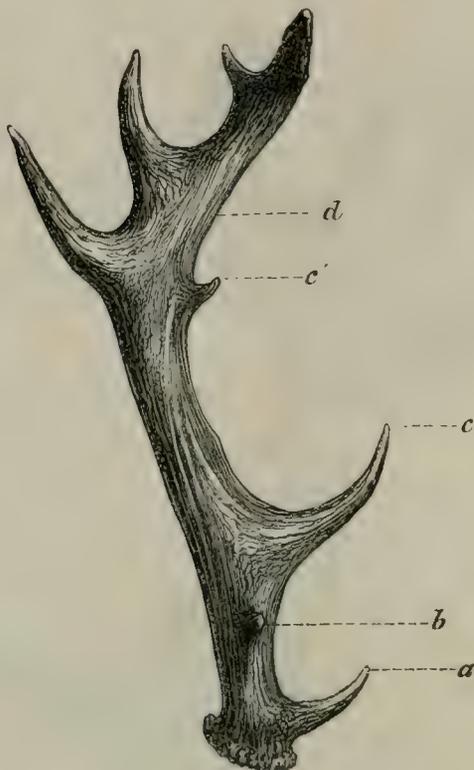
Left antler of *Cervus mesopotamicus* (remarkably largely developed).

after death. As compared with the single horn of the adult male (*l. c.* p. 264, fig. 3.) which formed the basis of my description of the fully grown horns of the species, the horns at present under consideration offer no very essential points of contrast, the characters presented by the new specimens in no way tending to render the anomalous form of horn described by me as characteristic of the species, less decided. There are, however, certain not entirely unimportant details in which the new specimens (consisting of single horns of six distinct males, in-

clusive of those figured) agree together, while they differ from the specimen first received; a slight modification of my original diagnosis appears to me to be therefore necessary.

With one exception (fig. 2), in none of the horns lately sent by Mr. Robertson is the inner tine *b* (*l. c.* p. 264, fig. 3 *b*) developed, from which I am led to believe that this tine is of uncertain occur-

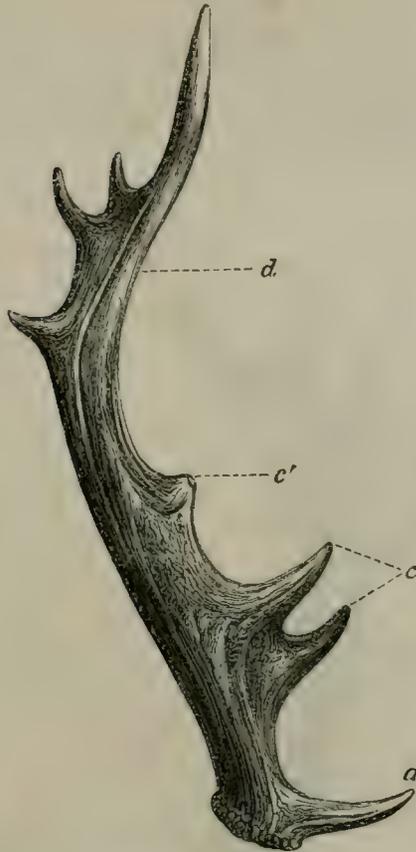
Fig. 2.



Left horn of *Cervus mesopotamicus* (about four years of age).

rence, and does not by any means constitute a fundamental specific character. Again, with but one exception (fig. 3 *c*), in none of the new specimens is the upper of the two tines (*l. c.* p. 264, fig. 3, *c*) which projects from the anterior aspect of the palmated portion of the horn any thing more than a mere rudiment; in some it is entirely absent. Instead of being subcylindrical, as was the case with the beam of the old type specimen, the beams of all the new specimens are very decidedly compressed anteriorly, forming, in the more adult, a sharp ridge from which are, not unfrequently, developed blunt rudimentary tines (*c'*, figs. 1, 2, 3, 4). In the finest horn sent by Mr. Robertson the upper third of the beam is furnished with eight strong tines, some of which are upwards of 7" in length (fig. 1 *d*); and even in the horns belonging to younger animals (figs. 2 & 3) these coronal tines

Fig. 3.

Left horn of *Cervus mesopotamicus* (about four years of age).

appear to be generally more numerous than was indicated by the old specimens.

These facts considered, the following diagnosis of the specific characters of the horns of *Cervus mesopotamicus* will, I think, be found more perfect than that given in my first notice of the species.

#### CERVUS MESOPOTAMICUS.

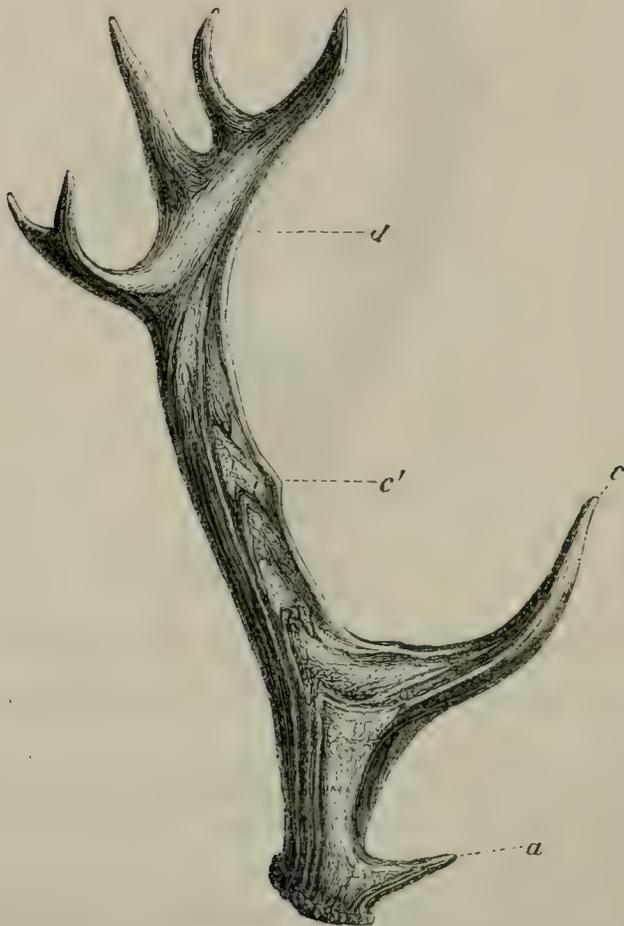
*Horns, adult male.*—Each horn supported on a short pedicle, its base surrounded by a massive well-developed burr, immediately above which a short straight brow-antler projects forwards and slightly upwards (*a*, figs. 1-4).

Expanding gradually from the burr, a more or less distinct fan-shaped palm is formed, from the anterior aspect of which are given off one or two laterally compressed, powerful tines (*c*, figs. 1-4, & *l. c.* figs. 2 & 3).

Above the palm the horn is contracted into a short beam rounded posteriorly, but with its anterior surface laterally compressed into a sharp ridge, from which blunt rudimentary tines are occasionally de-

veloped (*c'*, figs. 1-4). From the posterior surface of the upper third of the beam arises a row of long subcylindrical tines, from 3 to 8 in number, the bases of which, in very strongly developed specimens (fig. 1), are united so as to form a second palmature. The lower three fourths of the beam are bent in a decided curve outwards and slightly downwards, the upper fourth abruptly inwards and upwards.

Fig. 4.

Left horn of *Cervus mesopotamicus* (adult and of typical form).

From the following extract of a letter which I received from Mr. Robertson a short time since, it will be seen that I have been somewhat unfortunate in the name chosen for this species; as, however, the name *C. mesopotamicus* has been published, I believe I shall be taking the course least conducive to future confusion in adhering to it: Mr. Robertson writes:—

“I am very glad to see by your letter received some days ago, that the horns have enabled you to decide about the spotted deer. I fear,

however, that I did not clearly explain that this deer is met with in no part of Arabia, except in the jungles bordering the river Karoon and its tributary the Diz, both of which issue from the hitherto unexplored Luristan Hills. It does not exist in Mesopotamia or anywhere near the Euphrates; and the name *Cervus mesopotamicus* seems therefore to be a little misleading. I suspect, indeed, that this deer is really a native of the Luristan Hills, and that those I occasionally meet with on the Karoon are a few which wander down along it in the dry season. It is certain that there are more of them on the Karoon during the hot months than in winter. I have got a few horns from Luristan and some Gazelles' skulls from various parts of Arabia, which I shall send you by the first opportunity. Natives tell me the Luristan Hills abound in wild sheep and deer of various kinds. I should like much to visit them; but the inhabitants are predatory and fanatical, and if one wished, as I should, to leave the caravan-route, and explore the hills, a stronger party than I could conveniently muster would be necessary. I went twice to the Karoon last winter, but saw no deer on either occasion. Lions were plentiful, and other kinds of game consequently scarce, I hope to be more fortunate next season."

Busreh, May 30, 1875.

The table, which I here append, of some comparative cranial measurements of *Cervus mesopotamicus* and *Cervus dama*\* will, I trust, be of service in the determination of the species.

	<i>Cervus mesopotamicus.</i>		<i>Cervus dama.</i>	
	inches.	metre.	inches.	metre.
Greatest length of skull in a straight line .....	12.3	0.313	11.1	0.282
Distance from anterior rim of orbit to free extremity of the præmaxillæ .....	6.5	0.165	5.9	0.150
Distance from anterior extremity of nasals to free extremity of præmaxillæ .....	2.7	0.069	2.2	0.056
Width between the orbits.	4.6	0.117	4.1	0.104
Width of upper extremity of the nasals between the anteorbital vacuities .....	2.9	0.074	1.8	0.046
Distance from lower rim of orbit to maxillo-malar suture .....	1.15	0.028	.6	0.016
Distance from maxillo-malar suture to alveolus of posterior molar ...	.9	0.023	1.1	0.027
Extent of upper premolar series .....	1.55	0.039	1.35	0.034
Extent of upper molar series .....	2.1	0.053	1.9	0.048

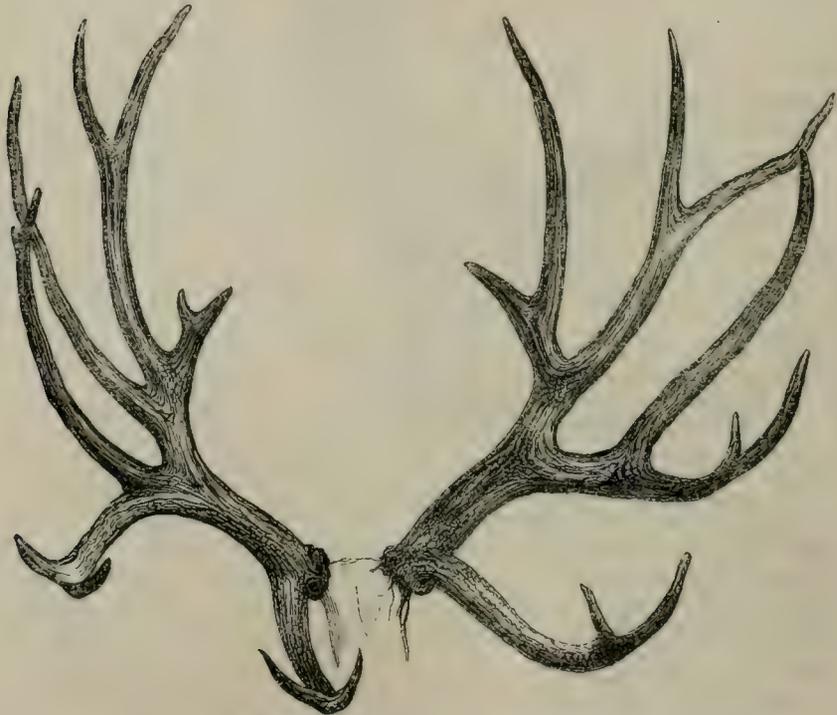
\* The measurements of *Cervus dama* are taken from an unusually large outlying Buck.

5. On *Cervus schomburgki* (Blyth).  
By Sir VICTOR BROOKE, Bart., F.Z.S.

[Received February 11, 1876.]

No fresh information of any consequence having been added to our knowledge of *Cervus schomburgki* since Mr. Blyth's original notice of the species (P. Z. S. 1863, p. 155, and 1867, p. 835), I have thought the following details and specific diagnosis, based on specimens which I recently received from Siam, and on an adult stag mounted in the gallery of the Muséum d'Histoire Naturelle at Paris, worthy of the Society's notice. For the Siamese specimens, which consist of the frontlet and horns of a remarkably fine old male, and a pair of loose horns of abnormal and very interesting growth, I am indebted to the kindness of Dr. Campbell, late resident medical officer of the British Consulate at Bangkok. Respecting the locality from which the specimens were obtained, Dr. Campbell writes, "in reply to your queries, I believe that all the specimens were procured in Northern Siam, probably even in the tributary States named Laos or Chau." The horns of the normal specimen (fig. 1), which are of very vigorous growth, possessing 20 distinct points, present all the characters described by Mr. Blyth as typical of the horns of

Fig. 1.



Normal antlers of *C. schomburgki*.

this fine species. The entire external surface of the abnormal horns (fig. 2) is covered with dense nodular exostosis, intersected by deep furrows, which adds greatly to their circumference, and gives to the extremities of the tines a blunt rounded outline. A section through the centre of one of the tines shows no line of demarcation between the external and internal portions of the horn, the same remarkable density pervading the whole; hence the very great weight of the horns, which is nearly double that of the normal pair.

Fig. 2.

Abnormal antlers of *C. schomburgki*.

There can, I think, be no doubt that this abnormal condition has been the result of injury to the testes of the deer to whom these horns belonged—many specimens, affected by a similar exostosis, which exist in my own and public collections having been the direct result of castration. Though much still remains to be ascertained by carefully conducted experiment and observation before an exact and exhaustive knowledge of the effects of injuries to the testes upon their antlers can be obtained, the three following propositions may, I think, be considered as resting upon a moderately firm basis.

(1) If a deer is perfectly castrated within the first six months of his life, no antlers are ever developed. (2) If castrated during the growth of his antlers, their growth in a natural direction is immediately arrested, and the velvet is retained during life, the horns frequently assuming very varied monstrous forms. (3) The castration of a deer with fully grown antlers free from velvet, causes the premature fall of these antlers, which are immediately replaced by a pair of antlers of normal or subnormal external outline and dimen-

sions, which remain, with their velvety periosteum, persistent during the remainder of the animal's life. The two former of these propositions I have myself verified by experiment; the third I must, for the present, take upon the authority of former experimenters\*, and upon the assurance of Mr. Sawyer, Head Keeper of the Royal Park at Richmond, who, some years ago, informed me that he had very frequently tried this experiment for himself and invariably with the same result.

From the almost perfectly normal outline and dimensions of these abnormal horns of *Cervus schomburgki* it is, I think, evident that they are referable to a deer castrated whilst in "hard horn." Their exostosed superficial surface, in which their abnormality consists, is accounted for by the supposition that the velvety periosteum being in full connexion (as it was possibly for some years) with the circulatory system, continued to perform, probably in a sluggish and irregular manner, its proper physiological function, the deposit of osseous matter, thus giving rise to a slowly increasing exostosis, in which the external arterial and venal canals became more and more deeply imbedded. At the same time the great density and weight of the horns seems to indicate that this external deposit of osseous matter was accompanied by an internal deposit which gradually obliterated the cancellous tissue of the centre of the horn.

The form of horns described as characteristic of *Cervus schomburgki* in the following diagnosis is based on the examination of numerous specimens, including the types; the external coloration and body-measurements upon the adult male specimen preserved in the Muséum d'Histoire Naturelle at Paris. This specimen was sent by M. Bocourt from Siam in 1868, and is that mentioned by Mr. Blyth (P. Z. S. 1867, p. 835), and later by Mr. Sclater (Trans. Z. S. vol. vii. p. 349).

The comparative measurements of *Cervus schomburgki*, *Cervus duvaucelli* (Cuv.), and *Cervus eldi* (auct. anon.) are taken from the frontlet and horns of the adult male *Cervus schomburgki* (fig. 1) above mentioned and from very fine skulls of *Cervus duvaucelli* and *Cervus eldi* in my own collection.

#### CERVUS SCHOMBURGKI (Blyth).

*Adult male*.—Antlers with very long powerful brow-antlers, which are frequently forked; beam very short, and more or less laterally compressed, upper part of the antlers strictly dichotomous, each of the main branches about equally developed, and in itself dichotomous, and furnished with long cylindrical tines. External surface of the antlers smooth and polished. Hair in winter rather long and coarse. General colour uniform brown, darkest on the nose and upper surface of the tail, and lightest on the cheeks and lower parts of the sides and haunches. Lower lip, belly, and under surface of the tail whitish. Upper lip, occiput, and limbs with a decided tinge

\* See a curious old work to which Prof. Rolleston has lately called my attention, entitled 'The Economy of Nature in Acute and Chronical Diseases of the Glands,' by Dr. Richard Russell (pp. 21-24).

of rufous. The hair on the front of the metacarpal cannon bones is lengthened into an everted mane about 2 inches in length.

*Immature male*.—Antlers with the posterior of the two main branches less developed than the anterior branch.

*Female*. Unknown.

*Hab.* Northern parts of Siam.

	<i>Cervus schomburgki.</i>	<i>Cervus duvaucelli.</i>	<i>Cervus eldi.</i>
	inches.	inches.	inches.
Height at shoulder .....	41	43	32
Length of ear .....	6·5	7	
Width of ear .....	3·8	3·5	
Length of tail, exclusive of hair	4	5	
Length of beam from burr to fork .....	8	17	
Length of longest tine on an- terior branch of fork .....	16	13	
Length of longest tine on pos- terior branch of fork .....	17	11·5	
Greatest span of coronal tines..	22·2	18	
Length of brow-antlers .....	17·5	14·7	10
Total length of skull .....		15·4	13
From free extremity of præmax- illæ to tip of nasals .....		3·3	2·6
From ditto to anterior rim of orbit .....		8·2	6·9
Extent of upper premolars .....		1·9	1·35
Extent of upper molars .....		2·6	1·85
Extent of lower premolars .....		1·8	1·3
Extent of lower molars .....		2·9	2·15

March 21, 1876.

Dr. E. Hamilton, V.P., in the Chair.

Mr. Sclater exhibited a series of skins of the Parrots of the Fiji Islands, obtained by Mr. E. L. Layard, F.Z.S., and belonging to Lord Walden's Collection. Mr. Sclater called special attention to a new species of the genus *Pyrrhulopsis* of Reichenbach, from the island of Taviuni, which Mr. Layard proposed to call *taviunensis*, represented by several specimens. This species had nearly the same purplish red colour as *P. tabuensis* (sive *atrigrularis*, Peale), of which a fine specimen was living in the Society's Gardens—but was readily distinguishable by the total absence of the blue nuchal collar. Referring to his former remarks on this subject (*P. Z. S.* 1864, p. 158), Mr. Sclater pointed out that the special habitat of four species of this group of Parrots had now been ascertained, and showed them on a chart of the Fiji group. These were:—

1. *P. ATRIGULARIS* (Peale): Ngau Island (*Rayner*).

2. *P. TAVIUNENSIS*, Layard : Taviuni (*Layard*).
3. *P. SPLENDENS* (Peale) : Kandavu and Viti Levu (*Layard*).
4. *P. PERSONATA* (G. R. Gray) : Kandavu (*Layard*).

It seemed now quite certain, from the researches of Dr. E. Gräffe (*cf.* J. f. O. 1870, p. 416), that the true *P. tabuensis* was found in the Tonga group, not, indeed, on the island of Tongatabu, but on the adjoining island of Eua or Eoua of that group. Mr. Selater was therefore not yet quite convinced, in spite of what Messrs. Finsch and Hartlaub had stated (J. f. Orn. 1870, p. 123), that Peale's *P. atrigularis* (which he had identified, P. Z. S. 1864, p. 158, as applicable to Mr. Rayner's specimen from Ngau Island, Feejees) was certainly = *P. tabuensis*, unless, indeed, it should turn out that *P. tabuensis* had been introduced by the natives of the Tonga Islands from the Feejee group\*.

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The following papers were read :—

1. Descriptions of Lepidoptera from the Collection of Lieut. Howland Roberts. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received February 21, 1876.]

(Plate XXII.)

The first two species here described were lent to me by Lieut. Roberts soon after his arrival in England ; but press of work has prevented me from determining their affinities until now.

#### FAMILY ERYCINIDÆ.

##### STIBOGES, n. gen.

Allied to *Abisara*, aspect of *Nymphidium*.

Wings with rounded outer margin broad, costal nervure of primaries terminating abruptly at about the middle of the costa, opposite to the end of the discoidal cell, subcostal with five branches, the last two forking to apex ; upper radial emitted from the inferior margin of the subcostal near its origin ; lower radial nearly equally dividing the discocellulars, which are concave ; second and third median branches emitted near together ; precostal of secondaries short, oblique, directed backwards ; costal nervure short, straight, oblique, terminating at basal third of costa ; subcostal forking beyond the

\* Mr. Salvin kindly sends me an extract from the "Voyage in search of La Perouse" (translated from the French, 2 vols. 8vo, 1800) in illustration of this point. "On the morning of the 26th March we landed (on Tongataboo). . . . They (the natives) sold us several birds; among others a charming species of Lory, which they assured us had been brought them from Fidji."—*Tom. cit.* ii. p. 105.—P. L. S.



1.



2.



3.



4.



5.



end of cell, the upper fork running close to the margin from the second third of costa; radial emitted close to the subcostal, reducing the upper discocellular to a point; lower discocellular long, oblique, nearly straight; second and third median branches emitted nearer together than the first and second; body slender; eyes prominent; antennæ slender, submoniliform; palpi very small. Type *Stiboges nymphidia*, n. sp.

1. *STIBOGES NYMPHIDIA*, n. sp. (Plate XXII. fig. 1.)

Wings semitransparent, snow-white; primaries with broad costal and external dark-brown borders, sinuated internally; two irregular submarginal series of unequal white spots; secondaries with a broad outer border, undulated internally; a sinuated disco-submarginal lunulated pale brown line; a submarginal series of elongated white spots; body dark brown; wings below as above; legs, palpi, and venter white. Expanse of wings 1 inch 9 lines.

Pinang (*Roberts*).

Family ÆGERIIDÆ.

Genus *SURA*.

2. *SURA CHALYBEA*, n. sp. (Plate XXII. fig. 4.)

Wings bright metallic steel-blue, becoming purple towards the outer margin; body purplish black; legs and anal tufts black-brown; antennæ black-brown. Expanse of wings 1 inch 9 lines.

Singapore (*Roberts*).

Family SPHINGIDÆ.

Subfamily MACROGLOSSINÆ.

Genus *MACROGLOSSA*.

3. *MACROGLOSSA OBSCURICEPS*, n. sp. (Plate XXII. fig. 5.)

Wings purplish black, primaries crossed near the middle by a broad ill-defined regular greyish band, bounded on each side by two velvety-black parallel lines; two scarcely visible waved discal lines; secondaries with the costal area creamy-ochreous; interno-median area crossed obliquely by a streak of dull ochreous hairs; body above ferruginous; head and antennæ dull black; segments of abdomen with lateral anterior piceous spots, the second and third segments with posterior lateral ochreous spots, the fourth to sixth segments with lateral white-tipped tufts; fifth segment blackish, especially at the sides; anal tuft black, tipped with ferruginous; wings below ferruginous, outer borders blackish, base ochraceous; a central transverse dark brown line; abdominal area of secondaries ochreous; palpi white; pectus sordid whitish, brownish at the sides; venter ferruginous, with central triangular testaceous patches; tufts as above. Expanse of wings 2 inches 3 lines.

Ayerpanas, Malacca (*Roberts*).

This is one of the best-marked of the species of *Macroglossa*.

Genus *LOPHURA*.4. *LOPHURA MINIMA*, n. sp. (Plate XXII. fig. 2.)

Primaries above grey, apical area broadly purplish brown, crossed by a dark brown discal line, and bounded internally by a triangular subcostal blackish spot; base brownish; two black spots on inner margin; secondaries tawny, with broad ferruginous external border; head and thorax grey, abdomen rosy greyish, dorsal region dark; wings below dull tawny, powdered, especially towards the outer margins, with grey; secondaries with a black-edged white dot at end of cell; anal angle, and two parallel central transverse lines, ferruginous; body below rosy greyish, back of pectus whitish. Expanse of wings 1 inch 1 line.

Ayerpanas, Malacca (*Roberts*).

## Subfamily SMERINTHINÆ.

Genus *MIMAS*.5. *MIMAS TERRANEA*, n. sp. (Plate XXII. fig. 3.)

Primaries greyish clay-brown, crossed by two central diffused reddish bands; a dull black dot at end of cell; several dark grey discal spots towards apex; secondaries dark brick-red; body greyish clay-brown; antennæ and lateral tufts on metathorax reddish; wings below rosy greyish; primaries with the discoidal cell and interno-median area ferruginous; a straight transverse discal brown line from costa to inner margin: secondaries with an elongated cuneiform ferruginous abdominal streak; two central parallel brown lines; fringe yellowish; body rosy greyish. Expanse of wings 3 inches 2 lines.

Ayerpanas, Malacca (*Roberts*).

A very well marked and distinct species.

2. Corrections of and Additions to "Raptorial Birds of North-western India."—Part II.\* By ANDREW ANDERSON, F.Z.S. &c.

[Received February 22, 1876.]

(Plate XXIII.)

Another collecting-season enables me to add the following novelties and additional information on the subject of my last paper, thus bringing up the number of Raptorial Birds occurring in the plains of the North-western Provinces to no less than fifty-two species.

Additions to former lists are indicated by an asterisk.

2. *VULTUR CALVUS*, Scop.

In allusion to my having found *Gyps bengalensis* resting on palm-trees, I have now to mention that on the 28th January last I saw a pair of King Vultures building on a solitary tar-tree (*Borassus fla-*

\* For Part I. see P. Z. S. 1875, page 16.



$\frac{1}{5}$

M. S. Hanhart imp

FALCO BABYLONICUS



*belliformis*). One bird invariably remained in the nest, sorting the materials as they were brought by its mate.

\*12. *FALCO BABYLONICUS*, Gurney. (Plate XXIII.)

This was *the* prize of the season; and I believe the present example is the finest extant, both as regards maturity and beauty. I shot this specimen in the Etawah district, on the 27th November, while seated on the top of a low babool tree. It allowed me to ride sufficiently close up to it to enable me to distinguish its rufous head and the warm reddish hue of the underparts, which are *the* tests of the fully matured *Falco babylonicus*. At first it occurred to me that it was only a *Lithofalco chicquera*; but its superior size soon dispelled my doubts; and a minute later, as the lovely bird hung by its claws head downwards, bleeding profusely through the mouth, I saw that it was a fine example of the present species.

The specimen now before me (a male) appears to be in *full* *maturity* dress. Carefully measured in the flesh, the following are the results:—Length 14·7; wing 10·7; tail from vent 6·0; tarsus 1·6; bill straight (including cere) 1·0, along the curve (as above) 1·1, width at gape 1·1; greatest expanse of foot—length 4·0, breadth 3·6, centre toe and claw 2·5; weight 1 lb. 6 oz.; the wings fall short of the tail by 1·1.

The cere, gape, and orbital space were *bright* yellow; the bill was pale blue, darkening gradually towards the tip, which was blue-black; the irides were dark brown; and the claws were horny black.

The crop contained the remains of a Lark or Pipit. The Falcon was in full enjoyment of repose after having made a good meal, and was quite unconscious of any approaching danger: I have seldom had a better opportunity of examining a bird of the kind at such close quarters before.

The figure in 'The Ibis' for 1861, p. 217, does not represent a fully adult bird. It will be seen on comparing that figure with the plate now given that the following characters are the indications of *full maturity*:—first, the *pale* blue or grey mantle, every feather being broadly edged and tipped with rufous; second, the very rufous head, the moustachial stripe being also shaded off with the same colour; third, the warm reddish tint of the underparts, which, *from the throat to the vent are wholly devoid of any markings at all*, there being only a *few* light-blue or lavender dots on the *lower flanks and tibial plumes*.

I cannot understand Mr. Hume's 16-inch *male*†; his measurements surely refer to a female; if he were correct, *Falco babylonicus* would be fully as large as *Falco peregrinus* (my males of the latter average under 16 inches!), whereas it is in reality a smaller species.

27 *bis*. *AQUILA BIFASCIATA*, Gray and Hardw.

That *Aquila orientalis*, Cab., has hitherto (erroneously though) been held to be distinct from *Aquila bifasciata*, Gray and Hardw., by continental naturalists admits no longer of any doubt. I have just

† Cf. 'Rough Notes,' part i. p. 80.

received a typical "*bifasciata*" in evidently nestling or first plumage from Dr. Crowfoot, labelled "*orientalis*, juv., Sarepta, August," of which the following is a description:—General colour of upper parts a rich hair-brown; the lower surface is a little lighter in tone; some of the feathers of the nape of the neck (as in the nestling of *A. hastata*) are tipped with fulvous; *the lower row of median coverts, the greater wing-coverts, and ends of the secondaries and tertials are very broadly ended with salmon-colour or reddish buff, forming three distinct wing-bars when the wing is closed*; some of the median coverts nearest the tertials have the buff spot at the end of the feather of a long or isosceles-triangular shape, the point of the spot being of course towards the base of the feather; most of the lower-back feathers are broadly edged with buff, and the lowest ones adjoining the upper tail-coverts are longitudinally marked with duller buff; one or two of these feathers have this colour almost confined to one side of the feather, with a slight spot on the other web; others have a very large oval spot of dull buff on the apical half of the feather, with a brown stripe down the middle of the feather dividing the buff; the side feathers of the lower back are much paler brown, and the broad edges of the feathers are dull white instead of buff; all the upper tail-coverts are of a beautiful buff or salmon-colour, having their edges somewhat paler; the tibial plumes are tipped with dull whitish; the lower tail-coverts are first dull white streaked with brown, and those beyond them nearest the tail are dull unspotted buff; along the ridge of the wing towards bases of primaries there are some whitish spots, and the primary-coverts are broadly ended with salmon-colour, like the greater coverts; lining of wing brown near bend; lower down the feathers are tipped with white, and those nearest the primaries are largely patched with buff, the lowest feathers of all being white with some grey patches; axillary plumes brown, with white tips; primaries black; secondaries not so black; tertials a dark brown, save the light tips of the two latter; the inner primaries towards their bases are slightly mottled on their inner webs with grey, and the secondaries and tertials increasingly so, taking the form of distinct bars on the two latter; tail dark brown, barred with grey, all the feathers being broadly ended with reddish buff; the cere and feet appear to have been greenish yellow; the outer primaries are not fully grown; and as the specimen was procured in August, it is in all probability not more than three months old; length of wings 19·75, tail 10·25, tarsus 3·6, bill from gape 2·8; the nostrils are long ones, placed *obliquely, as is characteristic of A. bifasciata*.

This specimen, probably a female, is not full-grown, as the outermost primaries are only partially developed; and it is evidently in nestling plumage, as indicated by its uniform rich, soft, silky, dark brown plumage; the wing-bands as well as upper tail-coverts (these would have become gradually white from exposure to the influence of the sun) are of a *rich fulvous or salmon-colour*. *I have frequently killed this Eagle in a similar stage of plumage\**; but the wing-bands

\* Cf. P. Z. S. 1872, p. 621.

and upper tail-coverts of the vast majority of them by the time they arrive in this country *get bleached to a dirty white, leaving only traces of the salmon-colour above referred to.*

In the present example the underparts are of a *uniform* dark brown colour; *i. e.* there is no indication of the stone-coloured blotches I have before referred to †; but this, I think, is due to individual variation, and I attach no importance whatsoever to the absence of this peculiarity in a solitary specimen.

It will thus be seen that Dresser's larger figure ('Birds of Europe,' part xxxiii.) represents a bird in *nestling plumage, after the buff bands have faded considerably.* How long it remains in this *bifasciated* plumage can only be ascertained by keeping one in captivity; but it is as well to repeat ‡ that the assumption of the fully adult dress is attained by the gradual disappearance of the wing-bands (these at first are buff or salmon-coloured, and then white) and the markings on the under surface (when present), after which it presents a *uniform brown throughout*, with the addition (in the course of time) of a fulvous nuchal patch, which is *the sign* of a fully matured bird. The growth, however, of this patch is far from regular, and few specimens are procured having it fully developed; at times it is confined to the top of the head, at others to the nape of the neck in a crescentic or half-moon shape.

#### 27. AQUILA MOGILNIK, G. Gmel.

Having now seen the nestling of *A. bifasciata* and *A. hastata*, I feel confident, for analogous reasons, that the Aden-killed *A. mogilnik* in the lined stage § was also in nestling or first plumage. This specimen was of a much richer tone throughout than the birds usually procured in this country, the fact being that the sun had not as yet affected the original tint of its plumage.

#### \*40. PANDION HALIAËTUS, Linn.

I lost a wounded Osprey on the 24th November last at a *jheel* in this district, which caused me not a little regret, the more so as I toiled after the bird up to my knees in water, first for some four hours in the morning, and again in the afternoon. It was very wild, keeping to the middle of a large open piece of water, and invariably settling on a decayed stump of a babool tree, where there was no approach of any sort. The place swarmed with larger Eagles, of sorts which never allowed the stranger to have a moment's rest, and were continually depriving it of its well-earned prey.

Mr. Cockburn, Curator of the Allahabad Museum, has lately given me a fine mature female which he shot in that district, where, he says, it is far from uncommon. In the well-watered parts of Northern Oudh and Eastern Bengal it is much more common; but the majority of the *jheels* in the Doab are too shallow as well as too weedy to attract this purely fish-eating Eagle.

† Cf. P. Z. S. 1875, p. 21.

‡ Cf. P. Z. S. 1872, p. 622.

§ Cf. P. Z. S. 1875, p. 21.

51. *CIRCUS SWAINSONII*, Smith.

A young male of this species which I shot on the 25th October last, close to Futteghurh, is very interesting, as it illustrates the manner in which the light grey plumage of the adult male is gradually assumed. The rufous head and rust-coloured markings on the underparts of this specimen, which was sexed by myself, indicate that the juvenile dress of the young male resembles in some degree that of the female. I have recently had an opportunity of examining another young male, belonging to Mr. Brooks, which is in a still further advanced stage, having only the *forehead* rufous.

The irides of the Futteghurh-killed bird were bright yellow, as in fully adult specimens; the legs and feet were light yellow; the bill and claws were black; and the cere was greenish yellow.

\*52. *CIRCUS CINERACEUS*, Montagu.

Jerdon's statement † "equally abundant with the last . . ." and, again, "I have found it in every part of India" requires modification as regards the deltaic portion of the North-western Provinces, an area comprising several thousand square miles. In this part of the country, although *C. swainsonii* is extremely common everywhere, *C. cineraceus* can only be considered in the light of an occasional straggler; and as the capture I am about to record throws some light on the geographical range, plumage, and food of this species, it is of interest in more ways than one.

Returning to my camp late in the evening of the 12th March, through an extensive tract of stiff dry grass from two to three feet high, I suddenly disturbed a large gathering of Harriers that had evidently settled on the reed beds for the night. There could not have been less than forty birds, inclusive of a few short-eared Owls that were *closely packed* in that one spot. As they circled overhead I recognized *Circus æruginosus* in all shades and colours; there was also a fair sprinkling of *C. swainsonii*, male and female. Being at the time on the *qui vive* for strangely coloured Harriers, I singled out and brought down what appeared to me on the wing to be a bird that could hardly be referred to the latter species. It fell from a good height on to the edge of a dry pond, rupturing its crop, which was very much distended and literally crammed with the callow young and eggs of *Galerida cristata* and *Pyrrhulauda grisea*, the majority of these dainty morsels having been swallowed entire.

The specimen underwent a critical examination by candlelight; and great was my delight when, instead of the common *C. swainsonii*, I found that my list could now boast of the addition of a fine adult male example of Montagu's Harrier. The plumage accords with Yarrell's description of the *adult male*—with this notable exception, however, that in my specimen the *whole of the underparts, from the chin to the under tail-coverts, are uniform with the mantle, viz. bluish grey*, dashed with longitudinal streaks of orange on the vent

† Cf. 'Birds of India,' vol. i. p. 98.

and thigh-coverts, whereas the author I have quoted (as in fact do Jerdon, Sharpe, and Hume†) gives the *breast only* as bluish grey, and the *rest of the underparts (of the adult male)* as white. Nowhere do I find the *whole of the underparts* described as *bluish grey the same as the back*; so that the present example would appear to be unique in this respect‡.

The following are its dimensions:—length 17·6, wing 14·5, tail from vent 9·4, tarsus 2·3. The irides were bright yellow; the legs and feet were dingy or pale yellow; the bill and claws were black; and the cere was greenish yellow.

But though this bird was doomed to succumb to the cause of science in a foreign country, the most melancholy event in its history is connected with its life in far more civilized climes than India; for its broken leg clearly testifies to the narrow escape it has had from falling a victim to the vengeance of some one's zealous game-preserved, most probably while acting as one of the "sanitary police of Nature." The left tarsus has the appearance of having been snapped in a trap, about the middle of the joint; the skin, which apparently had not been severed, has enabled the broken portion to reunite *sideways*; and though the fracture has healed in a most remarkable manner, the lower part of the leg hangs by the skin, which has assumed the form of a thick tegument; so that for all practical purposes, excepting perhaps for roosting, the injured leg could not have been of any use; the broken stump protrudes beyond the joint by a quarter of an inch.

The range of Montagu's Harrier in Northern India is very puzzling. In the jungle tracts of Bundelkhand (south of the Jumna) it is far from uncommon, and in parts of Oudh and Rohilkhand (north of the Ganges) it is pretty generally distributed; so that its absence in the Duab, an enormous tract of country, large areas of which are in every way suited to its habits, is very singular indeed.

#### \*53. *CIRCUS MELANOLEUCUS*, Gmel.

It is with much pleasure that I announce for the first time the advent of this unexpected addition (essentially an inhabitant of the humid country of Eastern Bengal and the Tarais generally) to the comparatively speaking arid plains of the North-western Provinces. The specimen in question fell to the shot of my friend Mr. Luard, on the 10th of February, when we were out shooting on the banks of the Ganges, near Futteghurh. When shot it had just alighted on the ground, and was in the act of eating a large green grasshopper; its crop contained orthopterons insects of various kinds.

It is an exceedingly fine male in the pied livery of the adult bird; its large, lustrous, gold-coloured eyes contrast strangely with its black and white plumage, giving it in life a most beautiful appearance. Carefully measured in the flesh it gave the following results, which,

† Cf. 'Birds of India,' vol. i. p. 97; 'Catalogue of Accipitres,' vol. i. p. 66; 'Rough Notes,' p. 303.

‡ Since the above was written I have received two male specimens of *C. cineraceus* from Europe; and in both examples the *breast only* is *bluish grey*.

for the sake of comparison with the measurements of *Circus swainsonii* and *C. cineraceus*, I annex in a tabular form :—

Species.	Length. in.	Wing. in.	Tail from vent. in.	Tarsus. in.
<i>C. swainsonii</i> ♂	17·6	13·2	8·8	2·6
<i>C. cineraceus</i> ♂	17·6	14·5	9·4	2·3
<i>C. melanoleucus</i> ♂	16·5	13·6	8·5	3·0

*Remarks.* Particular attention is drawn to the long wing and tail of *C. cineraceus*, and to the characteristic long tarsus of *C. melanoleucus*.

The irides of the present specimen were gold-coloured; the legs and feet were dingy yellow; the bill was blue-black; the claws were black; and the cere was pale yellow.

Before leaving the subject of *C. melanoleucus*, I may mention, from my own experience, that the Oudh tarai generally, as far west as the Shahjehanpore district, as well as parts of Central Oudh (wherever there are extensive grass jungles) may be added to the localities given by Hume as the *regular* range of this species\*.

#### 70. ASCALAPHIA COROMANDA, Lath.

The coloured eggs of *Poliornis teesa*, referred to in my last paper, have been wholly eclipsed by the acquisition of a pair of really well-marked eggs of the Dusky Horned Owl, which I took on the 28th of November last from an old nest of *Mycteria australis*, shooting one of the parent birds off the nest.

Mr. Hume, who has seen these eggs, and who was not a little sceptical in the matter of Owls so far forgetting themselves as to lay *spotted* eggs, writes to me as follows :—“Your eggs of *Ascalaphia coromanda* are spotted in a remarkable way. After carefully examining them I have now nothing to say contrary to what you hold; held up against the light the colour of the shell, a dull sordid yellow, is precisely that of many *white* eggs of *A. coromanda*; and under a powerful microscope the granulations appear to me to be similar to those of *A. coromanda*. Of this Owl I must still have seventy or eighty specimens by me; and I have taken eggs without number, and I do not think I ever saw a *single spot* on any one of them.”

One of these eggs was quite fresh; the other had been incubated for some ten days or so. In order to make certain that this was not a case of mistaken identity, I visited the nest several times in company with my friend Mr. Hastings before removing the eggs.

The markings consist of indistinct lilac blotches, showing through the shell, as it were, on of course a pure white ground; and they are both *profusely* though *minutely spotted*, especially at the obtuse end, with brown and lilac spots (or, rather, specks) of various shades.

In conclusion I have a few emendations to make to my last paper P. Z. S. 1875, p. 16, pl. iii.

In the first place the two figures of *A. hastata* have been wrongly numbered. No I. is the one with the *striated* breast; otherwise the plate and letterpress do not accord. Again, the explanation of

\* Cf. Hume in Journ. Asiat. Soc. 1870, and ‘Stray Feathers,’ vol. iii. p. 34.





$\frac{1}{4}$

J.Smit del. et lith.

M&N.Hanhart imp

STERCORARIUS CHILENSIS

Plate III. at the end of the article requires amendment, and should stand thus:—Fig. 1. *A. hastata*, young ♀, from a specimen obtained from the nest at Saharunpore, and killed 28th August, 1873, being the youngest of the three birds obtained on the same occasion. Fig. 2. *A. hastata* ♀, from a specimen after its first moult; killed October 21st, 1874.

The figures have been reduced to one fourth of the natural size.

*Note.*—These birds were made into specimens when in captivity; they were not shot.

### 3. On the *Stercorariinæ* or Skua Gulls.

By HOWARD SAUNDERS, F.L.S. &c.

[Received March 3, 1876.]

(Plate XXIV.)

In the following remarks upon the well-marked subfamily of the *Laridæ*, known as the *Lestridinæ*, or, more correctly as regards priority of nomenclature, as the *Stercorariinæ*, I shall pass over as briefly as possible the points which are already known to most ornithologists, and direct my observations to the synonymy and range of the members of the group, with incidental remarks upon their progressive stages of plumage. My principal predecessor in this work is Dr. Elliott Coues, who published in the 'Proceedings of the Academy of Natural Sciences of Philadelphia,' 1863, an elaborate "Review of the *Lestridinæ*," with the primary object of showing that the true "*Lestris richardsonii*" of Swainson, described in the 'Fauna Boreali-Americana,' p. 433, was a distinct species from the light-breasted form with which most naturalists had united it; but in his recently published 'Birds of the North-West' (Washington, 1874) he retracts this opinion, in accordance with the views derived from more extended experience. He still, however, adheres to his original plan of dividing the family into two subgenera, *Buphagus* of Moehring for *S. catarrhactes* and *S. antarcticus*, and *Stercorarius* for the remaining species; and he continues to employ both the generic and the specific names given by writers previous to the date of the 12th edition of Linnæus's 'Systema Naturæ' (1766), preferring to make the 10th edition the starting-point of his system of nomenclature. Argument on this subject would be futile; there is nothing to prevent any American naturalist from making his own rules; but British ornithologists have a recognized code of laws in the Rules of the British Association for 1842, drawn up and signed by the principal naturalists of that day, and generally adopted up to the present time both here and on the continent. In these it is agreed that the principle of priority ought not to be carried back beyond the 12th edition of Linnæus, a solitary exception being made in favour of those *genera* of Brisson which are *additional* to those of Linnæus's 12th edition. My excuse

for recapitulating these axioms is, that in consequence of them it is necessary to reject several names given by Brünnich in his 'Ornithologia Borealis,' 1764, which antedates our starting-point by two years—a fact of which some ornithologists, who have probably not examined the date of publication, do not seem to be aware. Under these circumstances, it is needless to discuss the subgenus *Buphagus* of Moehring (1752); nor do there appear to be any sufficient structural differences to warrant the generic separation of the Great Skuas from the other species, the Pomatorhine Skua forming such a connecting link between the heavy and the elegant forms as to preclude any consistent separation, unless Reichenbach's genus *Coprotheres* be also accepted for the Pomatorhine. For myself I prefer to retain all the known species of Skua in the same genus, viz. *Stercorarius* of Brisson (1760), the type of which is the species whose rightful name is, in my opinion, *Stercorarius crepidatus* (Gm.), but which I will for the present, to avoid any ambiguity, distinguish by the vernacular name of *Richardson's Skua*. I am, of course, aware, that this name was originally applied solely to a dark form of a well-known species; but it has since been generally adopted; and as having been applied to no other, its use precludes the possibility of a misunderstanding.

The genera are as follows:—

*Larus* (part), Linnæus, 1766. *L. catarractes*=Great Skua, *L. parasiticus*=Long-tailed or Buffon's Skua.

*Stercorarius*, Brisson, 1760. Type "Lestercoraire"=*S. crepidatus* (Richardson's Skua).

*Labbus*, Rafinesque, 1815; *Predatrix*, Vieillot, Analyse, 1816. Based on "le Labbe," of Buffon, which is *Richardson's Skua*.

*Lestris*, Illiger, Prod. 1811. "*L. parasiticus*, *L. crepidatus*, *L. catharractes*."

*Oceanus*, Koch, 1816. "*O. parasiticus*, *O. crepitatus*" (sic).

*Cataractes*, Fleming, Phil. Zool. 1822. "*Cataractes vulgaris*."

*Coprotheres*, Reichenbach, 1852. *S. pomatorhinus*.

*Megalestris*, Bonap. 1856. *S. catarrhactes*, *S. antarcticus*.

The generic name, variously spelt *Cataractes*, *Cataracta*, or *Cattarracta*, the two latter adopted by Retzius and Leach from Brünnich, had been previously applied to a subgenus of the *Uriniæ*; and under the name of *Cattarrhactes antiquus*, Prof. Marsh has described some bones found in the Tertiary deposits of N. Carolina (Am. J. Sc. 1870, p. 213). I mention this because these applications of generic names to widely different birds are very confusing, and might lead to the supposition that the fossil remains of a Skua had been discovered. Those who persist in separating the Skuas must therefore adopt *Megalestris* for the large forms, as the small pointed-tailed species are the types of all the other genera. It is certainly unfortunate that the earliest available name *Stercorarius* tends to perpetuate a popular fallacy, although one of universal distribution; but a precisely parallel case occurs in the signification of the word *Caprimulgus*, and other instances might be adduced. Illiger's generic name *Lestris*

(or robber) is undoubtedly far preferable, so far as its meaning goes, and it has been very freely adopted; but the laws of priority compel us to reject it, if we would avoid perpetuating confusion.

I have deemed it advisable on the whole to give the references to those præ-Linnæan authors upon whose descriptions those of writers subsequent to 1766 are based, marking by a line the division between them and the available nomenclature. The synonyms are given in order of date; and I have also inserted those references which appeared to me to have any real value. It is impossible to avoid some errors; but at least I have taken every precaution, and with some few exceptions, where the original works were not accessible, I have personally verified every reference.

STERCORARIUS CATARRHACTES.

*Larus fuscus*, Briss. Orn. vi. p. 165 (1760).

*Catharacta skua*, Brünn. Orn. Bor. p. 33 (1764).

*Larus catarractes*, Linn. Syst. Nat. i. p. 226 (1766), ex Brünn.

*Larus catarrhactes*, Gmelin, Syst. Nat. i. p. 603 (1788).

*Cataracta skua*, Retz. F. Suec. p. 161 (1800).

*Lestris catharractes*, Illiger, Prodr. p. 273 (1811).

*Lestris catarractes* (L.), Tem. Man. d'Orn. p. 511 (1815); Faber, Prod. Island. Orn. p. 102 (1822); Macgill. Brit. Birds, v. p. 479 (1852).

*Catarracta fusca*, Leach, S. Cat. M. & B. Brit. Mus. p. 40 (1816).

*Stercorarius catarrhactes*, Vieillot, N. Dict. H. Nat. xxxii. p. 154 (1819); Gray, Gen. Birds, iii. p. 653 (1849); Dresser, B. of Eur. pt. xli. (Sept. 1875).

*Cataractes vulgaris*, Fleming, Hist. Brit. An. p. 137 (1828); Selby, Ill. Brit. Orn. ii. p. 514 (1832).

*Lestris cataractes* et *Lestris skua*, C. L. Brehm, Vög. Deutsch. p. 715 (1831).

! *Stercorarius pomarinus*, Vieillot, Gal. Ois. p. 220, pl. 288 (1834), fig. excell. (!)

*Lestris cataractes*, Naum. Vög. Deutsch. x. p. 471, pl. 270 (1840).

*Stercorarius cataractes*, De Selys-L. Fne. Belg. p. 155 (1842).

*Megalestria catarrhactes*, Bp. Cat. Parzudaki, p. 11 (1856).

*Stercorarius catarractes*, Bp. Consp. Av. ii. p. 206 (1857); Laurence, Ann. Lyc. Nat. H. N. York, 1853, p. 7; Baird's B. N. Am. p. 838 (1860); B. Ross, Nat. Hist. Rev. 1862, p. 289; Feilden, 'Zoologist,' 1872, p. 3290.

*Buphagus skua*, Coues, Proc. Ac. Nat. Sc. Phil. 1863, p. 125, B. of N. W. Am. p. 604 (1874).

There was no particular variation observable in the plumage of sixteen specimens from the Faroe Islands, and in many others sent to me from time to time for examination; the older the bird the wider are the chestnut markings which occupy the centre of the feathers on the upper parts, and the longer and the more yellow

become the filamentous feathers of the neck. The *under wing-coverts* and the *axillaries* are always *sooty*, with, at most, but very few and ill-defined russet markings. I have examined the interesting melanism belonging to Mr. J. H. Gurney, jun., figured by Mr. Dresser in his 'Birds of Europe;' it was obtained in October, and the first primary on each wing has not yet attained its full length. From the crescentic edges to the dorsal feathers, seen on holding it to a side light, from the absence of acuminate feathers on the neck, and from the weak bill (which is much thinner than in Mr. Dresser's plate), I have little doubt of this example being a bird of the year; this impression is confirmed by the satin-like appearance of the primaries and upper parts, which is very different from any thing I have ever observed in birds whose plumage has undergone any wear.

The range of this species is the most restricted of any member of the family which breeds in the northern hemisphere. It has not been observed in Spitzbergen; and its most northern breeding-place within the Arctic circle is at the Lofoten Islands, off the coast of Norway; thence it is found nesting west and southwards to Iceland, the Faroes and the Shetland Islands. It is not recorded from the Baltic, or from the White Sea. Seeböhm and Harvie Brown did not observe it in their recent expedition to the mouth of the Petchora; nor did Middendorf find it in N. Siberia, where the other three European species breed. Von Baer's identification of this bird in Novaya Zemlya may well be doubted, as none of the many subsequent explorers have observed it there. Pallas (Z. Ros.-As. ii. p. 309) supposed that this might have been the bird recorded by Steller, as observed in 58° N. lat., on the Pacific coast, feeding on the carcass of a whale; but as it had a "yellowish bill" it was more probably a Fulmar Petrel. It has not been recorded as yet from the Pribilof Islands, the Aleutians, or Alaska; but it probably occurs along that coast, as a single specimen is described by Mr. Lawrence as having been obtained off Monterey, in California. Mr. Bernard Ross found it at the mouth of the Mackenzie river, and about Great Slave Lake, north of which it is very rare; it also appears to range throughout the Hudson's-Bay territory, and is clearly, as far as dimensions go, the "*L. keeask*" of Latham, mixed up with the Pomatorhine Skua, as shown by the description of the particoloured feet; the Esquimaux name of the latter species also happens to be "Keeask," according to Richardson, who does not mention *S. catarrhactes*. There is no authentic record of its occurrence on the Atlantic sea-board of the United States; and in South Greenland it was only twice observed by Holböll. From its breeding-stations it passes southwards in autumn along the western shores of Europe as far as the Straits of Gibraltar and N. Morocco, beyond which there is, as yet, no trace of it. As a mere straggler, of course, it has been found in Germany; and it was recorded by Mr. C. A. Wright as having been obtained at Malta (Ibis, 1864, p. 150); but the specimen has subsequently proved to be *S. pomatorhinus*. Mr. Godman does not enumerate it amongst the birds of

the Azores, Madeira, or the Canaries; but future observations may probably show a somewhat more extended range than I have been able to trace.

As a species it is nowhere abundant, and of late years its numbers in the Faroes and Shetland Islands have so seriously diminished as to render its speedy extermination there extremely probable. Although, like the rest of the family, it is essentially a "robber gull," yet it is by no means entirely parasitic; for it feeds to a great extent upon flesh, and especially upon the Kittiwake gull, of whose feathers and bones all the castings were composed which Capt. Feilden examined at the Faro Islands, whilst the stomachs of those he shot were full of flesh. This purely maritime Gull is the only one which can be plundered with impunity that is found in any great numbers in the haunts of the Great Skua; for the Herring- and Great Black-backed Gulls would not tamely yield their prey; and it is worthy of note that the winter range of *S. catarrhactes* extends no further south than that of the Kittiwake. We shall see that the heat of the tropics proves no barrier to other northern species which, from their superior swiftness of flight, require less specialized conditions for their existence.

#### STERCORARIUS ANTARCTICUS.

*Lestris catarractes*, Quoy and Gaimard, Voy. 'Uranie,' p. 137, Atlas, pl. 38 (1824) (Falkland Islands); Gould, B. of Aust. vii. pl. 21 (1848); Hutton, Ibis, 1872, p. 248 (*Chatham Islands*).

*Lestris antarcticus*, Lesson, Traité d'Orn. p. 616 (1831); ScL and Salvin, P. Z. S. 1871, p. 579 (part).

*Megalestria antarctica*, Gould, P. Z. S. 1859, p. 98.

*Lestris antarctica*, Selater, P. Z. S. 1860, p. 390; Abbott, Ibis, 1861, p. 165 (Falkland Islands).

*Lestris fuscus*, Ellman, Zoologist, 1861, p. 7472.

*Buphagus antarcticus*, Coues, Proc. Phil. Ac. 1863, p. 127; B. N.W. Am. p. 604 (1874).

*Lestris catarrhactes*, Hutton, Ibis, 1867, p. 185.

*Stercorarius antarcticus* (et *madagascarensis*?), Bp. Consp. Av. ii. p. 207 (1857); Von Pelzeln, Novara-Reise, Vögel, p. 150 (1865) (*St. Paul's I.*); Buller, B. New Zealand, p. 267 (1873).

*Stercorarius catarractes* (b), Schlegel, Mus. P.-B. p. 47 (1865); Layard, B. S. Africa, p. 366 (1867); Sharpe, Zool. 'Erebus and Terror,' i. App. p. 32 (1875).

*Buphagus skua antarcticus*, Coues, in Bull. U.S. N. M. no. 2 p. 9 (1875) (Kerguelen Island)\*.

Quite irrespective of the enormous gap which, so far as we know, at present separates the geographical range of *S. catarrhactes* from

\* Since writing the present article I have read the very interesting account of the habits of this species as observed at Kerguelen's Island by Dr. Kidder, Naturalist to the American Expedition to observe the Transit of Venus. It would appear that it avoids the water, and preys principally upon other birds; there are also other modifications of the usual habits of birds of this genus, to which space will not allow me to allude.

that of the Antarctic Skua, it seems to me that only the want of a sufficient series of both species for comparison can ever have led to their being united; for undoubtedly the distinctness of many other birds as species is unhesitatingly acknowledged on much slighter grounds. In the examination of a large series I have never met with any northern Skua with the stout deep bill with its well-marked angle at the gonys which invariably characterizes the southern bird; and if mere colour is taken into consideration, the total absence of rufous both on the underparts, the axillaries, and the under wing-coverts serves to distinguish the Antarctic Skua at a glance. But whilst perfectly distinguishable from *S. catarrhactes*, it presents three interesting variations in the course of its range, which I have been enabled to trace by the aid of a fine series in the British Museum. From Campbell's Island in 54° S., 168° E., up to Norfolk Island, in 29° S. (its most northern *known* range), past Kerguelen's Island, the Crozets, and up to the Cape of Good Hope, where Layard observed it in April, the specimens all agree in their remarkable uniformity of sooty-brown plumage, there being few, if any, striations even upon the feathers of the neck, whilst the size of some of the examples is enormous, the primaries measuring 16 and 17 inches from carpal joint to tips of primaries. The Falkland-Island Skuas, locally known as "Cape-Egmont Hens" and "Sea-Hens," are decidedly smaller, and the acuminate feathers of the neck and shoulders are distinctly streaked with yellowish white, although the general sooty appearance is preserved. But in three specimens obtained during the voyage of the 'Erebus' and 'Terror,' on the edge of the pack-ice, the upper parts are somewhat less dusky than in the Falkland-Island birds, and the tips of the feathers of the breast are tinted with yellowish, though the underparts of the feathers retain their sooty hue, whilst the acuminate feathers of the neck form a complete ring of yellow verging upon golden, and, by contrast with the darker colour of the crown, giving somewhat the appearance of a hood. In general dimensions this form is somewhat smaller than the preceding, and the bill is even more short and stout in proportion; but the general characters of resemblance are preserved throughout, the under wing-coverts and axillaries being dark smoke-coloured, whilst the lighter hue of the underparts extends no further than the tips of the feathers, and may be due to climatic influences. In their somewhat bleached appearance and the closer texture of the feathers about the base of the bill, these three birds have the appearance of permanent inhabitants of inhospitable circumpolar regions, whilst the Falkland-Island birds seem to be a connecting link between this and the larger form, whose range is principally within more temperate climates, where the conditions of existence are easier.

It is most probable that Bonaparte's *S. madagascarensis* belongs to this species, as the late Commander Spurling saw what he supposed to be a Great Skua off the Comoro Islands, and this would bring its extreme range up to about 12° S., leaving even then an interval of more than 40° of latitude between it and the most southerly known range of *S. catarrhactes*. Neither has *true S. antarcticus* been

found, so far as I am aware, on the western side of the Straits of Magellan, or on the coasts of Chili or Peru, where its place is taken by a bird which I consider fully entitled to specific rank, and which, strange to say, has all its affinities with the northern Skua, *S. catarrhactes*.

STERCORARIUS CHILENSIS (Plate XXIV.).

*Lestris antarcticus*, var. *b. chilensis*, Bp. Consp. Av. ii. p. 207 (1857); (Mus. berol. ex Am. Merid. Rostro vix brevius quam in Europæo, potius graciliore quam robustiore).

*Lestris antarctica*, Scl. & Salvin, Ibis, 1869, p. 284 (Santa Magdalena, Straits of Magellan—Cunningham).

*S. supra fuliginoso-nigricans, pileo summo fere concolori; corpore reliquo superiore maculis longitudinalibus rufescentibus versus apicem angustioribus plus minusve dilatatis variegato; collo postico albicante vix rufescente longitudinaliter striato; alis dorso concoloribus, remigum scapis albis, tectricibus alarum minimis dorso concoloribus et in eodem more rufo maculatis: primariis vix albedo, secundariis maculis magnis rufescentibus terminatis; supra-caudalibus rufo marmoratis et subterminaliter maculatis; cauda nigra, pallidius terminata; loris et plumis subocularibus fuliginosis pileo concoloribus, his rufo lavatis; genis, regione parotica, et corpore subtus toto cinnamomeo-rufis; axillaribus et tectricibus subalaribus castaneo-rufis, his et pectoris lateribus paullo fuliginoso striatis; colli lateribus dorso concoloribus; ala subtus nigricante, primariis basin versus albis; rostro nigro; pedibus nigris. Affinis S. catarrhacti, sed rostro graciliore, corpore subtus conspicue cinnamomeo-rufescente, et subalaribus et axillaribus castaneis distinguendus.*

Professor Peters, of Berlin, to whom I wrote on the subject, has courteously informed me that the type specimen in that museum has all the above characteristics. It is a slightly immature bird, and came from Chili.

Through the kindness of Mr. G. Fanshawe, F.Z.S., I have lately become possessed of four specimens of a Skua shot by his nephew, Mr. J. R. Denison, at Mejillones, on the little strip of coast which belongs to Bolivia, in lat. 23° 5' S., at the end of February or beginning of March. Three of these birds are adults; the fourth is evidently immature, as shown by the brown crescentic tips to the dorsal feathers; and the rufous of the underparts is less strongly marked than in the adults, showing that the ruddy colour increases with age. But even the young bird is ruddier than any *S. catarrhactes* I ever saw. In the museum at Cambridge is a similar immature specimen obtained by Dr. Cunningham, late of H.M.S. 'Nassau,' in the Straits of Magellan, in April; and Mr. Gervase Mathew, R.N., writes to me that he observed this chestnut-breasted bird at Valparaiso in January, and a month later at Coquimbo, when in H.M.S. 'Resolute.' More than this is not known to me at present; and in the absence of any reliable information as to its breeding-haunts it would be rash to indulge in any speculations as to whether they are to the north or to

the south of the Equator. The affinities of this well-defined form are decidedly with *S. catarrhactes*, and not with *S. antarcticus*; it is, indeed, a somewhat slighter bird than the former, and remarkable for its rich cinnamon-coloured underparts, wing-coverts and axillaries. The presence of this species on the shores of the South Pacific may be accounted for by the cool stream of water, about 300 miles wide, and known as Humboldt's current, which runs northwards from the Straits of Magellan, along the coasts of Chili and Peru. This cool band abounds in fish; and in consequence of these altered conditions we find there at least six species of Gull, some of them numerically abundant; whereas on the east coast of America there is a noticeable scarcity of Gulls within the tropics. Where Gulls are found, the stout heavy forms of Skua can pick up a living; their more lightly formed congeners can rob the Terns, and the two long-tailed species are more than a match in flight for the Arctic Tern; but against that family the Great Skuas would have little chance; and hence, probably, their more restricted range. If this species should prove to have its breeding-places in the North Pacific, it is somewhat singular that it should never have been observed north of the Equator, and that the only specimen of a great Skua recorded from the north-west coast, namely at Monterey, California, lat. 44° N., is clearly from the description given, *S. catarrhactes*. If, on the other hand, it should prove to be a denizen of the southern hemisphere, it is still more remarkable that we should find in such close proximity to *S. antarcticus* a form whose affinities are with *S. catarrhactes*. In order of arrangement it should follow the latter species, although in the present case I have taken it last for convenience of treatment.

STERCORARIUS POMATORHINUS.

*Stercorarius striatus*, Brisson, Orn. vi. p. 152, pl. 13. fig. 2 (juv.), 1700.

*Larus keeask* (part.), Latham, Ind. Orn. p. 818 (1790).

*Larus parasiticus*, Meyer & Wolf, Tasch. D. Vög. ii. p. 490, descrip. p. 492 (1810), nec auctorum.

*Catarracta parasita*, var. *camtschatica*, Pallas, Zoogr. Rosso-As. p. 312 (1811).

*Lestris pomarinus*, Temm. Man. d'Orn. p. 514 (1815); Audubon, B. Am. vii. p. 186, pl. 451 (1844); Ross, in Parry's 4th Voy. App. p. 196 (1828), fide Newton.

*Stercorarius pomarinus*, Vieillot, N. Dict. Hist. Nat. xxxii. p. 158 (1819); De Selys-L. F., Belg. p. 155 (1842); Gray, Gen. of B. iii. p. 653 (1849); Coues, Proc. Phil. Ac. 1863, p. 129; B. Ross, Nat. Hist. Rev. 1862, p. 289 (Gt. Slave Lake, very rare); Wright, Ibis, 1864, p. 151 (Malta); Gurney, Andersson's B. of Damara Land, p. 357 (1872).

*Cataractes pomarina*, Steph. in Shaw's G. Zool. xiii. p. 216 (1826).

*Cataractes pomarinus*, Selby, Ill. Brit. Orn. ii. p. 517 (1832).

*Lestris sphaeriuros*, Brehm, Vög. Deutsch. p. 718 (1831).

*Lestris striatus*, Eyton, C. Brit. Birds, p. 51 (1836).

*Lestris pomarina*, Faber, Prod. Island. Orn. p. 104 (1822); Sw. &

Rich. F. Bor.-Am. p. 429 (1831); Naumann, Vög. Deutsch. x. p. 487, pl. 271 (1840); Temm. Man. d'Orn. p. 495, ed. 1840; Middendorf, Sib. Reise, p. 240, tav. xxiv. fig. 1 (egg) (1853).

*Coprotheres pomarinus*, Reich. Nat. Syst. Vög. p. v (1852).

*Catarracta pomarina* (Tem.), Blyth, J. As. S. Bengal, xxviii. p. 406 (1859) (Moulmein).

*Lestris pomerinus* (Tem.), Newton, P. Z. S. 1861, p. 401, pl. xxix. fig. 3 (egg).

*Lestris pomarhinus*, Preyer, R. n. Island (1862).

*Lestris pomatorhinus*, Selater, Ibis, 1862, p. 297.

*Stercorarius pomarhinus*, Malmgren, Spitzbergens Fogl. p. 411 (1864).

*Stercorarius pomatorhinus*, Newton, Ibis, 1865, p. 509; Gillett, Ibis, 1870, p. 307; Coues, in Elliot's Prybilov Is. (1874); Coues, B. of N.W. Am. p. 607 (1874); Eaton, Zoologist, 1874, p. 3812 (Spitzbergen); Newton, B. Greenland, p. 107 (1875).

*Lestris pomatorhina*, Th. v. Heuglin, Ibis, 1872, p. 65.

The description and figure given by Brisson of his *Stercorarius striatus* clearly show that he had before him an immature specimen of this species, the representation of the strong heavy feet garnished with large claws being highly characteristic. Although Brisson's name cannot be retained, yet, if it had been adopted by any naturalist subsequent to the 12th ed. of Linnæus, it must necessarily have antedated the well-known name given by Temminck; but this change has fortunately been spared us. With regard to Gmelin's name of *crepidatus*, which Dr. Coues was inclined to refer to this species, I trust to be able to show that it can only belong to that which I call for the present Richardson's Skua. Temminck's name is therefore retained, subject to the emendation proposed by Mr. P. L. Selater (Ibis, 1862, p. 297), where he showed that the classical spelling should be *pomatorhinus*, being derived from  $\pi\acute{\omega}\mu\alpha$  (operculum) and  $\rho\acute{\iota}\nu$  (nasus), a view which has since been generally adopted by ornithologists. There can be no doubt from the description, especially of the tail-feathers, given by Pallas that this is the species called by him *C. parasitica*, var. *camtschatica*.

In plumage this species does not exhibit any remarkable variation, although some immature birds are decidedly less marked with sooty striations on the underparts than others. In the adults the acuminate feathers on the neck assume a beautiful golden tinge; and the dark pectoral band evidently becomes narrower with increasing age until it is totally lost and the bird is pure white from the chin to the abdomen. I have only seen one example of this extreme plumage, in the Rouen Museum, which boasts of nineteen picked specimens of Pomatorhine Skuas, none of which, unfortunately, bears any label indicating either date or locality.

The most northern locality recorded for this species is lat. 82° N., where a specimen was observed by Ross flying past the boats on Parry's fourth voyage. It has been found on the coast of Spitzbergen, and in Novaya Zemlya; and south of these points it ranges throughout the whole of the arctic and subarctic regions. Von Middendorf found it breeding on the "barrens" of the Taimyr and

the Boganida, in Siberia, and was the first to give a figure of the egg; and it is said to breed in societies from Bjornenas, north of Egedesminde, to the northward (Newton, B. of Greenland). There must, however, be many other breeding-places within the arctic circle; for the species is abundant in the north, and is not uncommon on our coasts, principally on the west, in autumn. Passing along the coasts of Western Europe, it occurs as a straggler in the interior of the continent, and visits the Mediterranean as far east as Sicily and Malta; goes down the west coast of Africa, where Capt. Shelley obtained it off Fantee; crosses the equator, and reaches Walwich Bay in lat.  $23^{\circ}$  S., where Andersson shot two specimens, one of which, a bird of the year, is in my collection. With this proof of its traversing the tropics it is no longer remarkable that it should have been obtained at Moulmein, on the coast of Tenasserim, in lat.  $16^{\circ} 22'$  N., by Major Tickell, as recorded by Mr. Blyth; the singular thing was, that the specimen in question should prove to be an adult and not a bird of the year, like all the other visitors to the south which I have examined\*. There is a specimen in the plumage of the first year in the collection of Messrs. Salvin and Godman, obtained by Mr. Cockerell off Cape York, the northern extremity of Australia. On the east coast of America it occurs from Labrador as far south as New York and Pennsylvania, beyond which it has not yet been traced. On the west coast there is no positive record beyond two instances on the Prybilov Islands; but Mr. Gervase Mathew's description of a Skua observed by him at Valparaiso and Coquimbo seems to refer to this species, respecting whose winter range we must wait for further details.

**STERCORARIUS CREPIDATUS.** (Richardson's Skua.)

*Stercorarius* (*Le Stercoraire*), Brisson, type of genus *Stercorarius*.

*Catharacta cephus*, Brünn. Orn. Bor. p. 36 (1764).

*Catharacta coprotheres*, Brünn. Orn. Bor. p. 36 (1764), dark form.

*The Black-toed Gull*, Pennant's Brit. Zool. ii. p. 419, tab. 2 (1768).

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*Larus crepidatus*, Banks, Hawkesworth's Voy. ii. p. 15 (1773); Gmelin, Syst. Nat. p. 602 (1788); Latham, Ind. Orn. p. 319 (1790); Meyer & W. Taschen. deutsch. Vög. ii. p. 493 (1810); Scoresby, Arctic Reg. i. p. 534 (1820).

"*Larus parasiticus*, Linn." Boddaert, T. des Pl. Eul. no. 991 (nec Linn.).

*Lestris crepidatus*, Tem. Man. d'Orn. p. 515 (1815).

*Stercorarius crepidatus*, Vieillot, N. Dict. Hist. Nat. xxxii. p. 155 (1819).

*Lestris parasitica*, F. Faber, Prodr. Is. Orn. p. 105 (1822); Brehm

\* Since writing the above I have had the opportunity of referring to Major Tickell's coloured drawing of this identical specimen, which proves it to be an immature bird after all! Mr. Blyth's error in stating it to be an adult was doubtless owing to the want of any specimens for comparison at that time.

& S. Beitr. Vögelk. iii. p. 853 (1822); Naum. Vög. Deutsch. x. p. 506, pl. 272, 273 (1840).

*Cataractes parasiticus*, Fleming, Brit. An. p. 138 (1828); Selby, Ill. Brit. Zool. ii. p. 520 (1832).

*Lestris richardsonii*, Swain., Sw. & Rich. F. Bor.-Am. p. 433, pl. 73 (1831); Macgill. Brit. B. v. p. 492 (1852); Audubon, B. Am. vii. 190, pl. 452 (1844); Gould, B. of Eur. v. pl. 441 (1837); Meyer, Ill. Brit. B. vii. p. 177 (1857).

*Lestris parasita*, Keys. & Bl. Wirb. Eur. p. 240 (1840); Midd. Sib. Reise, p. 241 (1853).

*Stercorarius parasiticus*, Schaeff. Mus. Orn. p. 62, pl. 37 (1789); De Selys-L. Fn. Belg. p. 155 (1842); G. R. Gray, List B. Br. Mus. iii. p. 167 (1844); Gray, Gen. Birds, iii. p. 653 (1849); Lawr. Baird's B. N. Am. 839 (1858); Blakiston (B. N.W. A.), Ibis, 1863, p. 152; Degl. & G. Orn. Eur. ii. p. 397 (1867); B. Ross, Nat.-Hist. Rev. 1862, p. 289; Coues, Pr. Phil. Ac. 1863, p. 132; Newton, Ibis, 1865, p. 510 (Spitzbergen); Andersson, B. of Damara Land, p. 357 (1872); Gould, B. G. Brit. v. p. 80 (187); Hume, Stray Feathers, p. 268 (1873) (Sindh); Buller, B. New Zealand, p. 268 (1873); Coues, Rep. Prybilov Is. no. 541 (1874); Sharpe, Voy. 'Erebus and Terror,' i. App. p. 32 (1875); Newton, B. Greenland, p. 107, Arct. Man. (1875).

*Lestris parasiticus*, Bp. Consp. Av. ii. p. 208 (1857).

*Lestris parasiticus*, var. *coprotheres*, Bp. Consp. Av. ii. p. 209.

*Lestris thuliaca*, Preyer, Reise n. Island (1862).

*Lestris parasitus*, Th. v. Heuglin, Ibis, 1872, p. 65.

*Lestris spinicaudus*, Hardy, Rev. et Mag. Zool. 1854, p. 657.

*Stercorarius spinicauda*, Layard, B. S. Af. p. 366 (1867).

*Stercorarius parasitica*, Dall & Bannister, Tr. Chic. Ac. i. p. 303 (1869) (Alaska).

*Stercorarius asiaticus*, Hume, Stray Feathers, p. 269 (1873) (Sindh).

*Lestris boji*, *schleepii*, *benickii*, Brehm, and *Stercorarius tephras*, Malmgren, are believed to be this, whilst *Lestris brachyrhynchus* and *L. microrhynchus*, Brehm, are ascribed to the next; but it would be a mere waste of time to verify Brehm's supposed species.

Dr. Coues follows those authors who have chosen to divert Linnæus's name of *L. parasiticus* to this species—a supposition utterly negated by the description in the Syst. Nat. p. 226, which is based upon that in his 'Fauna Suecica,' p. 55, No. 156. Nothing could well be clearer than his statement:—"rectricibus duabus intermediis longissimis," which can only apply to the Buffon's or Long-tailed Skua; but, as if to make assurance doubly sure, Linnæus adds "remiges nigræ, rachi 1. 2. niveæ." The natural inference from drawing especial attention to the fact that the shafts of the first and second primaries are white, is clearly that those of the other primaries are not white. Now the particular characteristic by which "Richardson's Skua," may be distinguished at any age beyond that of the nestling, is that the shafts of the other primaries are conspicuously lighter than in those of Buffon's Skua, in which

only those of the first and second primaries are white, those of the third and successive primaries being dark. I am indebted to Mr. R. Collett, of Christiania, for pointing out to me, some years since, this excellent distinction. The *L. parasiticus* of Linnæus is therefore not *S. crepidatus*, but the "Buffon's Skua;" and so is, according to my view, *Catharacta parasiticus* of Brünnich; but it is needless to discuss the latter name, as it is out of date.

Dr. Coues considers that the *Larus crepidatus* of Gmelin is in all probability based upon the young of the Pomatorhine Skua, to which Brisson gave the name of *Stercorarius striatus*. It is true that Gmelin (who translated from Latham) identifies *S. striatus* of Brisson with his *L. crepidatus*; but although *S. striatus* is certainly a young Pomatorhine, it was by no means easily recognizable by the naturalists of that day; and, moreover, Gmelin correctly cites in the first place *Catharacta cephus*, Brünn., which is certainly this species, and in the third line refers to "Le Labbe ou Stercoraire" of Buffon, whose figure ('Planches Enluminées,' No. 991) is an excellent one, besides giving an accurate description of the tail-feathers ("rectricibus duabus intermediis longioribus"); he also refers it to the "Black-toed Gull" of the 'Brit. Zool.,' which is clearly this species. This would be quite sufficient to impose Gmelin's name of *L. crepidatus* upon "Richardson's Skua;" but the name did not actually originate with Gmelin. On referring to Hawkesworth's 'Voyages' (1773), vol. ii. p. 15 (not vol. i. p. 15, as erroneously cited by Latham, and of course duly copied by Gmelin, without reference), we find in the narrative of Lieut. Cook's voyage in the 'Endeavour' that "on the 8th October 1768 (when a little to the south of the Cape-Verd Islands) Mr. Banks [afterwards Sir Joseph Banks] shot the Black-toed Gull not yet described according to Linnæus's system; he gave it the name of *Larus crepidatus*." The Black-toed Gull is described in Pennant's 'British Zoology,' vol. ii. p. 419 (1768); and plate 2 is an excellent representation of a "Richardson's Skua" of the year, the feet of this species at that age having the upper part of the webs yellowish, and the posterior portion black, giving the bird the appearance of being "shod" or "sandalled," whence Banks's somewhat quaint Latin rendering. I think it probable that the bird was identified from Pennant's description and figure; for in the MS. in the British Museum of Solander, who was also in the 'Endeavour,' there is indirect evidence of that work having been on board; but as Banks gave no description, it is perhaps safest to cite Gmelin as the authority for the name.

It is now well known that there are two very distinct plumages to be found in birds of this species, even in the same breeding-places—an entirely sooty form, and one with light underparts,—and that white-breasted birds pair with whole-coloured birds as well as with those of their respective varieties. If this species is "dimorphic," the offspring of one particoloured and one whole-coloured bird ought to resemble one or other of their parents without reference to sex; my examination of upwards of a hundred specimens from widely different localities and in all stages inclines me to the belief that this is not the case, and that the young of such union will be intermediate,

whilst the offspring of two similar parents will "breed true." This point can only be solved by some ornithologist who will devote his attention to a colony during the breeding-season, observing the produce of all these unions, and, if possible, marking the nestlings before they take wing; perhaps some of our Scotch friends will take the hint.

That the sooty plumage is not merely a sign of immaturity is shown by the long tail-feathers, and by the burnished tinge of the acuminate ones on the nape.

It is worthy of notice that in Spitzbergen, its most northern breeding-ground, neither Dr. Malmgren nor Professor Newton found a single example of the dark whole-coloured form; all those which Admiral Collinson's and Dr. Rae's Expeditions brought home from the far north are also white-breasted specimens, which looks as if the dark form was a more exclusively southern one.

In the white-breasted birds the striations on the underparts decrease with age until little more than a pectoral band remains; this, again, becomes narrower until in some specimens it entirely disappears and the bird is white from the chin to the abdomen.

This species has the most extended range of any member of the family. Parry found it up to lat.  $82^{\circ} 2' N.$ ; and it breeds throughout the arctic and subarctic regions, as far south as the islands of the north of Scotland; and Thompson records it as having nested near Achil Island on the west of Ireland. I should not be surprised to learn that there is some breeding-place along the western shores of France; for both old and also very young birds occur at Málaga early in August. Some go higher up the Mediterranean; but others, principally the young, continue their course along the west coast of Africa, to Walwich Bay and as far as the Cape of Good Hope; and in those waters they pass the months of what is our winter, compelling the Terns and the small Gull (*L. hartlaubii*) to disgorge their prey. From the altered appearance which they present in their progressive stages of plumage at a time when European naturalists have lost sight of them, an individual from the vicinity of St. Helena received the name of *S. spinicauda*. Careful examination of a series of specimens from the Cape of Good Hope, where Mr. E. L. Layard only observed them from December to February, showed that all were in the act of losing and renewing the central tail-feathers and the outer primaries, which are the last to be moulted; and although at the first glance the birds have a somewhat distinct look, yet there can be no doubt whatever of their being our northern species. Most that I have seen are birds of less than a year old, although this immaturity is less noticeable in the dark-plumaged birds than in the lighter ones; in none, however, are the central tail-feathers fully developed, and most are still partially in the quill-sheath. One specimen, evidently obtained just before the northward migration, is absolutely the same as a bird of only two months older from the Færoes. It is to be presumed that *S. crepidatus* goes up the east coast of Africa, as Mr. Allan Hume obtained it (naming it *S. asiaticus*), and observed many along the coast of Sindh, the Gulf of Oman, and between Guader and Bombay.

Returning to the Atlantic, we find it along the North-American coast; and Solander, in his MS., describes, under the names of *L. fuliginosus* and *L. nigricans*, two specimens of this species obtained in the harbour of Rio de Janeiro on December 4, 1768, thus giving it a claim to be included in the list of the Neotropical Laridæ so ably worked out by Messrs. Selater and Salvin (P. Z. S. 1871, p. 564). South of Rio there is no record of its occurrence on the east coast of America; but I can only refer to this species the example obtained by Mr. Buller at Horowhenua in the Province of Wellington, New Zealand, on April 30, 1864. His general description suits *S. crepidatus*; and he expressly states that the shafts of the primaries are *white*, the characteristic which particularly serves to distinguish it from Buffon's Skua, with which he has identified it. At the time that I examined the specimen in question I was not aware of this distinctive feature: the skin also had been badly preserved; and, to make matters worse, the plumage was so worn and abraded that it is a marvel that the bird was able to fly at all.

On the west coast of America it is only recorded as occurring at the Prybilov Islands and in Alaska; but Mr. Gervase Mathew, R.N., informs me that when at Callao in April 1873, in H.M.S. 'Resolute,' he observed many small Skuas in various states of plumage, and attributed them (correctly no doubt) to this species, which he had often observed previously on the English coast.

STERCORARIUS PARASITICUS. (Long-tailed or Buffon's Skua.)

*Le Stercoraire à longue queue*, Buffon, Pl. Enlum. 762.

*Stercorarius longicaudus*, Brisson, vi. p. 155 (1760).

*Catharacta parasitica*, Brünn. Orn. Bor. p. 37 (1764).

*Larus parasiticus*, Linn. Syst. Nat. p. 226 (1766), Fauna Suec. 55. no. 156 ("rectricibus duabus intermediis longissimis."); ? Müller, Zool. Dan. Prod. 166 (1774); Phipps, Voy. N. Pole, p. 187 (1774); Gm. Syst. Nat. p. 601 (1788); Scoresby, Arctic Regions, i. p. 534 (1820).

*Catharacta parasitica*, O. Fab. F. G. p. 103 (1780).

*Catarracta parasitica*, Retz. F. Suec. p. 160 (1800).

*Catarractes parasita*, Pallas, Z. Ros.-As. p. 310 (1811).

*Lestris parasitica*, Illiger, Prod. p. 273 (1811); Sw. & Rich. F. Bor.-Am. p. 430 (1831); Macgill. Brit. B. v. p. 503 (1852).

*Lestris parasiticus*, Temm. M. d'Orn. p. 512 (ed. 1815), p. 796 (ed. 1820), p. 501 (ed. 1840); Jenyns, Brit. Vert. An. p. 283 (1835); Gould, B. of Eur. v. pl. 442 (1837); Audubon, B. Am. vii. 192, pl. 452 (1844); Meyer, Ill. Brit. Orn. vii. p. 174, pl. 314 (1857).

*Stercorarius longicaudus*, Vieill. N. Diet. Hist. Nat. xxxii. p. 157 (1819); Newton, Ibis, 1865, p. 511 (Spitzbergen); Degl. & Gerbe, Orn. Eur. ii. p. 399 (1867).

*Lestris crepidata*, Brehm & S. Beiträge z. Vögelkunde, iii. p. 861 (1822); Naum. Vög. Deutsch. x. p. 534, pl. 274 (1840).

*Lestris buffonii*, Boie, Meyer & W. Taschen. iii. p. 212 (1822); Middendorff, Sib. Reise, ii. p. 241, taf. xxiv. fig. 2 (1853).

*Stercorarius cephus*, Steph. in Shaw's Gen. Zool. xiii. pt. i. p. 211, pl. 23 (fig. nec descrip.) (1826); B. Ross, Nat.-Hist. Rev. 1862, p. 289, Blakiston, Ibis, 1863, p. 152 (Mackenzie River).

*Lestris lessoni*, Degl. Mém. Ac. R. Lille, p. (1838); Schinz, Eur. F. p. 392 (1840).

*Lestris cephus*, Keys. & Blas. Wirb. Eur. p. 240 (1840); Bp. Consp. Av. ii. p. 209 (1857).

*Stercorarius longicaudatus*, De Selys-L. F. Belg. p. 156 (1842); Degl. Orn. Eur. ii. p. 298 (1849); Newton, B. Greenland, p. 107 (1875).

*Stercorarius cephus*, Gray, Gen. Birds, iii. 1849, p. 653; Schlegel, Mus. P.-B. *Lari*, p. 49 (1863); Gray, Hand-List, iii. p. 110 (1871).

"*Lestris longicaudatus*, Briss.," Thomps. Nat. Hist. Ireland, iii. 399 (1851).

*Lestris hardyi*, Bonap. Tabl. d. longipen. Compt. Rend. xlii. 1856, p. 770; Consp. Av. ii. p. 210 (1857).

*Stercorarius buffoni*, Coues, Proc. Phil. Acad. 1863, p. 136; Dall & Bann. Tr. Chic. Ac. i. p. 304 (1869) (Alaska); Coues, Prybilov Isl. (1874); Irby, Orn. Str. Gibraltar, p. 216 (1875).

*Lestris longicaudata*, T. v. Heuglin, Ibis, 1872, p. 65 (Novaya Zemlya).

In treating of the preceding species I have already shown that Linnæus's description of his *L. parasiticus* can only apply to this species, which may always be distinguished by its very long central tail-feathers and by having, even in immature plumage, the shafts of only the first and second primaries white, those of the others being dusky. In its adult state, the Long-tailed Skua has also the under tail-coverts, abdomen, and flanks of a sooty brown; the tarsi also are yellowish olive, whilst in adult *S. crepidatus* the legs are black. I have seen but few immature specimens, all birds of the year, obtained on their autumnal migration; they are of a nearly uniform sooty colour, with the usual pale edgings to the feathers characteristic of the first plumage. This species is found from Novaya Zemlya to Spitzbergen, and, south of these points, throughout the whole circuit of the arctic regions. Von Middendorff first discovered its breeding-places on the Taimyr and Bogonida, in Siberia; the late John Wolley found it nesting on the Lapland fells; Sir John Richardson obtained nestlings in Melville Peninsula; Mr. Bernard Ross observed it at the mouth of the Mackenzie River; it occurs in the Prybilov Islands; and Dall and Bannister found it in Alaska, the extent of its recorded range on the Pacific coast. By far the rarest of the family as an autumnal visitant, it ranges along our shores and those of Western Europe as far south on the Straits of Gibraltar and Morocco, beyond which there is no trace of it, whilst on the east coast of America it does not seem to go south of lat. 40° N. I have already pointed out that Mr. Buller's supposed example of this species from New Zealand must be referred to *S. crepidatus*. Professor Peters, of Berlin, has kindly informed me that the type specimen in that Museum of *Lestris hardyi*, Bonaparte, has the shafts of all except the first two primaries dusky; and on that ground I presume it to be a young bird of this species.

The specimen in question is *said* to have been obtained "between the Philippines and Sandwich Islands"—a considerable extension to the range of the species so far as it is at present known.

In concluding my remarks on a family whose members are principally Arctic in their habitat, it would be a great omission if I failed to acknowledge my indebtedness to Professor Newton's comprehensive remarks on the Arctic fauna in these 'Proceedings,' in 'The Ibis,' and in the 'Arctic Manual.' The whole available information respecting the *northern* range of the Skuas is given in a condensed form, accompanied by most important references; and to these originals, especially to the paper on the Birds of Spitsbergen in 'The Ibis,' 1865, I would refer those who require more details than I have thought it necessary to give in the present article.

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April 4, 1876.

Prof. Newton, 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 March 1876:—

The total number of registered additions to the Society's Menagerie during the month of March was 91. Of these, 65 were acquired by presentation, 16 by purchase, 3 by birth, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 111.

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

1. A male Brown Monkey (*Macacus brunneus*, Anderson), transmitted home to us from Siam as a present by Mr. T. G. Fermor Hesketh, F.Z.S.

This Monkey was presented to Mr. Hesketh by the King of Siam, and is, no doubt, from that country. It agrees generally with Dr. Anderson's figure (P. Z. S. 1872, p. 203, pl. xii.), but is rather darker in colour.

Dr. Anderson tells me he has now come to the conclusion that, in spite of what he stated (P. Z. S. 1874, p. 652), his *Macacus brunneus* and *M. arctoides* of Is. Geoffr. are referable to the same species. Dr. Anderson also takes Blyth's view\*, that *M. speciosus* of Geoffr. St.-Hil. et F. Cuv. properly applies to this Siamese Monkey, and not to the Japanese species figured under that name by Temminck. This, however, though probable, I may observe, cannot be positively proved, as the name was established on a drawing, and there is no existing type. I think, therefore, it would be better to use *Macacus arctoides* (as the oldest name that can be certainly attributed to this animal), and to call the Japanese species, which I have lately figured (P. Z. S. 1875, pl. xlvii.), *M. fuscatus* (as proposed by Blyth *l. s. c.*), rejecting the term *speciosus* altogether.

\* "Mammals of Burmah," in J. A. S. B. No. i. 1875, p. 6.





J Smit del et lith.

M & N. Hanhart imp

POLYBORUS THARUS, *var.*

The present example has a deep-red face, but quite uniform non-annellated hairs. The annellations, Dr. Anderson tells me, only appear in the adult animal.

2. Two Caracaras (*Polyborus*) in a very remarkable plumage, purchased of a dealer in Liverpool March 2nd, and stated to have been received from "Patagonia." Their general form and size is exactly that of *Polyborus tharus*; and I am of opinion, on the whole, that they are merely young individuals of that species in an abnormal phase of plumage; though it is right to say that other naturalists who have seen them are inclined to believe that they belong to a distinct species.

Mr. Smit's drawing (Plate XXV.) gives a correct figure of these curious birds. The plumage is of a nearly uniform milky white, with yellowish shaft-stripes on the back and breast; the naked cere is flesh-coloured, the bill greenish yellow; the feet are nearly white; but the iris is dark brown. It will be observed that the tail is imperfect.

3. A lead-coloured Falcon (*Hypotriorchis concolor*), presented March 3rd by Mr. A. F. Allman, having been captured on board a vessel on its passage down the Mozambique Channel. This is an immature bird, nearly in the plumage figured by Schlegel and Pollen (Orn. Madagasc. pl. xii.), and is the first example we have received of this scarce species.

4. Three Sirens (*Siren lacertina*, Linn.), from South Carolina, presented by Mr. G. E. Maingault, Curator of the Museum of Natural History, Charleston, March 29th. Mr. Maingault has on a previous occasion transmitted to us an example of this rare and singular Batrachian; but these are the first that have reached us alive.

5. A South-American Flamingo (*Phœnicopterus ignipalliatus*), from the Upper Amazon, acquired by purchase March 29th. The individual assigned to this species in 1871 (P. Z. S. 1871, p. 627), which was quite young when received, and is now adult, is certainly not of this species, but either a small individual of *P. antiquorum* or one of the so-called *P. minor*; so that the present example is the first of the present species we have received. The bird is very remarkable for its party-coloured legs, the greater part of the toes and tibio-tarsal joint being of a bright scarlet.

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Professor Newton, V.P., exhibited a small volume, belonging to the Rev. Richard Hooper, of Upton Rectory, near Didcot, and remarked:—

"This little book has been kindly lent to me by its owner, who has before interested himself in enquiries after the Dodo (*Didus ineptus*)\*. It is obviously the same work as that described by Broderip in our 'Transactions' (iv. p. 183), but an entirely different and, so far as I can learn, a hitherto unknown edition of it. Broderip's copy was published, he says, at Amsterdam, by Abraham Wolfgangh, in 1662. Mr. Hooper's is without date, and was published at the same place by 'Abraham en Jan de Wees, Boek-verkoopers,

\* Ann. and Mag. Nat. Hist. (2) iii. p. 259.

inde 4 Evangeliste.' Internal evidence fails to show more than that it did not appear before 1643, occurrences in which year are several times mentioned in its pages (*e. g.* pp. 261 and 345); and on a fly-leaf are the initials 'R. L.' and the date '1676.' Now I am informed by Mr. Bradshaw, the Librarian of the University of Cambridge, that A. de Wees is known to have published an edition of this work (which I should have said is a translation and amplification of Pliny's Natural History) in 1662, the same year that Wolfgangh did. But the volume I have here is not that edition, and must therefore be either an earlier or a later one. I am inclined to believe the former, (1) because, as I have already said, no year later than 1643 is mentioned in it, and (2) because the figure of the Dodo which it contains (at p. 374) is unquestionably of cognate origin with that given in the rare edition of Bontekoe's Voyage (p. 7), which I now exhibit. This edition of Bontekoe is thought by Strickland\* to have been published "a year or two" subsequently to 1646. Comparing the two figures now before you, I think you will admit that the copper-plate of the Pliny has not been copied from the woodcut of the Bontekoe, but the woodcut from the copper-plate; and if so, the impression in Mr. Hooper's Pliny† is the earliest we *yet* know of this very singular figure. It is unfortunate that the fate of Broderip's copy is unknown to me; nor am I aware of the existence of a second copy of that (Wolfgangh's) edition. Both in the title-page and in the text there are many typographical differences between the two editions, if the extracts reprinted in our 'Transactions' may be trusted; but these differences seem to have no scientific interest, however valuable they may be to bibliographers, and I will not trouble you with them."

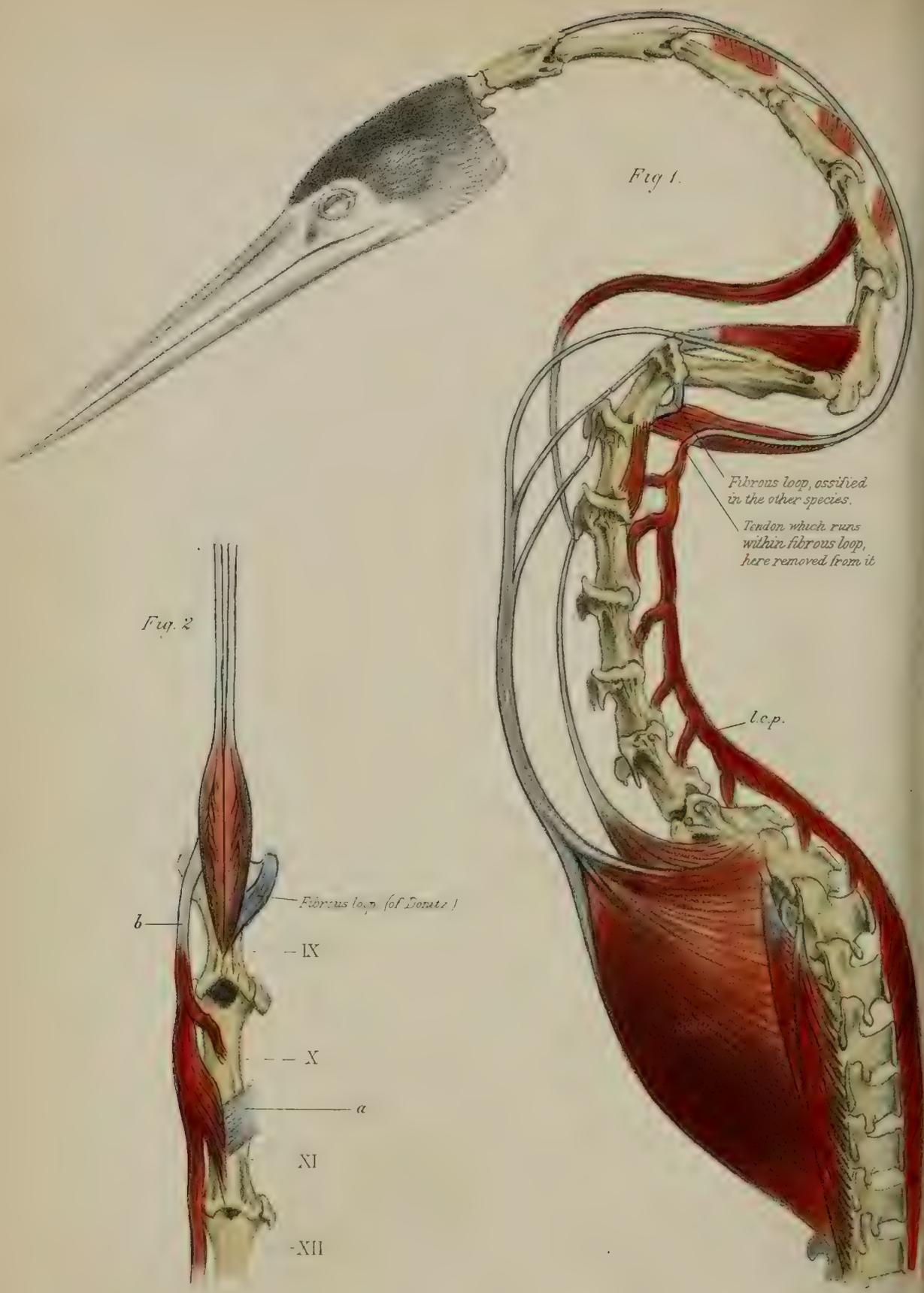
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Mr. R. Bowdler Sharpe, F.Z.S., exhibited a specimen of a Hawk-Owl (*Surnia ulula*), belonging to Mr. James Rawlence, of Bulbridge-within-Salisbury. It was shot by a Mr. Long several years ago near Amesbury, in Wiltshire, and was given by him to Mr. Rawlence, in whose collection it remained till Mr. Mansell-Pleydell happened to see it, and brought it to London for identification. The specimen was very interesting as being the first British-killed specimen of the true Swedish *Surnia ulula*. It would be seen, on reference to the 'Birds of Europe,' that all the specimens of Hawk-Owls hitherto killed in Great Britain have belonged to the American form, *Surnia funerea*, with the exception of one bird shot in Shetland, which was probably the Swedish bird; this, however, could not be ascertained, as the

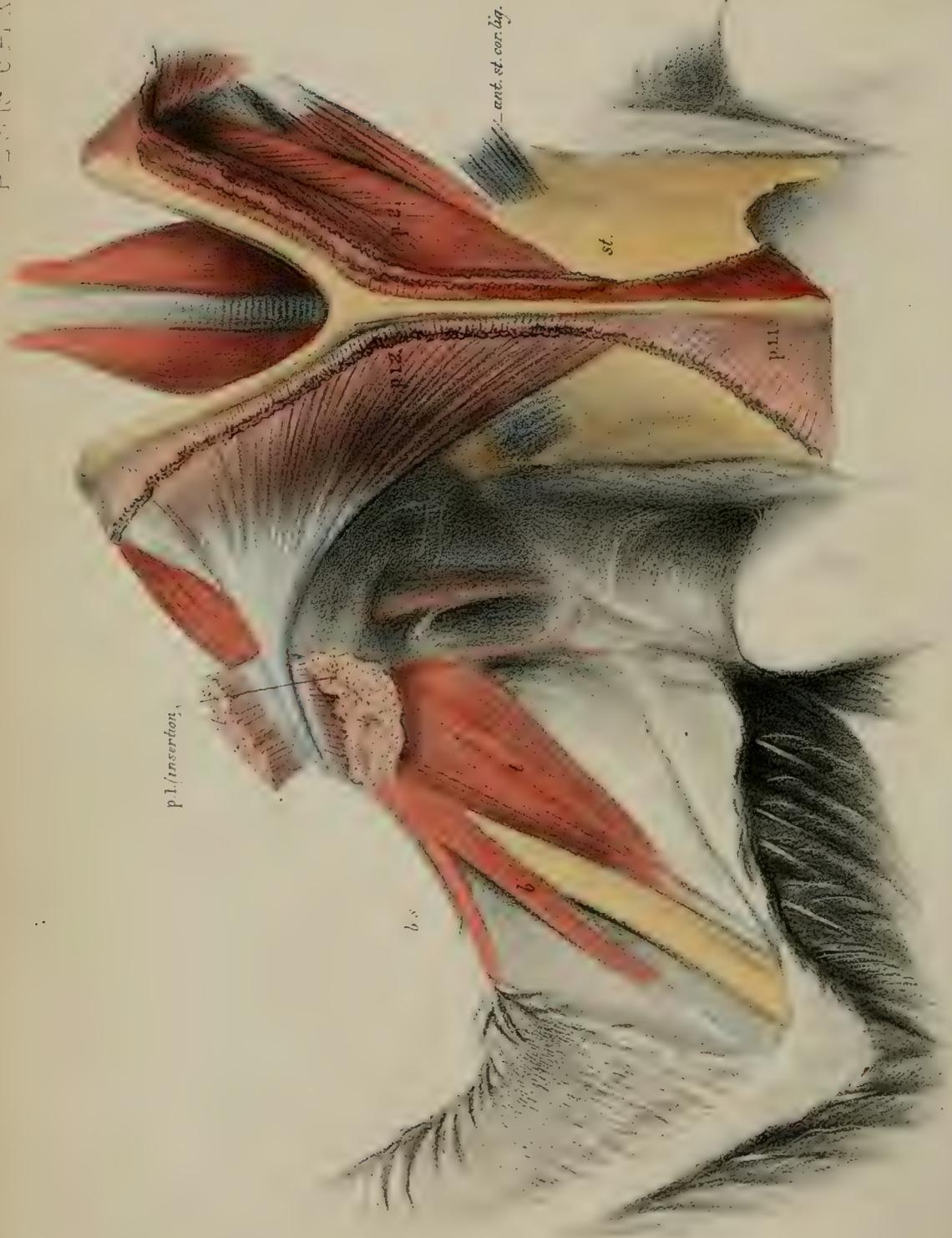
\* 'The Dodo' &c. p. 63.

† The full title of the volume is C. PLINI SECUNDI Des wydt-vermaerden Natuur-kondigers vyf Boecken. Handelende van de Nature, I. Van de Menschen. II. Van de viervoetige en kruypende Dieren. III. Van de Vogelen. IV. Van de kleyne Beestjes of Ongedierten. V. Van de Visschen, Oesters, Kreeften, &c. Hier zijn by-gevoeght de Schriften van verscheyden andere oude Autheuren de Natuur der Dieren aengaende. En nu in desen laetsten Druck wel het vierde part vermeerdert, uyt verscheyden nieuwe Schryvers en eygen ondervindinge: en met veel kopere Platen verciert. t'AMSTERDAM. By Abraham en Jan de Wees, Boek-verkoopers / inde 4 Evangeliste.







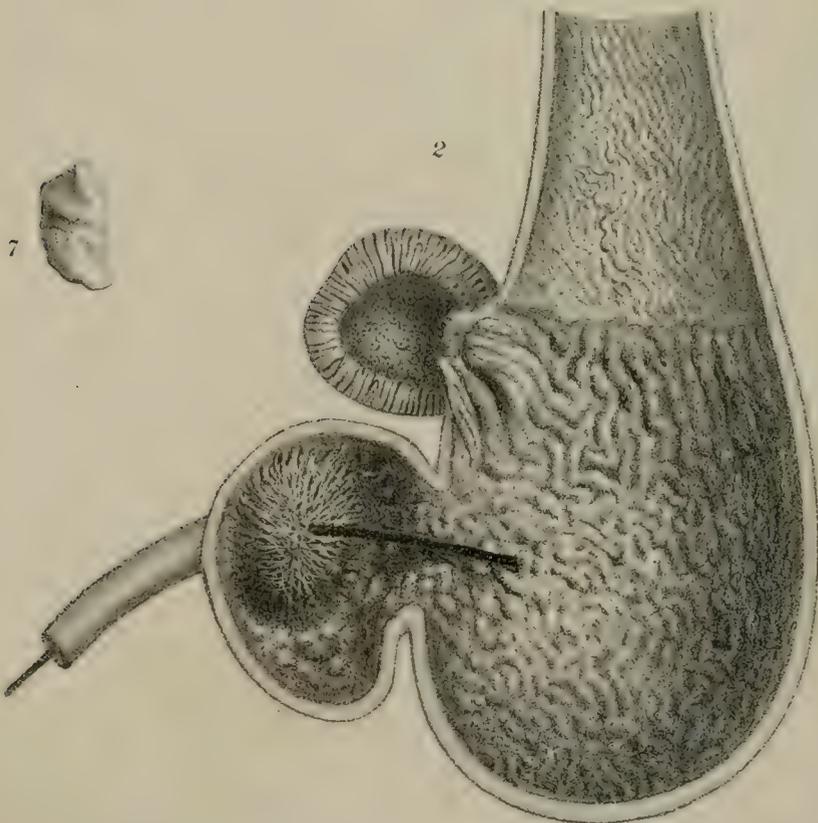
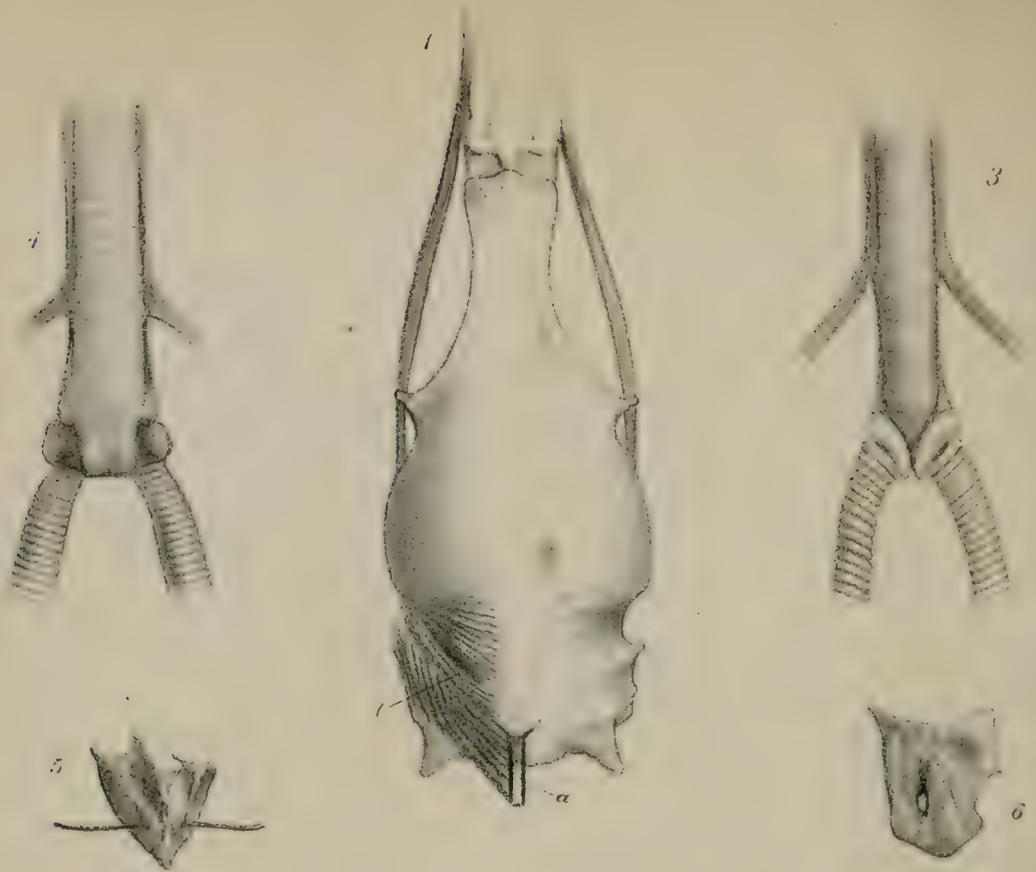


J. Smit del.

ANATOMY OF PLOTUS ANHINGA.

H. Hart imp.





J. Smith del.

Hanhart imp.

skin had been destroyed by moth. The present was therefore the first authentic introduction of the *Surnia ulula* into this country. The Hawk-Owls of America and Europe were, Mr. Sharpe said, scarcely distinct species, but tolerably recognizable races.

The following Papers were read:—

1. Notes on the Anatomy of *Plotus anHINGA*. By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

[Received March 31, 1876.]

(Plates XXVI., XXVII., XXVIII.)

The Darter is one of those birds whose anatomy, with the exception of its skeleton, is comparatively little known; I therefore take the present opportunity of describing the organs and some of the most important muscles of *Plotus anHINGA* from the two specimens which were recently living in the Society's collection, and which, from my prosectorial advantages, it has been my good fortune to be able to dissect.

On December 28th, 1872, the Society became possessed, for the first time, by purchase, of a male specimen of *Plotus anHINGA*, which died on the 17th of this month, with general jaundice and distention of the gall-bladder from obstruction of the common bile-duct. The second specimen, a female, was purchased on the 30th of September, 1875; it was never quite healthy, and died on the 7th of February, without any special organic lesions, but with a dropsical condition of the subcutaneous areolar tissues, frequently found in Steganopod birds. It is this second specimen which I first dissected; and the other coming to hand, opportunely for me, has enabled me to verify my observations.

*Pterylographically*, there is nothing for me to add to the results arrived at by Nitzsch\*. The skin is not in the least pneumatic, in which respect it contrasts greatly with *Sula* and *Pelecanus*, and agrees with *Phalacrocorax*.

With reference to the anatomy of its circulatory organs, it is to be noted that *Plotus anHINGA* possesses only a single carotid artery, the left. In *Sula bassana*, *Phalacrocorax carbo* and *P. lugubris*, *Fregata aquila*, and *Phaethon* there are two. In *Sula fusca* (a specimen in very bad immature plumage from Port Lemon, Porto Rico) the left carotid only exists, as also in *Pelecanus rufescens* and *P. onocrotalus*.

As to the respiratory organs, from Plate XXVIII. fig. 3 it can be seen that the syrinx is in no way peculiar, a single pair of intrinsic lateral muscles being present. By the side of it I have figured the lower portion of the windpipe of a male Gannet (*Sula bassana*), in which a pair of fatty bodies are developed just above the bifurcation of the bronchi, the like of which I have not elsewhere seen.

\* Pterylography, Ray Society's Translation, edited by P. L. Selater, F.R.S., p. 151.

Osteologically *Plotus anHINGA* deserves some special attention. Brandt\* in his valuable memoir on avian anatomy has fully described and figured the skeleton. Nevertheless from his drawing of the vertebræ of the cervical region it is evident that he was not thoroughly acquainted with the peculiarities of their mutual articulation.

Eyton † describes briefly the osteology of *Plotus novæ-hollandiæ*, but does not give figures. The specimen he refers to is in the College-of-Surgeons' Museum (No. 1179 A). His drawing of *Phalacrocorax cristatus* ‡, however, makes it apparent that he fully realizes the peculiarity of the mutual relationships of the cervical vertebræ in its close allies.

W. Donitz§ draws attention to a peculiarity in the cervical region of *Plotus levaillantii* which will be referred to further on. This peculiarity is not represented in Brandt's figure of *P. anHINGA*; and it is not to be found in either of the Society's specimens, one being at least three and a half years old.

In speaking of *Phalacrocorax cristatus* Mr. Eyton remarks, "The tubercle on the upper edge of the occipital bone has a pointed, movable, triangular process attached to it, which I suspect has also been the case with my specimen of *Plotus*, but has been lost."

In the Society's female specimen there is a fibro-cartilaginous similarly situated process, not more than one sixth of an inch long, which is ossified in the evidently older male. In his notes on the anatomy of the Cormorant, Hunter tells us || that "a small bone, about an inch long, passes back from the os occipitis and gives origin to the temporal muscle, which is very strong." The same bone in the Darter, although comparatively not so long, performs the same function, the superficial temporal muscles meeting behind the skull along the median raphe, which becomes ossified to form the above-mentioned bony style in the adult bird. (See Plate XXVIII. fig 1 a.)

Before commencing the description of the cervical articulations of the Darters, it may be mentioned that the same condition is observed, only in a less marked degree, in the Cormorants, and still less in the Gannets and Pelicans.

The first eight cervical vertebræ (including the atlas and axis), when articulated together in such a way that all the articular surfaces are in their proper relations one to the other, form a continuous curve with a strong concavity forwards. So considerable is this curve, that when the beak of the bird is horizontal the axis of the peculiarly long eighth vertebra is parallel to that of the skull, or very nearly so. The curve is not a part of a circle, but is one which gradually augments in acuteness from above downwards, its most considerable development being between the 7th and 8th vertebræ, which are consequently articulated at a considerable angle

\* Mémoires de l'Acad. Imp. des Sciences de St. Pétersbourg, tom. v. 6<sup>ème</sup> Série, Sect. d. Sc. Nat. 1839.

† Osteologia Avium, p. 218.

‡ Loc. cit. pl. v. f. 1.

§ Archiv für Anat. u. Physiol. 1873, p. 357.

|| Essays and Observations, edited by Prof. Owen (1861), vol. ii. p. 328.

with one another, more strongly marked than that between the 5th and 7th, and this, again, more decided than that between the 5th and 6th, and so on.

The 8th and 9th vertebræ articulate so as to form an angle exactly the opposite in direction—namely, with its genu directed forwards instead of backwards. The same is the case with the 9th and 10th, the 10th and 11th, the 11th and 12th, the 12th and 13th; more slightly so between the 13th and 14th, and the 14th and 15th; whilst the 15th and following until the last (the 20th), which with the one above it carries imperfect ribs, form almost a straight line with one another, being slightly bowed, with the convexity directed backwards.

With the exception of the atlas and the 6th and 7th, the cervical vertebræ are peculiarly elongate, the 8th being more so than the others, as may be seen in Plate XXVI. fig. 1.

Donitz figures a pair of accessory bony bridges on the dorsal surface of the vertebra following the most lengthy one, which must evidently therefore be the 9th. He, however, speaks of it as the 8th, which seems to me to be an error depending on the omission of the consideration of the atlas, because in *Plotus anHINGA* (both from Brandt's figure and my specimens) it is most certainly the 9th, as it is in *Plotus novæ-hollandiæ*, *Phalacrocorax carbo*, and *P. lugubris*. I have, however, not seen *Plotus levaillantii*.

Donitz attributes the peculiar kink in the neck of the Darters, which it is impossible to obliterate without lacerating the surrounding muscles, to the presence of the bony bridges he describes; in this, however, he is mistaken, it depending on the above-mentioned peculiarity in the 8th cervical vertebra, by which it is angularly articulated with the 7th and 9th vertebræ, the upper genu being posterior, and the lower anterior. In further verification of this, it may be stated that in *P. anHINGA* the bony bridges do not exist, and yet the kinking is most strongly marked.

*Myologically* the cervical region of the Darter is very peculiar, on account of the great concentration of its muscular mechanism towards the thoracic end of that segment of the body, the tendons from them running lengthy courses up the neck. The anterior and the posterior cervical muscles will be considered separately.

*Anterior cervical region.*—Normally in birds the *longus colli anterior*, or great front flexor muscle of the neck, commences as a series of thin tendinous slips from the middle of the bodies of the first two or three vertebræ which carry complete ribs (true dorsals). The fibres diverge and ascend in such a manner that they form a bilateral median mass acutely triangular at its lower end. They receive continual accessions from the bodies and hæmapophyses of the cervical vertebræ, ending in slips which are attached, successively, to the apices of the anterior transverse processes three or four higher than the vertebræ whence they sprang. Through the whole length of the cervical region they are of very similar mass, and therefore help to maintain the otherwise fairly uniform diameter of the vertebral column\*.

\* *Vide* Owen on *Apteryx*, Trans. Z. S. vol. iii. pl. 33, p. 310.

In *Plotus* this uniformity is considerably disturbed, irrespective of the above-described kink, by the excessive development of the *longus colli* in its lower almost interthoracic portion, as well as, though to a less degree, by the enlargement of the *longus colli posterior* behind.

In *Plotus ankinga*, as above stated, there are 20 cervical vertebræ. A small slip of the *longus colli* arises from the body of the third dorsal vertebra, which is inserted into the transverse process of the 17th cervical. Above, and in contact with this, is another similar slip to the 16th cervical. From the bodies of the 2nd and 1st dorsal vertebræ, as well as from the antero-median portions of the six lower cervical vertebræ, a large muscle arises on each side, in layers (somewhat resembling the layers formed by the basally expanded petioles of an onion bulb)—the lower being partially enclosed in the upper—which ultimately form a bipenniform mass with a tendon running axially through it and continually receiving additions in the form of outer coverings of tendinous tissue arising from the enclosing muscles, till it forms a strong single tendon which courses up the front of the neck, close to the middle line on each side, to be inserted into the downward-directed, peculiarly long hæmapophysial spine of the 8th cervical vertebra, and gives off slips, on its way up, to the serially homologous processes of the 9th and 10th vertebræ. A similar tendinous slip to the 11th vertebra has an independent origin from the bodies of the 15th and 16th vertebræ, internal to the main muscular mass, which is almost the size of a lemon, and with its fellow of the opposite side, of much the same shape, filling up and projecting beyond the slight anterior concavity above mentioned, formed by the mutual articulations of the 15th, 16th, 17th, 18th, and 19th cervical vertebræ. (In Plate XXVI. figs. 1 & 2, these different details are clearly shown.)

*Posterior cervical region.*—Here there is an exaggerated development of muscle in the juxta-thoracic part, opposite the similar enlargement in front, although it is not so considerable behind. The *longus colli posterior* is the muscle which is excessively developed. It becomes differentiated from the posterior dorso-spinal mass opposite the 14th and 15th cervical vertebræ to run up the neck in the form of a fleshy belly which receives additional origins, in the form of muscular slips, from the vertebræ as high as the 9th cervical. Where the slip from the 10th vertebra (which is a small one) joins it, the muscle becomes tendinous, forming a rounded cord, to the inner side of which the large fasciculus from the 9th vertebra is attached.

A reference to the account given above of the disposition of the vertebræ in this region will make it evident that the tendon of the *longus colli posterior* must make a considerable backward turn opposite the transverse line of articulation between the 8th and 9th cervicals—because there the two bones meet at a considerable angle, *with the genu directed forwards*. This being the case, some special mechanism is essential to prevent the tendon from breaking away from the vertebral column when the muscle with which it is

associated contracts. In fact, a pulley has to be formed round which the tendon may turn in the same manner that at the knee, in birds, the *biceps cruris* is able to act upon the fibula from a point situated some way down it, because it is bound close to the greatly bent knee-joint by the well-known sling-band in that region. In Plate XXVI. figs. 1 & 2, the sling-band here described is clearly shown.

A similar sling-band is found in the posterior cervical region of those birds which have any great backward curve of the neck, it in the Gannets being also associated with the 9th vertebra. It is nothing more than a specialization and strengthening of the aponeurosis which is always found covering the muscles, opposite the place where the strain occurs. In *Phalacrocorax carbo* the general sheath is strong, and no specialized band can be distinguished.

In *Plotus anHINGA* this sling-band is attached at its inner end, with its fellow of the opposite side, to the middle line of the posterior surface of the neural arch of the 9th vertebra, about halfway between its proximal and distal extremities; whilst at its outer end it is fixed to the tubercle which is situated just outside the upper articular process of the same vertebra, a backward and slanting loop of tendinous tissue joining the two (*vide* Plate XXVI. figs. 1 & 2).

It is the ossification of this just-described tendinous loop which constitutes Donitz's bridge in *P. levaillantii* and *P. novæ-hollandiæ*. In neither of the Society's specimens of *P. anHINGA*, nor in that figured by Brandt, nor in a specimen of the same species seen by Donitz himself, is this bridge ossified. It may therefore be that in *P. anHINGA* it remains tendinous; or, less probably, it has happened that the four specimens inspected have none of them been adult birds. One is at least  $3\frac{1}{2}$  years old, we know.

Through this bridge, as has been briefly described by Donitz, from a dried specimen, the tendon of the *longus colli posterior* passes—which it does before it receives the considerable fleshy fasciculus originating from the neural arch of the ninth vertebra, as is rendered evident in Plate XXVI. figs. 1 & 2.

The tendon, augmented by fibres from the just-mentioned additional origin, passes up the back of the neck, side by side with its fellow, to end by being inserted into the posterior surface of the lower articular process of the axis vertebra, it, in its course, sending small tendinous slips to the corresponding parts of the third and fourth cervical vertebræ. The tendon is peculiar in being ossified where it is opposite the bodies of the vertebræ with which it is related, and supple at the joints, which makes it appear to be composed of alternate bony and fibrous elements when it is removed from the body. From the fifth, fourth, and third vertebræ short muscular fibres ascend to join the corresponding portions of the main tendon in single penniform series.

It is nearly always the case in avian anatomy that the inner fibres of the cervical portion of the *longus colli posterior* muscle become differentiated to form the *digastrique du cou* of Cuvier, better known to us as the *biventer cervicis*, a muscle one peculiarly interesting

modification of which, in the genus *Ceryle* among the Alcedinidæ, has been described and figured by Dr. Cunningham in the Society's 'Proceedings'\*. This, by the way, I may mention, I have had the opportunity of fully verifying. Meckel, in his 'General Treatise on Comparative Anatomy,' tells us† that he found it at its minimum of development in the Gallinæ, the Goose, and the Cormorant. In a specimen of *Sula fusca*, as well as in *Phalacrocorax carbo*, it is present, but extremely small, I find. It is entirely absent in *Plotus ankinga*, the *longus colli posterior* (*cervicalis ascendens*, Meckel) entirely ceasing at the lower margin of the axis vertebra, in the tendon above described.

There are other myological features deserving of special notice in the thoracic and crural regions of the Darters.

The *great pectoral* muscle is composed of two independent layers:—a superficial large one, arising from the inferior border of the sternum, its carina, and from the outer border of the furcula; and a deep one from the upper two thirds of the deeper part of the carina, superficial to the *pectoralis secundus*, and from the symphyseal half of the outer border of the furcula. The superficial layer is inserted by a broad linear attachment to the pectoral ridge of the humerus, whilst the deep layer ends in a rounded tendon which commences at the axillary margin of the triangular muscle, with which it is associated, and receives the fibres of the remainder of the muscle in its course to its attachment into the lower end of the pectoral ridge of the humerus, beyond the insertion of the lowest fibres of the superficial layer. In Plate XXVII. this arrangement is clearly indicated. A condition exactly similar to this is observed in *Phaëthon*, *Pelecanus*, *Sula*, the Cathartidæ, all the Storks, and the Petrels, and in no other birds as far as I am aware. In *Phalacrocorax* it is not easily recognized.

As in *Phalacrocorax* and *Phaëthon*, but not in *Sula* or in *Pelecanus*, the *biceps* muscle of the arm sends a fleshy slip to the middle of the patagial tendon of the *tensor patagii longus* (Plate XXVII. *b. s.*).

No trace of the *expansor secundariorum*‡ muscle could be detected.

As in all the other Steganopods, the *tensor fascia* of the thigh does not cover the *biceps cruris* in the least.

The *ambiens* is of fair size; it deeply grooves the large ossified patella; and some of the fibrous ligament overlapping this groove shows traces of ossification; so that in aged birds the groove may be converted into a foramen, as is always the case in *Phalacrocorax*, where the thus formed foramen is far from superficial (*vide* Plate XXVIII. figs. 5, 6, & 7). In a specimen of *Pelecanus rufescens* the *patella* was not ossified.

The *semitendinosus* is very large, composed of parallel fibres, and without any accessory head developed to join it. The *femoro-caudal* also, as in all other true Steganopods, lacks an *accessorius*; it closely

\* P. Z. S. 1870, p. 280.

† French edition, Paris, 1829–30, vol. vi. p. 11.

‡ *Vide ante*, p. 193.

resembles that muscle in *Sula* and *Pelecanus*, being separated from the *obturator externus* by a well-marked interval, which is not the case in *Phalacrocorax*\*. It is to be remembered, as I have had the opportunity of stating elsewhere†, that in *Fregata aquila* the *semi-tendinosus* is entirely absent, as in the Accipitres, whilst in *Phaëthon* it has an accessory head as well as a considerable bulk itself, these facts tending strongly to verify Brandt's division of the Steganopods‡ into three well-differentiated groups, of two of which the two above-named genera are the only examples.

The alimentary canal of the Darter presents features of especial interest, as in its stomach there is a modification in the structure of the proventriculus not referred to in zoological works generally. It is fully described by Mr. Macgillivray in Audubon's 'Ornithological Biography' §, where an excellent figure illustrates the account. Mr. Macgillivray also accurately describes most of the other viscera. He, however, omits to refer to the hairy mat in the second stomach, which latter viscus, he strangely says, is soft and smooth inside. The observations here made, which are in accordance with those of Mr. Macgillivray, cannot be considered *de trop*, as the extremely abnormal conformation he describes required verification before it could be accepted as not being merely an individual peculiarity.

The *tongue*, as an independent organ, does not exist. It is very small in all Steganopods, but free at its anterior extremity; smallest proportionally in *Pelecanus*. In *Plotus*, however, it is not free at its apex, it forming merely a longitudinal groove along the middle of the floor of the mouth, and ending abruptly behind by a small transverse slightly projecting ridge,  $2\frac{1}{4}$  inches in front of the *rima glottidis*, which is evidently the rudiment of the base of the organ. The hyoid cornua,  $1\frac{1}{2}$  inch long, running in the faucial membrane, here meet and blend.

There is no *crop*; the œsophagus, however, is very dilatable. The *proventriculus* does not form a zone, as is the rule; nor does it form a patch, as in *Struthio*, *Rhea*, *Chauna*, and a few other birds; but it forms a special gland-cavity into which the individual constituents of the organ open. This cavity communicates with the digestive tube by a small orifice which is situated on the right side of the stomach, just below the commencement of the yellow dense characteristic epithelium of the stomach in birds. Plate XXVIII. fig. 2 will assist in rendering this explanation more distinct.

The proventricular compartment is covered by peritoneum, is nearly globose, about the size of a chestnut, and fixed to the right side of the lower end of the œsophagus. On superficial inspection it looks very like an enlarged spleen (that organ being subglobose in birds). Its cavity is very small, being much encroached upon by the great depth of the cylindrical glands which compose its walls. The yellow stomach-epithelium surrounds its orifice and goes no further. There are no indications of additional proventricular glands at the lower

\* *Vide* P. Z. S. 1873. p. 636.

† P. Z. S. 1873, p. 636, and 1874, p. 122.

‡ P. Z. S. 1874, p. 116.

§ Vol. iv. p. 158.

termination of the œsophagus, the epithelium in that part being quite smooth and apparently squamous.

This further development in *Plotus* of a special and well-differentiated gland-organ from what in other birds is a zone or a simple circular patch of glands, is very similar to the equally uncommon development of the cardiac gland-organ in the stomach of the Manatee, which is most certainly only a modification of the similarly situated gland-patch in the Dugong.

The stomach is not developed into a gizzard, its walls in no part exceeding one sixth of an inch in thickness. It is divided into two compartments, a cardiac and a pyloric, as is that of the Pelican. The former of these corresponds to the gizzard in most birds, the latter to the imperfectly formed cavity associated with the pyloric valve in the Storks, Gannet, &c. (*vide* Plate XXVIII. fig. 2).

Of the stomach of the Pelican, Hunter tells us\* that "it is oblong, much in the direction of the œsophagus, with a little curve, smallest at the lower end: it makes a quick turn and swells again into a round bag; or it may be supposed that from the side near the lower or smaller end is attached a bag whence the duodenum arises." In the Catalogue of the Museum of the Royal College of Surgeons (1852), Prof. Owen† remarks, with reference to a specimen (No. 519) of the stomach of a Pelican (*Pelecanus onocrotalus*), "The œsophagus is continued into the proventriculus or glandular cavity, without any marked constriction; and the latter passes insensibly into the part analogous to a gizzard. This part communicates by a transverse aperture with a small globular cavity, which is lined by a vascular membrane, and communicates with the duodenum by a very small oblique aperture. This superadded cavity renders the analogy between this stomach and that of the Crocodile complete, with the exception of the absence in the latter of distinctly developed gastric glands. These, in the Pelican, are simple elongated follicles, closely compacted together, and extended over a large surface." In *Plotus* the second cavity is similarly situated, intervening between the stomach proper and the duodenum. The dense yellow epithelium of the one, however, extends into the other, right up to the pyloric valve. [It may be that in the specimen described by Prof. Owen the lining had been previously stripped off, which may have led to the term vascular being applied to the mucous membrane of the second stomach.]

Hunter, in his dissection of *Sula* and *Phalacrocorax*, does not mention the existence of a second stomach; and I have not observed or found recorded such an arrangement in either of those genera, or in *Phaëthon*, or in *Fregata*.

In *Plotus* there is still another peculiarity which, as far as I know, is found in only one other bird, namely *Cathartes aura*. In Audubon's 'Ornithological Biography' ‡, Mr. Macgillivray tells us that in the stomach of *C. aura* "there is a pyloric lobe [second com-

\* Essays and Observations, Owen's edition, 1861.

† Vol. i. "Organs of Motion and Digestion," p. 148.

‡ Vol. v. p. 340.

partment] about half an inch in diameter, which is lined with bristly hairs. They are all inserted at right angles to the surface, penetrate to the base of the epithelium, and are of various lengths, some of them not protruding beyond the surface, others upwards of half an inch, of various colours, some black, generally tipped with whitish, others light greyish yellow, all thick at the base, and tapering to a fine point. Being disposed in a regular manner, they might seem to form a part of the organization of the stomach, and not to be, like the hairs found in *Cuculus canorus* and *Coccyzus americanus*, merely extraneous." The pyloric orifice in *Plotus anHINGA*, as is seen in Plate XXVIII. fig. 2, is protected by a mat of lengthy hair-like processes, much like cocoa-nut fibre, which nearly half fills the second stomach. This second stomach is globose, and nearly an inch in external diameter. Its dense lining-membrane is raised into short rugæ and tubercles, as is that of the first; and it is evidently a modification of the epithelium which develops these tubercles in the region of the pylorus which gives rise to the above-mentioned mat-sieve. The hairs composing the mat are hispid, slender, and about half an inch long. They arise from a surface a little less than a square inch in area round the pylorus, which is in its centre. They cease at the very margin of the small circular orifice, where the commencement of the delicate mucous membrane of the duodenum can be just seen. My friend, Mr. E. A. Schäfer, Assistant Professor of Physiology at University College, has very kindly examined these hairs microscopically, and tells me that "they are much more like true hairs, both in structure and mode of attachment, than they are like the epithelial projections which are so often met with over the filiform papillæ of the human tongue, which, at first sight, they much resemble. Like hairs, they consist of an outer 'cuticular' part, and an inner 'fibrous' part; and in some places there is also yet another substance running along the middle of the fibrous part, which might be compared to the medulla of a hair. The cuticular part is much thicker in proportion than that of a cutaneous hair, and forms here and there dentate projections at the sides of the filament. The cuticle is continuous with the horny superficial portion of the stratified epithelium which covers this part of the stomach; in neither can the outlines and nuclei of the component cells be distinctly seen, the cells having blended into a nearly homogeneous substance. That portion of the hair which extends below this into the deeper layers of the epithelium, appears not to be covered with a prolongation of the cuticle, but to be formed only of the fibrous part. This last-named seems, like the fibrous or cortical constituent of a cutaneous hair, to be composed of a closely set bundle of much elongated cornified epithelial cells, slightly larger than those of a cutaneous hair, and with their extremities not fusiform (as in that) but truncated. The number in a cross section varies according to the size of the filament. They may, in many, be seen projecting at the end a little beyond the cuticular part.

"The roots of the gastric hairs are so closely set as to occupy the greater portion of the mucous membrane, so that the connective

tissue of the corium, which occupies the intermediate space, is very small in amount. Between the tissue and the hair-root is seen a layer of columnar epithelium cells, which in some places are of considerable length. They are continuous towards the surface with the deeper cells of the stratified epithelium. They represent the 'root-sheaths' of the cutaneous hair, and seem to have undergone a horny metamorphosis.

"At their extreme ends the roots are entirely different from those of the cutaneous hairs. There is no hair-knob and no papilla; but the root generally breaks up into two, three, or more short rootlets, each of which tapers to a pointed extremity. This, at least, is the appearance in vertical section; but transverse sections show that this branching of the hair-root has, at all events in the first instance, more of a laminated character.

"These rootlets are covered by a layer of cubical epithelium cells, which are continuous with the columnar cells surrounding the hair-root. The latter, as before remarked, is formed merely by the fibrous substance or cortical portion of the hair; and the fibres which compose this would therefore seem to be in some way produced by these cells.

"Some few hairs seem to end by a single tapering rootlet, but most of them spread out and branch in the way described."

This peculiar hairy mat must act as an excellent sieve to prevent the entrance of solid particles, fish-bones, &c. into the narrow intestines.

The small intestine is 55 inches long in the female, and 40 inches in the male; and it is not capacious. The duodenal loop measures 5 inches in each limb. The left lobe of the bilobed liver is about half the size of the right; and a gall-bladder of considerable size is present. The large intestine is 6 inches long in the female, and 3 inches in the male. There is only a single cæcum, exactly like that in the Ardeidæ, in my specimens. This conformation of cæcum is found in no other Steganopod bird, there being two cæca in all the other genera. These, in *Pelecanus*, are a little over an inch in length, in *Sula* slightly shorter, whilst in *Phalacrocorax*, *Fregata*, and *Phaëthon* they are simple knob-like bodies, nearly globose in form. The rudiment of the vitelline duct is persistent.

In the distance of its diminutive cæcum from the cloaca (in other words, in the length of the large intestine) *Plotus* differs slightly from its allies. In *Pelecanus* the large intestine is under 2 inches in length; and it is much the same in *Sula*. In *Phaëthon* it does not exceed a quarter of an inch in length. It, however, differs considerably in my two specimens, being in both longer than the same in Audubon's specimen.

In the urino-genital system of *Plotus anhinga*, in both sexes, the ducts open in the normal manner into the cloaca, just above its lower orifice. This orifice, however, is not on the surface, but is into a cavity, behind the cloaca, which opens externally quite close to the place where the two communicate. Except for this nearly marginal orifice the second cavity is a cæcal sac, oval in shape, and about

1½ inch high, covered at its blind end with the crypts of shallow glands, which also run down its sides. That it is a modification of the *bursa Fabricii* cannot be doubted.

## EXPLANATION OF THE PLATES.

## PLATE XXVI.

- Fig. 1. View of left side of neck of *Plotus ankinga*, dissected. *l.c.a.* longus colli anterior muscle; *l.c.p.* longus colli posterior muscle. The fibrous representative of Donitz's bridge is seen attached to the ninth cervical vertebra.
2. View of part of the posterior region of the neck of *Plotus ankinga*. The roman figures refer to the cervical vertebræ counted from the head. Donitz's bridge is seen attached to the ninth; and at *a* is also seen a fibrous band, which is of similar function, attached to the eleventh. At *b* is seen the fasciculus of the tendon of the posterior neck-muscle which traverses the fibrous loop, which latter has been removed on the left side.

## PLATE XXVII.

View of the anterior thoracic region of *Plotus ankinga*, dissected to show the superficial (*p. 1, 1*) and deep layer (*p. 1, 2*) of the pectoralis major muscle on the right side, as well as the pectoralis minor (*p. 2*) on the left. The insertion of the deeper layer of the pectoralis major is seen to be surrounded by the much more considerable mass of the similar portion of the superficial stronger layer. The triceps (*t*) and the biceps (*b*) of the cubitus are seen on the right side, as is the patagial slip (*b. s*) of the latter. The sternum (*st.*) is superficially bound to the lower end of the coracoid bone by the anterior sterno-coracoid ligament (*ant. st. cor. lig.*), which is particularly powerful in the Steganopods and Storks.

## PLATE XXVIII.

- Fig. 1. View of top of head of *Plotus ankinga*, showing the occipital style (*a*) and the temporal muscle (*t*) arising from it on one side.
2. Stomach of *Plotus ankinga*, inside view.
3. Anterior view of the lower end of the trachea in *Plotus ankinga*.
4. The same in *Sula bassana*.
- 5 & 6. Top and side view of the patella in *Phalacrocorax carbo*, showing the canal for the ambiens muscle. *N.B.* The side view (fig. 6) is accidentally drawn with the base uppermost.
7. Front of patella in *Plotus ankinga* deeply grooved by ambiens muscle.

## 2. Remarks on a Hybrid between the Black Grouse and the Hazel Grouse. By H. E. DRESSER, F.Z.S.

Amongst the Gallinaceous birds, and especially amongst the Ducks, we not unfrequently find wild hybrids; and not a few of these hybrids have during the last year or two been exhibited at the meetings of this Society—but none, I may almost venture to say, so interesting as the bird I have now the pleasure to exhibit before the meeting; for there can be no doubt that it is a wild cross between the Black Grouse (*Tetrao tetrax*) and the Hazel Grouse (*Bonasa betulina*), a cross that has, so far as I can ascertain, never yet been recorded. The *Rachelvogel* of the Swedes, the hybrid between the Capercailly and the Black Grouse, is by no means uncommon, especially in places where the males of the Capercailly have been

shot off; and I have seen several interesting hybrids between the Black Grouse and the Willow Grouse. Mr. Collett names an instance of a male Willow Grouse having been seen to pair with a barndoor Fowl; and I have heard of the Black Grouse crossing with the Red Grouse; but I have never seen a specimen of a hybrid between these two; and I may add that I can find no record in the works of the Scandinavian authors of a hybrid between the Hazel Grouse and the Black Grouse having hitherto been met with. The specimen exhibited belongs to John Flower, Esq., F.Z.S., who has intrusted it to me for examination and exhibition, and who gives me the following particulars respecting it:—

“I bought this bird of W. Smithers, poulterer, near the Cannon-Street Railway Station, on March 16, 1876. It had passed through several hands before it came to Mr. Smithers; and all that I have as yet been able to learn of its past history is that it came from Norway. Some one who has had the bird seems to have been aware that it was something out of the common, as I found a piece of cotton wool had been placed in the œsophagus, no doubt to prevent the feathers being soiled by the escape of matter through the mouth; and judging from its appearance, the wool had been there some considerable time.

“The weight of the bird, which was in very fair condition, was a trifle over 1 lb. 9 oz. The weight of a grey hen, which I weighed for the purpose of comparison, I found to be 1 lb. 10 $\frac{3}{4}$  oz.

“On dissection the hybrid proved to be a male. The intestines and cæca were as nearly as possible exactly like those of the grey hen, except that the intestine of the hybrid (measured from the gizzard to the lower end of the cæca) was 3 inches shorter than in the grey hen, the length between these points being, for the grey hen 54 inches, for the hybrid 51 inches. The length of the cæca in both was 24 inches.

“The crop was empty; but the gizzard contained a quantity of small stones, most of them of white quartz, and a quantity of twigs and vegetable matter, including one bud of a birch catkin. I turned the contents of the gizzard out into a small basin of warm water; and these, when stirred, emitted rather a sweet aromatic smell, which must have arisen from the vegetable matter which the bird had eaten.

“Thinking something might be learnt from the colour of the pectoral muscles when cooked, I had the muscles of the hybrid and of the grey hen baked. Those of the grey hen then presented the usual contrast characteristic of the Black Grouse; but the muscles of the hybrid were nearly white, the lower muscle being slightly brighter in colour than the upper one. The flesh of the hybrid was much inferior in flavour to that of the black Grouse, being rather dry and tasteless, much like the flesh of a red-legged Partridge. I have preserved the breast-bone and pelvis; and they accompany this memorandum.”

I may remark that, so far as my own experience goes, and from what I have ascertained from the various Swedish and Russian





sportsmen who have had ample opportunities of studying the habits of the Hazel Grouse, it is always monogamous, and that when paired the pair remain strictly faithful to each other. Therefore I have never heard of a Hazel cock having been seen at a "lek" of the Black Grouse, though the male Willow Grouse has been known to attend there, and to take ample advantage of his opportunities. I can only surmise that the present hybrid has been the result of a Hazel cock which had failed in finding a mate, having paired with some Grey Hen met with during his solitary wanderings.

3. On the Genus *Dasyprocta*; with Description of a New Species. By EDWARD R. ALSTON, F.L.S., F.G.S., F.Z.S.

[Received March 11, 1876.]

(Plate XXIX.)

My attention has been lately turned to the Mammals of Central America; and I have hence been led to review all the known species of the genus *Dasyprocta*, concerning the characters and distribution of which a good deal of confusion has existed. Through the kindness of Mr. Selater and Dr. Günther I have been enabled to compare the skins of a number of Agoutis which have died from time to time in the Society's Gardens with the specimens in the British Museum, and believe that I am now able to arrange the various forms with some approach to general correctness.

The range of the genus *Dasyprocta* extends throughout a considerable part of the Neotropical Region, from the Antilles and Mexico in the north to Brazil and Paraguay in the south. Within these limits there exist a number of well-marked but nearly allied geographical races, of which eight or nine appear to deserve specific distinction. As might be expected in such closely related forms, I have been unable to find any constant cranial distinctions, and have been compelled to depend on outward characters, of which I have found the coloration of the long hairs of the rump to be the most trustworthy. Owing to the confusion which has existed as to some of these species, and to the carelessness of collectors and museum-curators as to locality, it is very difficult to make out the exact distribution of the various races of Agouti; but I have endeavoured to note what little information we possess.

The following, then, is the principal synonymy, with brief diagnoses and habitats, of the various Agoutis, beginning with a well-marked species, which appears never to have been described, and which I propose to call:—

1. DASYPROCTA ISTHMICA, sp. n.

Fur ringed with black and yellow; rump black, more or less washed with orange or yellow, the long hairs being black at the base, scarcely annulated except close to the tips, which are broadly

margined with the light colour; feet dusky. Length about 22 in., hind foot 4.25 in.

*Hab.* Central America.

This Agouti is at once distinguished from all the others which have black and yellow annulated fur, by the long hairs of the rump being black with broad pale tips. Seven or eight individuals of both sexes agree in all essential characters, but differ slightly in the colour of the tips of the long hairs, and consequently in the general colour of the rump. The exact distribution of the species is still uncertain. Several living examples have been received from Colon by the Society, which have hitherto been referred to *D. punctata*\*; and it appears probable that the Agouti of Costa Rica which Dr. von Frantzius calls *D. cristata*† will prove to be the same.

### 2. *D. CRISTATA*.

*Cavia cristata* (Geoffroy), Desmarest, *Nouv. Dict. d'Hist. Nat.* i. p. 215 (1816, descr. orig.).

*Dasyprocta cristata*, Desmarest, *Mamm.* p. 358; Waterhouse, *Mamm.* ii. p. 383; Wagner, *Suppl. Schreb. Säugeth.* iv. p. 41.

*Dasyprocta antillensis*, Selater, *P. Z. S.* 1874, p. 666, pl. lxxxii (descr. orig.).

Fur very dark, ringed with black and reddish or brownish yellow, nuchal tuft and rump black, the long hairs either dusky or obscurely ringed at the base. Length about 18 in.; hind foot 3.75 in.

*Hab.* West Indies.

The West-Indian Agouti for which Mr. Selater proposed the provisional name of *D. antillensis*, is identical with the specimens which Mr. Waterhouse identified with Desmarest's *D. cristata*, and seems to agree perfectly with the original descriptions. The phrase *pelage noirâtre, piqueté de roux*, is particularly characteristic; and I am convinced that Mr. Waterhouse was correct, although the figure in F. Cuvier and Geoffroy's 'Mammifères' (iii. livr. 52) gives the idea of a lighter animal. The species was founded on a pair of Agoutis in the Jardin des Plantes, which were said to have been received from Surinam. There can be little doubt, however, that this was an error, and that the species is a strictly insular race. The Society has received living specimens from St. Vincent and St. Lucia; and there are skins from St. Thomas in the British Museum. In one example from the first-named island, the hairs of the rump are obscurely ringed at the base, and the nuchal crest is but little developed.

### 3. *D. VARIEGATA*.

*Dasyprocta variegata*, Von Tschudi, *Faun. Peru.* p. 190, pl. xvi. (1844, descr. orig.).

Fur dusky at base, black, ringed with pale yellow only near the tip, the long hairs of the nape and rump entirely black, or with a narrow pure white ring near the tip. Length about 22 inches, hind foot 4 inches.

*Hab.* Peru, New Granada, Panama?

\* Cf. Selater, *P. Z. S.* 1874, p. 666. † Cf. Wiegman, *Arch.* 1869, p. 274.

Mr. Waterhouse united the Peruvian Agouti with *D. cristata*; but it is a well-marked species, easily distinguishable by the fur being annulated only near the tip. According to Von Tschudi it inhabits the forests and "ceja" regions of Eastern Peru, to an altitude of 6000 feet above the sea. The Society has received living specimens from Colon, the exact locality of which is uncertain; and Mr. E. Gerrard, Jun., has kindly lent me two fine examples collected by Mr. Salmon at Medellin, near Antioquia, New Granada. It is probable that the Agouti obtained by Mr. Fraser, at Palhatanga, Equador, which Mr. Tomes referred to *D. caudata* (*D. azaræ*)\* was really of this species.

#### 4. *D. FULIGINOSA.*

*Dasyprocta fuliginosa*, Wagler, Isis, 1832, p. 1220 (descr. orig.); Waterhouse, Mamm. ii. p. 385.

*Dasyprocta nigricans* (Natterer), Wagner, Wieg. Arch. 1842, p. 362 (descr. orig.); Wagner, Suppl. Schreb. Säugeth. iv. p. 46.

*Dasyprocta nigra*, Gray, Ann. Nat. Hist. x. p. 264 (1842, descr. orig.), Voy. 'Sulphur,' p. 36, pl. xvi.

Fur ringed with brownish or sooty black and pure white; rump hoary, the very long and soft hairs being broadly tipped and often ringed at the base with white. Length about 23 inches; hind foot 4.75 inches.

*Hab.* Amazonia; Peru; Ecuador†.

Wagner and Waterhouse have shown that the above are merely synonyms of this large dark species. Wagler described it from specimens collected on the Brazilian Amazons; and Natterer obtained it at Borba and on the Rio Negro. Mr. Selater has a skin collected by Mr. E. Bartlett, at Chamicuros, on the Peruvian Amazons; and a specimen obtained in Ecuador, by Mr. Fraser, was referred to this species by Mr. Tomes.

#### 5. *D. MEXICANA.*

*Dasyprocta mexicana*, De Saussure, Rev. et Mag. de Zool. (2<sup>e</sup> sér.), xii. p. 53 (1860, descr. orig.).

Fur ringed with black and pure white, the rump black, the long hairs being black throughout their length, throat and belly almost white. Average length 17 inches; hind foot 3.50 inches.

*Hab.* Mexico.

As remarked by its first describer, this species most resembles *D. fuliginosa*. It differs, however, in its much smaller size, its darker coloration, and in the less elongated hairs of the rump being black throughout from the base to the tip. It is a native of the "hot zone" of Mexico; and a specimen is now living in the Society's Gardens, presented by Mr. Marckmann de Lichtabel, in February 1874‡.

#### 6. *D. AZARÆ.* (Plate XXIX.)

\* *Dasyprocta azaræ*, Lichtenstein, Doubl. Zool. Mus. Berl. p. 3

\* P. Z. S. 1860, p. 216.

† Cf. P. Z. S. 1860, p. 216.

‡ Cf. P. Z. S. 1874, p. 683.

(1823, descr. orig.); Wagner, Suppl. Schreb. Säugeth. iv. p. 38; Waterhouse, Mamm. ii. p. 387.

*Dasyprocta caudata*, Lund, K. Dansk. Vidensk. viii. p. 297 (1841, descr. orig.).

Fur ringed with black and yellow, nearly uniform throughout, slightly darker on the back and often hoary on the rump; the long hairs ringed to the base; throat and breast pure yellow. Length 20 inches; hind foot 3.30.

*Hab.* S. Brazil, Paraguay, Bolivia.

This is the most southern species of Agouti, replacing the more northern *N. aguti* in the province of St. Paulo, Brazil, where Natterer found it in great numbers. If Wagner is right, however, in uniting Lund's *D. caudata* with the present species, its range extends a little further north, into the Province of Minas Geraes. Southwards it is found, according to Dr. Burmeister, throughout southern Brazil and Paraguay, but does not extend beyond the Rio de la Plata\*. In Bolivia, Mr. Waterhouse says that it was found by Mr. Bridges, near Santa Cruz de la Sierra, where it is called *Hoche colorado* by the inhabitants.

As I hope to have another opportunity of figuring the Central-American Agoutis, I have chosen this species, of which I am not acquainted with any good representation, as the subject of the accompanying Plate (Plate XXIX.).

#### 7. *D. PUNCTATA*.

*Dasyprocta punctata*, Gray, Ann. Nat. Hist. x. p. 264 (1842, descr. orig.), Voy. 'Sulphur,' p. 36, pl. xv.

Fur ringed with black, and either bright rufous or yellow, uniform throughout, hairs of rump scarcely elongated, ringed to the base; breast and lower parts also annulated, except a pale median line on the abdomen. Length about 22 inches; hind foot 4 inches.

*Hab.* Guatemala, Costa Rica.

Skins collected by Mr. Salvin in Guatemala differ much in ruddiness, from a bright chestnut to a pale yellow. The latter agree exactly with the types of Gray's *D. punctata* (from "Tropical America"). They so much resemble *D. azaræ* that one might be inclined to follow Wagner and Waterhouse in uniting them, were it not for the vast difference in their geographical position†. Even the pale examples of *D. punctata* may be always distinguished from the Brazilian form by the larger size, the still more uniform coloration, and the annulation of the fur on the chest; and I have never seen a specimen of *D. azaræ* which showed a trace of the rich ruddy tints which seem to be normal in the Guatemalan form. The Society has also received this species from Costa Rica.

#### 8. *D. AGUTI*.

*Mus aguti*, Linnæus, Syst. Nat. i. p. 80 (1766, descr. orig.).

\* *Thiere Brasil*, p. 233.

† *Cf.* Mr. Salvin's remarks on some analogous facts in the distribution of birds (*Ibis*, 1872, pp. 147-152).

*Dasyprocta aguti*, Desmarest, Mamm. p. 358; F. Cuvier et Geoffroy, Mamm. iii. 3<sup>me</sup> liv.; Waterhouse, Mamm. ii. p. 376; Wagner, Suppl. Schreb. Säugeth. iv. p. 42.

Fur ringed with black and yellow; rump bright yellow or orange, the long hairs pale yellow at their base, and only obscurely ringed near the tip. Length about 20 inches.

Guiana, N. Brazil, E. Peru.

The range of the Yellow-rumped Agouti is particularly difficult to make out, as its specific name has been applied to almost every member of the genus. It extends, however, from British Guiana, where Schomburgk\* says it is extremely common, through North Brazil, where Natterer collected specimens near the junction of the Madeira and Amazons, to Eastern Peru. In the latter country Von Tschudi says that it inhabits the plains, and does not go up into the mountains like *D. fuliginosa*.

#### 9. D. PRYMNOLOPHA.

*Dasyprocta prymnolopha*, Wagler, Isis, 1831, p. 619 (descr. orig.); Wagner, Suppl. Schreb. Säugeth. iv. p. 46; Waterhouse, Mamm. ii. p. 380.

Fur ringed with black and yellow; nuchal crest and a longitudinal band on the rump black, sides of the rump rich golden orange or rufous; the long black hair uniform in colour, or light yellow at the base. Length about 20 inches; hind foot 3.75.

*Hab.* Guiana.

Of the distribution of this most beautiful species I have been unable to learn any thing beyond the fact of its being a native of Guiana. It is probably a more northern race than the last, and may extend into Venezuela. Many examples are now living in the Society's Gardens.

#### 10. D. ACOUCHY.

*Cavia acouchy*, Erxleben, Syst. Reg. An. p. 354 (1777, descr. orig.).

*Dasyprocta acouchy*, Desmarest, Mamm. ii. p. 358; Wagner, Suppl. Schreb. Säugeth. iv. p. 48; Waterhouse, Mamm. ii. p. 391.

Fur ringed with dark brown and rufous, upper parts darker, lower parts and a spot behind each ear bright rufous or yellow. Tail produced, slender, slightly haired. Length about 14 inches, tail 2 inches, hind foot 3 inches.

*Hab.* Guiana, N. Brazil.

This little species, easily distinguished from all the rest by its having a complete tail, instead of merely a tuberculous rudiment, is abundant in Guiana and North Brazil; but I have been unable to find any proof of the often repeated assertion that it is also met with in some of the West-Indian Islands. Probably it has been confused with *D. cristata*.

Of the remaining described species, *D. croconota*, Wagler (Isis

\* Reisen in Brit. Guiana, iii. p. 779.

1831, p. 618), appears to have been founded on an individual variation of *D. aguti* with white incisors; *D. albida*, Gray (Ann. Nat. Hist. x. p. 264) is probably, as Mr. Sclater has suggested\*, an accidental variety of the Antillean Agouti which I have here referred to *D. cristata*; and, finally, Mr. Waterhouse was no doubt correct in regarding "*D. leptura*, Natterer" (Wagner, Schreb. Säug. iv. p. 49) and *D. exilis*, Wagler (Isis, 1831, p. 619), as being merely synonyms of *D. acouchi*.

4. On new Species of Bolivian Birds. By P. L. SCLATER, M.A., Ph. D., F.R.S., and OSBERT SALVIN, M.A., F.R.S.

[Received April 3, 1876.]

(Plates XXX.—XXXIII.)

The following new species of birds are founded on specimens contained in a collection recently formed in Bolivia by Mr. C. Buckley. Nearly the whole of this collection was made in the province of Yungas, in a forest-clad spur of the Andes which extends in a northeasterly direction between the Rio de la Paz and the Rio Coroico, affluents of the Rio Beni and then of the great tributary of the Amazon the Rio Madeira. Mr. Buckley's head quarters in this district was a place called Tilotilo, a mere group of Ranchos not indicated on any map. The country he explored included a great range of elevation, extending from about 3000 feet to 12000 feet above the sea-level, and consequently considerable variation of climate and vegetation, the rich forests so characteristic of the eastern slopes of the Andes forming the chief feature. The collection, which contains between 400 and 500 skins of about 194 species, has passed into the hands of Messrs. Salvin and Godman. The following are the species in it which we consider to be undescribed.

1. CATHARUS MENTALIS, sp. nov.

*Supra saturate fumoso-brunneus unicolor, alis caudaque paulo obscurioribus: subtus schistaceus medialiter dilutior, ventre medio fere albo; mento et gula cum genis brunneo indutis: rostro aurantiaco; pedibus pallide corylinis: long. tota 6·5, alæ 3·3, caudæ 3·2, tarsi 1·3, rostri 0·95.*

*Hab.* "Suape" prope "Tilotilo" prov. Yungas, Bolivia.

*Obs.* Similis *C. fuscato*, sed mento brunnescente et colore corporis superi fuscescentiore distinguendus.

2. BASILEUTERUS EUOPHRYS, sp. nov.

*Supra olivaceo-viridis unicolor: superciliis latis et corpore subtus flavis: loris, pileo medio et regione oculari nigris: rostro nigro: pedibus pallidis: long. tota 5·5, alæ 2·7, caudæ 2·6, tarsi 0·95,*

\* P. Z. S. 1874, p. 666.



1



2

J.Smit del. et lith

M. J. H. ...

1. CALLISTE FULVICERVIX  
 2. CALLISTE ARGYROPHANES





J Smit del. et lith

M & N Hanhart imp

MALACOTHRAUPIS DENTATA





J. Smit del. et lith.

$\frac{1}{2}$

LATHRIA UROPIGIALIS

M & N Hanhart imp.



2



J. Smit del. et lith.

M. & N. Hanhart imp.

THAMNOPHILUS SUBFASCIATUS, 1♂, 2♀



*rostri a rictu 0·67. Fem. mari similis, sed pileo et loris  
vix nigricantibus.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* *B. nigri-cristato* affinis, sed superciliis latis et elongatis  
diversus.

3. *MALACOTHPRAUPIS DENTATA*, sp. et gen. nov. (Plate XXXI.)

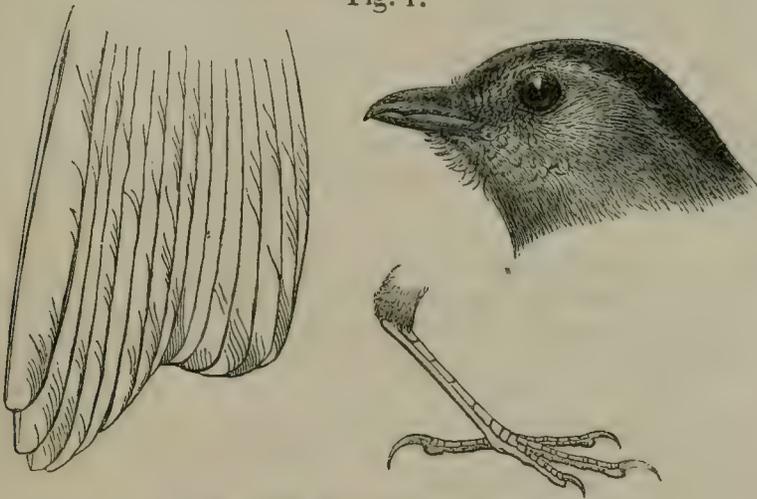
*Malacothraupis, gen. nov. ex familia Tanagridarum, generi Lanioni  
affine, sed rostro crassiore et minus elongato et alis brevioribus  
distinguendum: rostrum medialiter dentatum et ad apicem  
uncinatum: setæ rictales vix ullæ: alæ breviusculæ, rotundatæ,  
remigibus iii<sup>to</sup> iv<sup>to</sup> et v<sup>to</sup> fere æqualibus et longissimis, primo  
quam septimus paulo brevior: pedes modici: cauda paulum  
elongata.*

*Sp. unica M. dentata.*

*Supra cinerea, pileo paulo obscuriore superciliis angustis albis:  
alis et cauda nigricantibus cinereo limbatis: subtus clare  
castanea, mento et abdomine medio albis: crisso cinereo ad-  
umbrato: rostro superiore nigricante, inferiore fusco, pedibus  
obscure plumbeis.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

Fig. 1.



Head, wing, and foot of *M. dentata*.

4. *CALLISTE PUNCTULATA*, sp. nov.

*Supra late viridis, plumarum centris nigris quasi punctata: alis  
caudaque nigris viridi limbatis: subtus alba, nigro guttata,  
ventre medio pure albo: hypochondriis et crisso aureo indutis:  
rostro et pedibus nigris: long. tota 4·5, alæ 2·5, caudæ 2·0.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Species, sicut in *C. guttata*, subtus distincte maculata, sed  
ab hac colore capitis nitore aureo omnino carente diversa, et ideo  
magis ad *C. punctatam* appropinquans.

5. *CALLISTE FULVICERVIX*, sp. nov. (Plate XXX. fig. 1.)

*Cærulea: alis caudaque nigris cæruleo limbatis: ventre medio crissoque albis ochraceo tinctis: loris nigris: fascia trans nucham angusta stramineo-fulva: subalaribus albis: rostro nigro; pedibus fuscis: long. tota 4.3, alæ 2.9, caudæ 1.9.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Species *C. ruficervici* affinis, sed colore corporis puriore cæruleo, pileo quoque et cervice postica cæruleis pectori concoloribus, neque nigris distinguenda.

6. *CALLISTE ARGYROFENGES*, sp. nov. (Plate XXX. fig. 2.)

*Supra nitide stramineo-flava, pileo alis et cauda sericeo-nigris: subtus abdomine nigro, lateribus stramineo-flavis, et gula argenteo-viridi insignis: subalaribus nigris: rostro et pedibus nigris: long. tota 4.5, alæ 2.8, caudæ 1.9.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Proxima *C. argenteæ*, sed alis omnino nigris, gula viridescentiore et dorso flavescentiore sane diversa.

7. *CHLOROSPINGUS CALOPHRYS*, sp. nov.

*Supra olivaceo-viridis, pileo cum nucha et capitis lateribus nigris: fronte et superciliis latis et elongatis aurantiacis: subtus flavus, gutture aurantiaco, lateribus in olivaceum trahentibus: rostro plumbeo, tomis pallidis: pedibus pallide fuscis: long. tota 5.5, alæ 2.65.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Proxima *C. auriculari* ex Peruvia, sed ab hoc, item ab affini *C. atripileo* ex Columbia, superciliis aurantiacis gula concoloribus diversus.

8. *CYANOCORAX NIGRICEPS*, sp. nov.

*Cineraceo-violaceus, capite undique cum gula et cervice antica nigris: remigibus intus cineraceis: cauda supra cærulea, subtus nigricante: rostro et pedibus nigris: long. tota 1.30, alæ 7.5, caudæ 6.5.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Similis *C. cyanomelani* ex Paraguaya, sed capite nigro et rostro crassiore satis diversus.

9. *OCHTHODIÆTA FUSCORUFUS*, sp. nov.

*Supra fumoso-brunneus unicolor; alis caudaque nigricantibus, secundariorum marginibus externis et tectricum minorum et majorum fascia apicali necnon reetricis extimæ margine exteriori clare rufis, remigum omnium pogoniis internis nisi apud apices et reetricum omnium marginibus internis cum corpore toto subtus ferrugineo-rufis: gula albicante, fusco obsolete striolata: rostro et pedibus nigris: long. tota 7.0, alæ 4.1, caudæ 3.2, tarsi 0.9.*

*Hab.* Tilotilo, prov. Yungas, Bolivia, et Peruvia int.

*Obs.* Species *Ochthodiætæ* et *Ochthæcæ* generibus quasi inter-

media, cum illo melius congruere videtur: habitus fere sicut *O. fumigati*, sed rostro brevior, et quoad colores corpore subtus ferrugineo primo visu distinguenda.

Besides the Bolivian example, we have a specimen of this same species obtained by Mr. Whitely, at Paucartambo, in Peru, in January 1874.

10. *OCHTHÆCA PULCHELLA*, sp. nov.

*Supra cinerea, dorso postico rufescente: loris et superciliis angustis citrino-flavis, fronte pileo concolori: alis et cauda fuscis, secundariorum marginibus externis et tectricum majorum et minorum apicibus clare rufis: subtus dilutius cinerea, ventre medio albicantiore, hypochondriis rufescentibus: rostro fusco, subtus ad basin albicante: pedibus nigris: long. tota 4·5, alæ 2·4, caudæ 2·0.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Species forma et ptilosi *O. citrinifrontis*, ex Æquatoria, sed fronte non flava et alis rufo bifasciatis distinguenda.

11. *ANÆRETES FLAVIROSTRIS*, sp. nov.

*Supra cineraceo-olivaceus, fronte et lateribus capitis nigro striolatis, pilei plumis ad basin albis, crista tenui elongata nigra terminatis: alis nigris, secundariorum et tectricum alarium marginibus latis distincte albis: cauda nigra, rectricis utrinque extimæ pogonio externo toto et ceterarum, nisi in mediis, apicibus angustis albis: subtus pallide citrino-flavicans, gula et pectore toto albo et nigro confertim flammulato: rostro ad basin aurantiaco, ad apicem nigricante: pedibus nigris: long. tota 4·0, alæ 2·1, caudæ 2·2.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Species *A. parulo* proxima, sed flammulis pectoris latioribus, tectricum fasciis albis distinctis et rostro ad basin aurantiaco diversa.

Slater's collection contains a worn specimen of this species collected in Bolivia by Bridges, which has been hitherto referred to *A. parulus*.

12. *LATHRIA UROPYGIALIS*, sp. nov. (Plate XXXII.)

*Supra cinerea unicolor, alis caudaque obscurioribus; uropygio late castaneo: subtus dilutior, hypochondriis et ventre imo cum crisso castaneo-rufis: alarum remigibus primariis externis in mare valde acuminatis et extrorsum versis, in femina paulum acuminatis: rostro corneo, pedibus nigris: long. tota 10·5, alæ 5·5, caudæ 5·6.*

*Hab.* Tilotilo, ad alt. 8000 ped., Bolivia.

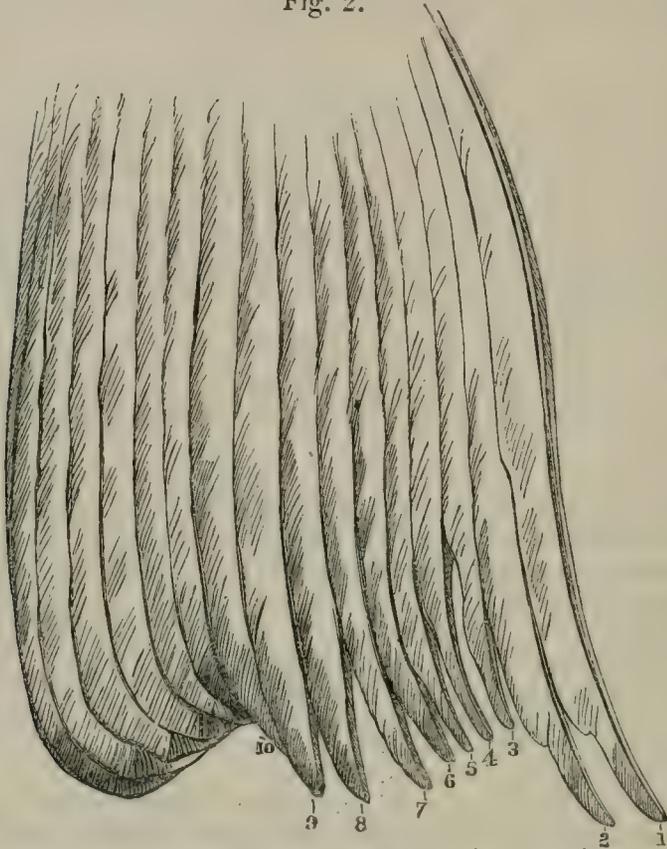
*Obs.* Species remigum forma abnormali insignissima, crassitie et habitu generali *L. fuscocinereæ* prædita.

The structure of the wing of this species is of so remarkable a character that it deserves a more lengthened notice.

As will be seen by the figure, the inner web of the first primary of the male of *L. uropygialis* begins to be slightly attenuated at

about two thirds of its distance from the base : at about half an inch from the extremity it is still further reduced by more than one half, and at the same time curved gently outwards. The second primary

Fig. 2.



Primaries of *Lathria uropygialis*, from inside.

is very similar to the first, and nearly of the same length. The third, fourth, and fifth are still more abnormally attenuated, and .6 inch shorter than the first two. They are nearly of equal length ; but the third is slightly shorter than the fourth, and this than the fifth. The sixth primary is rather more normal in appearance, and a little longer than the fifth. The seventh, eighth and ninth are nearly equal in length and, next to the first and second, the longest in the wing. They are pointed at their extremities and but slightly turned outwards. The tenth and last primary is normal throughout : except at the end, which is pointed ; its outward curve is very slight. Besides this abnormality, the inner web of each primary is slightly turned upwards along its margin, so as to clasp the shaft of the next succeeding primary when the wing is expanded. The barbules, also, of the outer webs of the primaries from the fourth to the seventh inclusive, terminate in fine filaments.

This structure is the same in two specimens of this singular bird, which are, no doubt, males. In another, which we take to be a

female, the structure is much more normal. The primaries gradually increase in length from the first to the fifth, sixth, and seventh, which are nearly equal and longest. They have but a slight outward curvature at the extremities; and the inner webs are comparatively but slightly reduced.

In *L. fusco-cinerea*, which in general size and structure comes nearest to the present bird, the primaries are normal throughout, and show none of these peculiarities.

This singular wing-structure is worthy of at least a subgeneric distinction; and we suggest the term *Chirocylla*\* as indicative of it.

13. *GRALLARIA ERYTHROTIS*, sp. nov.

*Supra obscure olivacea, cinereo tincta: subtus valde dilutior et rufescente lavata, ventre medio pæne albo: regione auriculari vivide rufa, fronte et superciliis hoc colore tinctis: rostro nigro, ad apicem albicante, pedibus clare corylinis: long. tota 6.0, alæ 3.5, caudæ 2.0, tarsi 2.0.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Species forma et statura omnino *G. monticolæ*, sed regione auriculari rufa distinguenda.

14. *THAMNOPHILUS SUBFASCIATUS*, sp. nov. (Plate XXXIII.)

*Supra cinereus olivaceo tinctus, pileo et alis extus rufis: subtus cinereus, pectore toto et ventre medio albo et nigro confertim transfasciatis: cauda nigra, rectricum pogoniis internis albo transfasciatis: subalaribus et remigum marginibus internis ochraceis: rostro corneo, pedibus nigris: long. tota 5.5, alæ 2.7, caudæ 2.6.*

*Fem. Rufescenti-cinerea, pileo, alis extus et cauda rufis: subtus ochraceo-rufescens unicolor.*

*Hab.* Tilotilo, prov. Yungas, Bolivia.

*Obs.* Sp. *Th. argentino* maxime affinis, sed fasciis pectoris nigris latioribus et crebrioribus, rostro fortiore et colore feminæ diversa.

15. *ASTURINA SATURATA*, sp. nov.

*Supra fusca, dorsi plumis et scapularibus intus pallidiore fusco vel ferrugineo transfasciatis: capite toto fusco-nigro, gula concolori, albido vix striato: subtus præcipue in pectore saturate rufa, abdomine toto et tibiis pallido ferrugineo transfasciatis: crisso fulvo, fere unicolori: remigibus primariis rufis, nigro transfasciatis, intus in pogonio interiore fulvescenti-albis, apicibus fusco-nigris: cauda rufescenti-fusca, subtus dilutiore nigro trivittata; rectrice una utrinque extrema basin versus fasciis duabus angustis alteris notata: rostro nigro, cera et pedibus flavis: long. tota 15.0, alæ 10.0, caudæ 7.0, rostri a rictu 1.25, tarsi 2.55.*

*Hab.* Apollo et Tilotilo, Bolivia.

*Obs.* *A. nattereri* forsan proxima, sed capite nigrescentiore et fasciis caudæ pallidis distincte ferrugineis diversa.

\* *Χειρ, manus, et κυλλός, curvus.*

This Bolivian race of *Asturina* seems to be separable from the form already recognized, by its combination of the characters of several of its allies. The tail is like that of the Central-American *A. ruficauda*, from which, however, it differs in the dark head and rufous chest. The underparts resemble those of *A. nattereri*; but the head is darker, and the tail is differently coloured. *A. pucherani* differs from the present bird in the lighter, almost creamy, colour of the underparts and primaries.

A recent examination in the Paris Museum of the specimens referred to as *Astur magnirostris* by D'Orbigny (Syn. Av. p. 5; and Voy. p. 91) proves them to belong to *Asturina pucherani* as defined in our synopsis of the genus *Asturina* (P. Z. S. 1869, p. 133, and Exot. Orn. p. 177, t. 89); though from D'Orbigny's remarks upon them we were previously in some doubt on this point.

5. A Revision of the Neotropical Anatidæ. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.R.S.

[Received April 4, 1876.]

(Plate XXXIV.)

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IV. Table of their geographical distribution and remarks thereon...	409

I. INTRODUCTION.

The greater part of this paper was written before the issue of the 'Nomenclator Avium Neotropicalium' in 1873; and the systematic arrangement of the genera and species of Anatidæ adopted in the 'Nomenclator' was taken from the MS., which was laid aside unfinished in consequence of the pressure of other matters. It has now been thought desirable to complete it for publication, in order to show the ground upon which certain species were included in the list, and in order to give a more complete account of the geographical distribution of the South-American Anatidæ than has yet appeared. Certain necessary changes in the nomenclature have been introduced.

As only a small portion of this widely distributed family is treated of here, no attempt has been made to propound any new classifications, but that in ordinary use has been followed.

It has not been thought necessary to give descriptions of the species contained in Baird's 'Birds of North America.'

II. PRELIMINARY REMARKS ON THE NEOTROPICAL ANATIDÆ.

The Anatidæ of the southern portion of the South-American continent differ greatly, both as to genera and species, from the members of the same group of birds found on the northern confines of the Neotropical fauna. The former are most of them peculiar to



$\frac{1}{3}$

J Smit del et lith

QUERQUEDULA ANDIUM.

M & N. Harbart imp.



the districts in which they are found, whilst the latter, with few exceptions, consist of winter emigrants from the northern continent. In the intermediate country, comprising by far the larger portion of South America, few members of this family are met with. In speaking of the Anatidæ of the Neotropical Region, therefore, our subject very naturally divides itself into two portions, each of which requires somewhat different treatment, owing to the amount of attention they have received from naturalists. We propose, then, to give a more complete account of those species which belong strictly to the southern continent, including the Antilles and Central America with Mexico. The species which belong to the northern continent and which only come during winter within the limits of the South-American avifauna, on the other hand, we shall handle more briefly, confining our notes and references to such as bear upon their occurrence in their winter quarters.

The geographical distribution of the South-American Anatidæ requires special consideration, inasmuch as the members of this family found in the Neotropical region, except in a few cases, do not conform in their range to the limits assigned to that region, but to a great extent rally round the more temperate portions of the continent. The characteristic species are in no case met with near the northern boundaries of the Neotropical region.

The equatorial genera *Dendrocygna* and *Cairina*, however, reach Southern Mexico; and the former is represented throughout the Antilles. They alone are distributed according to the prevailing law affecting Neotropical birds. Intertropical countries in general are not rich in Anatidæ; and America is no exception to the rule. The Tree-ducks (*Dendrocygna*) form the chief exception. They alone abound in Tropical America, the high Andes (tropical only in position) being, of course, left out of consideration. The cause of this scarcity is not very apparent at first sight. The enormous rivers of tropical America and its numberless lagoons might be expected to be capable of supporting Ducks in any quantity. But such is not the case. The intertropical species are almost all of them arboreal in their habits; and it may possibly be that this is so because they thus escape being preyed upon by the large Crocodilians which abound in these waters.

The bulk of the peculiar South-American species are not found to the northward of the lower portion of the basin of the La Plata. Here, however, and onwards to Tierra del Fuego they abound, not only in species but in individuals, and their numbers would seem to rival those of the northern hemisphere. But the component species, and, in many instances, the genera, are quite different. Swans are there, but the species bear no resemblance to those of the north. The Geese are all different. *Anas* is there, but differing widely from the northern prototype. The same may be said of *Dafila*, where the sexes are similarly dressed, instead of being widely different. *Mareca* is also there; but here, again, the sexes are nearly alike, instead of the reverse. The Teals, too, of the south are very different from those of the north. The host of northern diving and oceanic species

are doubtfully represented by the two aberrant genera *Metopiana* and *Tachyeres*; and the Andean *Merganetta* stands quite alone.

The Shovellers (*Spatula*) of north and south are strictly congeneric; so also are the members of the genera *Erismatura* and *Mergus*.

Returning to the strictly tropical members of this family, and tracing their alliances and range, we find some remarkable facts in geographical distribution, which, so far as we are aware, find no parallel amongst birds. The genus *Chenalopex* contains but two species—one belonging to the valley of the Amazons and the adjoining districts, the other to Africa. *Sarcidiornis* is found in Paraguay, Africa, Madagascar, the peninsula of India, Ceylon, and Burmah. *Dendrocygna viduata* is common to both the American and African continents; and *D. fulva* is found alike in America, India, and Madagascar. The causes of this singular distribution of so many members of one family are at present inexplicable.

The greater part of our characters in the following synopsis are taken from specimens in the collection of Salvin and Godman, which contains most of the known South-American species. In selecting specimens for description we have sought out such as came from the same or the nearest locality to that where the original types were procured.

### III. SYNOPSIS OF THE SPECIES OF NEOTROPICAL ANATIDÆ.

The Anatidæ may be divided into the following seven sub-families:—

- I. *Anserinæ* or Geese.
- II. *Cygninæ* or Swans.
- III. *Anatinæ* or River-ducks.
- IV. *Fuliginæ* or Sea-ducks.
- V. *Erismaturinæ* or Lake-ducks.
- VI. *Merganettinæ*, or Torrent-ducks.
- VII. *Merginæ* or Mergansers.

#### Subfamily I. ANSERINÆ.

##### Genus 1. ANSER.

Type.

*Anser*, Cuv. Règn. An. i. p. 530 (1817) . . . . . *A. cinereus*.

*Chen*, Boié, Isis, 1822, p. 563 . . . . . *A. hyperboreus*.

*Anser* is strictly an arctopolitan form, of which winter visitants belonging to three species occur in the Antilles.

##### 1. ANSER HYPERBOREUS.

*Anser hyperboreus*, Pallas, Spic. Zool. vi. p. 31 (1769); Zoogr. vol. ii. p. 227, t. 65; Baird, B. of N. Am. p. 760 (1858); Cab. J. für Orn. 1857, p. 225 (Cuba); March, Pr. Ac. Phil. 1864, p. 70 (Jamaica).

*Chen hyperboreus*, Gundl. Repert. F.-N. i. p. 387, et J. für Orn. 1875, p. 371 (Cuba).

*Hab.* Cuba (*Gundlach*); Jamaica (*March*).

In Cuba *A. hyperboreus* seems to be a regular annual visitant, and is common, remaining in the island from October until the end of March. It has only been observed in Jamaica when the winter in the north has been severe.

2. ANSER CÆRULESCENS.

*Anas cærulescens*, Linn. S. N. i. p. 198 (1766).

*Anser cærulescens*, Elliot, B. of N. Am. t. 43; Bryant, Pr. Bost. Soc. N. H. xi. (1866) p. 70 (Inagua).

*Chen cærulescens*, Gundl. Repert. F.-N. i. p. 387, et J. für Orn. 1875, p. 374 (Cuba).

*Hab.* Inagua, Bahama Island (*Bryant*); Cuba (*Gundlach*).

Dr. Bryant reports that, some years before his visit to Inagua in 1859, a flock of this Goose visited the island, when every individual was killed by the inhabitants. Dr. Gundlach, who maintains the distinctness between this bird and *A. hyperboreus*, says that it is of rare occurrence in Cuba, but that it arrives along with the migratory flocks of the allied species.

3. ANSER GAMBELI.

*Anser gambelii*, Hartl. Rev. Zool. 1852, p. 7; Baird, B. of N. Am. p. 761 (1858); Cab. J. für Orn. 1857, p. 226 (Cuba); Gundl. Repert. F.-N. i. p. 387, et J. für Orn. 1875, p. 375 (Cuba); Lawr. Mem. Bost. Soc. N. H. ii. p. 313 (Mazatlan).

*Hab.* Cuba (*Gundlach*); Mazatlan (*Grayson*).

Not common, but not so rare in Cuba as *A. cærulescens*, where, however, it is stated to be a regular winter visitant, remaining in the island from October till the end of March. Col. Grayson obtained it near Mazatlan, N.W. Mexico.

Genus 2. BERNICLA.

	Type.
<i>Bernicla</i> *, Boié, Isis, 1822, p. 563 . . . . .	<i>B. torquata</i> (= <i>B. canadensis</i> ).
<i>Chloëphaga</i> , Eyton, Mon. Anatidæ, p. 13 (1838)	<i>B. magellanica</i> .
<i>Tænidestes</i> , Reich. Nat. Syst. d. Vög. p. ix (1852) . . . . .	<i>B. antarctica</i> .
<i>Chlætrophus</i> , Bannister, Pr. Ac. Sc. Phil. 1870, p. 131 . . . . .	<i>B. poliocephala</i> .
<i>Oressochen</i> , Bannister, Pr. Ac. Sc. Phil. 1870, p. 131 . . . . .	<i>B. melanopectera</i> .

*Bernicla* is a widely extended form, with four or five representatives in North America, of which one reaches the Neotropical region as an

\* Some attempts have recently been made to revive *Branta* of Scopoli (Ann. I. H. N. p. 67) for this genus. But *Branta* of Scopoli is an artificial group composed of species which have no sort of natural affinity, and is therefore to be cancelled. Besides *Branta* is generally used for *Fuligula rufina*, and it would create great confusion to substitute it for the universally accepted term *Bernicla*.

occasional winter visitant, and with six peculiar species in Antarctic America.

### 1. *BERNICLA CANADENSIS.*

*Anas canadensis*, Linn. S. N. i. p. 198 (1766).

*Bernicla canadensis*, Baird, B. of N. Am. p. 764 (1858); March, Proc. Ac. Phil. 1864, p. 70 (Jamaica); A. & E. Newton, Ibis, 1859, p. 368 (St. Croix?).

*Anser parvipes*, Cass. Pr. Ac. Phil. vi. p. 188 (1852), (Vera Cruz).

*Bernicla canadensis*, var. *occidentalis*, Lawr. Mem. Bost. Soc. N. H. ii. p. 271 (Durango).

*Hab.* Jamaica (*March*); Durango, Mexico (*Grayson*).

An occasional visitant in Jamaica in winter, its occurrence depending upon the rigour of that season in the north. Messrs. A. & E. Newton think that a flock of wild Geese seen in the Island of St. Croix in 1857 probably belonged to this species. *Anser parvipes*, from Vera Cruz, is only known to us from Cassin's description, but may probably belong to *B. canadensis*. Durango is the only other recorded Mexican locality for it. Col. Grayson here met with it.

### 2. *BERNICLA MELANOPTERA.*

*Anser melanopterus*, Eyton, Mon. Anat. p. 93 (1838) (Lake Titicaca); Darwin, Voy. Beagle, iii. p. 134, t. 50 (1841); Schl. Mus. des P.-B., Anseres, p. 100; Tschudi, F. P. p. 308 (1846) (Puna reg. of Peru).

*Bernicla melanoptera*, Gay, Faun. Chil. p. 443 (1848) (Chili); Reich. Natat. lviii. f. 953; Bibra, Denkschr. Akad. Wien, v. p. 131; cf. J. für Orn. 1855, p. 57 (Chili); Cassin, Gilliss's Exp. ii. p. 101 (1856) (Chili); Phil. & Landb. Wieg. Arch. 1863, p. 185, et Cat. Av Chil. p. 40 (Chili); Sc. Ibis, 1864, p. 121; P. Z. S. 1867, pp. 320, 334, 339 (Chili); Sc. & Salv. P. Z. S. 1869, p. 156 (Pitumarca).

*Chloëphaga melanoptera*, Burm. La Plata-Reise, ii. p. 513, et P. Z. S. 1872, p. 365.

*Oressochen melanopterus*, Bannister, Proc. Ac. Phil. 1870, p. 131.

*Anser montanus*, Tsch. Wieg. Arch. ix. pt. i. p. 390.

*Anser anticola*, Tsch. Wieg. Arch. x. pt. i. p. 315 (1844).

*Alba; remigibus nigris; scapularibus et cauda viridescenti-nigris; tectricibus alarum majoribus extus purpureis, speculum formantibus; minoribus albis; scapularibus anterioribus fusco notatis, posterioribus fuscis in viridescenti-nigrum trahentibus: long. tota circ. 30, alæ 17.5, caudæ 6.5, rostri a rictu 1.7, tarsi 3.7, dig. med. cum ungue 3.3* (Descr. exempl. ex Peruvia in Mus. S. & G.): *rostro (ave viva) carneo, ungue nigricante, pedibus rubris, irideo bscura. Fem. mari similis, sed minor.*

*Hab.* Lake Titicaca (*King, Pentland*); Puna region of Peru (*Tschudi*); Tinta, S. Peru (*Whitely*); cordillera and plains of Chili (*Ph. et Landb.*); Quintero, Chili (*Gay*); Portillo Pass, Chili (*Gilliss*).

This fine goose is found in the high Andes of Peru and Bolivia, and has been observed both on Lake Titicaca and at Tinta and Pí-tumarca, at an elevation of from 11,000 to 14,000 feet above the sea-level, in what Tschudi has termed the "Puna region." It is also found throughout the central provinces of Chili, descending to the plains in winter, but in summer retiring to the high Cordillera, to the verge of the line of perpetual snow. It has been observed at Quintero, in the province of Santiago, and in such numbers, on a small body of water near the celebrated Portillo Pass, that the spot is called Valle de los Pinquenes, Pinquen being the native name of this species. The limit of its southern range probably hardly passes the 35th degree of south latitude.

There were three specimens of this fine species lately living in the menagerie of this Society (List Vert. Zool. Soc. 1872, p. 244); but none of them seemed to enjoy such good health in captivity as the other South-American Geese. The male is considerably larger than the female.

### 3. BERNICLA MAGELLANICA.

*Oie des Terres magellaniques*, Buff. Pl. Enl. 1006, undè

*Anas magellanica*, Gm. S. N. i. p. 505 (1788) (Straits of Magellan).

*Anser pictus et magellanicus*, Vieill. Enc. Méth. p. 117 (1823).

*Chloëphaga magellanica*, Eyton, Mon. Anat. p. 82 (1838); Darwin, Voy. Beagle, iii. p. 134 (1841) (Tierra del Fuego and Falkland Islands); ScL. P. Z. S. 1857, p. 128; 1858, p. 289; 1860, p. 387 (Falkland Islands); Gould, P. Z. S. 1859, p. 96; Abbott, Ibis, 1861, p. 157 (Falkland Islands); ScL. & Salv. Ibis, 1868, p. 189 (Straits of Magellan); 1870, p. 500 (Elizabeth Isle); Ph. & Landb. Cat. Av. Chil. p. 40.

*Bernicla magellanica*, Gay, Fauna Chil. p. 443 (1848) (Chiloe).

*Painted Duck*, Cook, It. i. p. 96, unde

*Anas picta*, Gm. S. N. i. p. 504 (1788) (Staaten Island).

*Anas leucoptera*, Gm. S. N. i. p. 505 (1788); ex Buff. xvii. p. 101, et Brown's Ill. t. 40 (Falkland Islands).

*Anser leucopterus*, Vieill. Enc. Méth. p. 113 (1823).

*Bernicla leucoptera*, Less. Traité d'Orn. p. 627 (1831).

*Alba, hypochondriis et dorso superiore cum parte basali colli postici nigro transvittatis; primariis, tectricibus alarum majoribus, tertiariis et scapularibus elongatis cinerascentibus; dorso postico et reetricibus cinerascenti-nigris; rostro nigro, iride fere nigra, pedibus obscure plumbeis: long. tota circ. 26, alæ 16·3, caudæ 5·5, rostri a rictu 1·6, tarsi 3·8, dig. med. cum ungue 3·3. Fem. capite et collo cinnamomeis; gastræo antice cinnamomeo, postice albo, omnino nigro transvittato; subcaudalibus lateraliibus nigris, mediis fusco irroratis; dorso antico cervino et albo transvittato, postico et reetricibus brunnescenti-nigris: primariis fusco-nigris, secundariis albis, tertiariis et scapularibus elongatis grisescentibus; tectricibus alarum majoribus æneis, vitta subapicali nigra, albo terminatis; rostro nigro,*

*iride fere nigra, pedibus flavis: long. tota circ. 26, alæ 16, caudæ 5·5, rostri a rictu 1·6, tarsi 3·3, dig. med. cum ung. 3* (Descr. exempl. ex Ins. Falklandici in Mus. S. & G.).

*Hab.* Straits of Magellan (*King, Darwin, Cunningham*): Staaten Island (*Cook*): Falkland Islands (*Darwin, Abbott*).

According to Darwin, this Goose is found in Tierra del Fuego and the Falkland Islands, being common in the latter. They live in pairs or small flocks in the interior of the island, and seldom approach either the sea or the freshwater lakes. They build on the outlying islets, probably through fear of the foxes; and the same cause may also account for their being tame by day but the reverse on the approach of dusk. They live entirely on vegetable matter, and are called by the seamen "Upland Geese."

Capt. Abbott, who, like other travellers, found this species common in East Falkland, says that it breeds all over the country, as well as on the adjoining islets—and on this point differs from Mr. Darwin; but he adds that the disappearance of foxes from East Falkland may have led to a change of habits as regards the situation chosen by this species for its nest. He gives a good account of its nesting-habits.

This species appears to do well in captivity, and many broods have been reared in the Gardens of this Society since its introduction in 1857 (Rev. List of Vert. Zool. Soc. 1872, p. 245).

The Chilian form of this Goose has been described by Philippi and Landbeck as *Bernicla dispar*—the main and, in fact, the only distinction consisting in the male being distinctly barred with black on the under surface. Our immature male specimen from the Falklands is marked to a slight extent in a similar manner; and we are disposed to consider the character one of hardly sufficient value to separate the two forms specifically. The following references belong to the Chilian form:—

#### 4. BERNICLA DISPAR.

*Bernicla magellanica*, Cassin, Gilliss's Exp. ii. p. 201, t. xxiv. (1856); Gay, Fauna Chil. p. 443 (1848) (Chiloe).

*Bernicla dispar*, Ph. & Landb. Wieg. Arch. 1863, p. 190, et Cat. Av. Chil. p. 40; Burm. P. Z. S. 1872, p. 366; Sclater, Ibis, 1864, p. 122.

*Chloëphaga dispar*, Scl. P. Z. S. 1867, pp. 320, 334.

*Hab.* Central Chili (*Ph. et Landb.*); Argentine Republic, Sierra Tinta and Rio Negro (*Burm.*).

Philippi and Landbeck state that this Goose is of frequent occurrence in winter in the central provinces of Chili, and that one of the collectors for the Museum of Santiago brought a specimen from the Straits of Magellan.

Burmeister refers the Goose frequenting the Sierra Tinta, near Tandil, to the southward of Buenos Ayres, to this species or race; he also adds that he has recently received both sexes from El Carmen, on the Rio Negro.

In October 1871 the Society purchased of Mr. Weisshaupt, along

with other Chilian animals, a pair of this form of the Magellanic Goose. The female unfortunately died; but the male was lent to a correspondent, who returned to the Gardens in its place, in November 1875, a pair of young birds, bred between it and a female *B. magellanica vera*, of which we exhibit a drawing. The male, it will be observed, is not quite so strongly barred as in the pure *B. dispar*, but presents well-defined black edgings on the under plumage. The females of the two forms are, so far as we can see, quite identical.



*a*, Male, and *b*, Female, Magellanic Geese in the Society's Gardens, bred between *B. dispar* ♂ and *B. magellanica* ♀.

5. *BERNICLA POLIOCEPHALA*.

*Anas inornatus* ♀, King, P. Z. S. 1830-31, p. 15 (Straits of Magellan).

*Bernicla inornata*, Gray & Mitch. Gen. B. t. 165; Gay, Faun. Chil. i. p. 444.

*Chloëphaga poliocephala*, Gray, List Gall. Grall. and Anseres in B. M. p. 127 (1844), descr. nulla; Scl. P. Z. S. 1857, p. 128; 1858, p. 290; 1861, p. 46 (Falkland Islands); 1867, p. 335; Abbott, Ibis, 1861, p. 159 (Falkland Islands); Scl. & Salv. Ibis, 1868, p. 189 (Oazy Harbour); 1870, p. 499 (Port Grappler); Nomencl. p. 128.

*Bernicla poliocephala*, Burm. P. Z. S. 1872, p. 366 (Bahia Blanca).

*Anser poliocephalus*, Schl. Mus. des P.-B., Anseres, p. 191.

*Chloëtrophus poliocephalus*, Bann. Pr. Ac. Phil. 1870, p. 131.

*Bernicla chiloensis*, Ph. & Landb. Wieg. Arch. 1863, p. 149 (Chiloe), et Cat. Av. Chil. p. 40.

*Capite toto et collo cum scapularibus griseo-plumbeis, pectore et dorso superiore castaneis nigro transfasciatis; abdomine, tectricibus subalaribus, campterio et tectricibus minoribus albis; primariis nigris; secundariis albis, interioribus fusco in pogonio externo notatis; tectricibus alarum majoribus nigris, extus viridescenti-nitentibus, apicibus albis; dorso imo et cauda nigris, hypochondriis nigro et albo transfasciatis, crisso castaneo; rostro nigro, pedibus extus flavis intus fusco-nigris: long. tota 24, alæ 13·5, caudæ 5, tarsi 2·7, dig. med. cum ung. 2·5 (Descr. maris ex Patagonia (Rio Negro) in Mus. S. & G.). Fem. mari similis.*

*Hab.* Straits of Magellan (King, Cunningham); Patagonia, Rio Negro (Hudson); Chiloe (Philippi & Landbeck); Falkland Islands (Abbott, Leconte).

This species was at first supposed to be the female of the bird described by Captain King as *Anas inornatus*, under which name an excellent figure of it was given by Gray and Mitchell in the 'Genera of Birds.' Mr. Gray was the first to detect the error and to give the present bird a MS. name; but he left it to Sclater to describe the species and make the distinctions clear. The fact of the similarity of the sexes in this and the next species has been abundantly shown by living birds which have reared broods in captivity in our Gardens. The species does not seem to be very common in the far south, as it escaped Mr. Darwin's notice; and in the Falkland Islands, the great rendezvous of these Geese, it would appear to be only a straggler.

During the three years Captain Abbott resided in the Falkland Islands he only observed three examples of this species; and these were obtained singly amongst flocks of "Upland Geese" (*B. magellanica*): he supposes that these birds were stragglers from the coast of Patagonia. F. Leconte, who was sent by this Society to the Falklands to obtain living animals, brought home one skin of this Goose.

Burmeister says the range of this Goose extends over the whole of Patagonia, where it is one of the most common species.

Philippi and Landbeck state that the true patria of their *B. chilensis* is the island of Chiloe, where it breeds. During the winter it migrates further northward. At Ancud it may be seen in a domesticated state.

Dr. Cunningham obtained this Goose at Oazy Harbour, in the Straits of Magellan, but did not meet with it in the Falkland Islands.

#### 6. *BERNICLA RUBIDICEPS*.

*Bernicla inornata*, Gray, Zool. Voy. Erebus and Terror, t. 24.

*Chloëphaga rubidiceps*, Scl. P. Z. S. 1860, p. 387, t. 163 (Falkland Islands); 1861, p. 46; Abbott, Ibis, 1861, p. 158 (Falkland Islands); Scl. et Salv. Nomencl. p. 128; Sharpe, Zool. Erebus and Terror, Birds, p. 37.

*Anser rubidiceps*, Schl. Mus. des P.-B., Anseres, p. 102.

*Chlætophus rubidiceps*, Bann. Pr. Ac. Phil. 1870, p. 131.

*Corpore subtus cum capite toto et collo cinnamomeis, pectore et hypochondriis nigro transfasciatis, crisso nigro marginato; supra grisescens colli basi crebre nigro et cinnamomeo transfasciata, interscapulii plumis fascia subterminali nigra notatis; dorso imo, uropygio et cauda nigris viridescente vix tinctis; remigibus nigris, secundariis et tectricibus alarum minoribus albis; tectricibus majoribus extus æneo-viridibus albo terminatis: long. tota circ. 23, alæ 13·5, caudæ 4·5, rostri a rictu 1·5, tarsi 2·5, dig. med. cum ungue 2·8* (Descr. maris ex insulis Falklandicis in Mus. S. & G.). *Rostro nigro, iride fere nigra, tarsis extus flavis intus nigrescentibus* (Desc. av. in vivario Zool. Soc. Lond.).

*Hab.* Falkland Islands (*Abbott, Leconte*).

The "Brent Goose," as this species is called in the Falkland Islands, Captain Abbott says, is not so common as the other species, except in some places in the North Camp, where he saw large numbers in pairs.

The male is larger than the female, and frequents the edge of the nearest pool of water whilst the female is sitting on her nest amongst dry bushes. The eggs are usually five (rarely six) in number, and are laid the first week in October. The young birds attain the dress of maturity the first year, except that the wing-speculum is dull black instead of glossy green.

This species also does well in captivity, many broods having been reared since 1860, when the species was first introduced into this country alive (Rev. List of Vert. Zool. Soc. 1872, p. 245).

#### 7. *BERNICLA ANTARCTICA*\*.

*Antarctic Goose*, Forst. It. pp. 495, 518, undè

\* *BERNICLA INORNATA*.

*Anas inornatus*, King, P. Z. S. 1830-31, p. 15 (Straits of Magellan).

*Bernicla inornata*, Gay, Faun. Chil. p. 444 (1856); Gray and Sharpe, Zool. Erebus and Terror, Birds, pl. 30.

*Chloëphaga inornata*, Scl. et Salv. Nomencl. p. 128; Sharpe, Zool. Erebus and Terror, Birds, p. 37.

*Similis præcedenti sed minor, dorso angustius transfasciato; speculo alari,*

*Anas antarctica*, Gm. S. N. i. p. 505 (1788) (Tierra del Fuego); Schl. Mus. des P.-B., Anseres, p. 98.

*Bernicla antarctica*, Steph. Shaw's Zool. xii. p. 59; Eyton, Mon. Anat. p. 84 (1838); Darwin, Voy. Beagle, iii. p. 134 (1841) (Tierra del Fuego, Falkland Islands); Less. Voy. Coq. t. 50; Gay, Fauna Chil. p. 442 (1848); Reich. Natat. lvii. f. 397, 948; Bibra, Denkschr. Akad. Wien, v. p. 131 (Chili); cf. J. für Orn. 1855, p. 57; Cassin, Gilliss's Exp. ii. p. 200, t. xxiii. (1856) (coast of Chili); 1860, p. 388; 1867, pp. 320, 334, 339; Gould, P. Z. S. 1859, p. 96; Scl. & Salv. Ibis, 1869, p. 284 (Port Otway); 1870, p. 499 (Goods Bay); Nomencl. p. 128; Abbott, Ibis, 1861, p. 159 (Falkland Islands); Burm. La Plata-Reise, ii. p. 514, et P. Z. S. 1872, p. 366; Ph. & Landb. Wieg. Arch. 1863, p. 199, et Cat. Av. Chil. p. 40.

*Tæniadestes antarctica*, Bannister, Pr. Ac. Phil. 1870, p. 132.

*Anas hybrida*, Mol. Storia, p. 213 (?); Gm. S. N. i. p. 502 (1788), ex Molina.

*Anas magellanicus*, Sparrm. Mus. Carls. t. 37.

*Mas alba*; *rostrum nigro, pedibus flavis*: long. tota circ. 24·0, *alæ* 15·0, *caudæ* 5·2, *rostri a rictu* 1·7, *tarsi* 3, *dig. med. cum ungue* 3·5 (Descr. exempl. vix adult. ex ins. Falklandicis in Mus. S. & G.). Fem. *brunneo-nigra*; *vertice et nucha brunneis, fronte, capitis lateribus et collo albo vermiculatis; dorso postico, uropygio et cauda albis; primariis nigris, secundariis et tectricibus alarum minoribus cum subalaribus albis; tectricibus majoribus viridescente extus terminatis, speculum alare formantibus: subtus pectore hypochondriis et ventre summo distincte albo transfasciatis, ventre imo cum crisso albis*: long. tota circ. 24·0, *alæ* 14·0, *caudæ* 5·3, *rostri a rictu* 1·7, *tarsi* 2·7, *dig. med. cum ungue* 3·2 (Descr. exempl. ex ins. Falklandicis in Mus. S. & G.).

*Hab.* Tierra del Fuego (Forster, Darwin, Cunningham); Straits of Magellan to Chiloe (Darwin, Philippi & Landbeck); Patagonia (Burmeister, Hudson); Falkland Islands (Darwin, Abbott).

This is one of the oldest known species of South-American *Anatidæ*, being alluded to by Forster and also apparently by the Abbé Molina, as well as in Pernety's 'Voyage.' The remarks of the first author led to the name given to it by Gmelin, by which it has since

*dorso imo et rectricibus fusco-nigris; pedibus flavis*: long. tot. circ. 24, *alæ* 14·8, *cauda* 4·5, *tarsi* 3, *dig. med. cum ungue* 2·5, *rostri a rictu* 1·2.

*Hab.* Straits of Magellan (King).

Though the type specimen of this bird in the British Museum bears a general resemblance to a male *B. magellanica*, we are by no means sure that it may not ultimately prove to be merely an immature specimen of *Bernicla antarctica*, the size of the bill corresponding more closely with that of the last-named species. From this, however, it differs in having a black tail, and in other minor characters. The specimen is evidently immature; but not being able to assign it positively to any other species, we leave it for the present to stand as doubtful; at the same time we think it more than probable that it will eventually be found to belong to one of the above-mentioned *Berniclæ*.

been almost universally recognized. The bird described by Molina, and called *Anas hybrida*, which name was also adopted by Gmelin as apparently applying to a species distinct from his *A. antarctica*, probably refers to this species; and if so, Molina's name has the priority; but so vague are his descriptions, and so inapplicable the name he has chosen, that we must decline to disturb a title so firmly established as *antarctica*. Forster noticed this species in Tierra del Fuego, where it has since been seen by every traveller who has written on the birds of that district. Here Darwin found it, and also in the Falkland Islands and on the western coast of South America as far north as Chiloe. It lives exclusively on rocky parts of the sea-coast; hence the name, "Rock-Goose," given to it by sailors. In the deep and retired channels of Tierra del Fuego, says Mr. Darwin, the snow-white male, invariably accompanied by his darker consort, and standing close by each other on some distant rocky point, is a common feature in the landscape.

Captain Abbott confirms Mr. Darwin's observation as to the abundance of this Goose in the Falklands; he adds that he found it along the coast, and that the nest is placed a few yards from the shore, in an exposed place, and the female may sometimes be seen sitting on her eggs from a distance. The male bird remains stationed close by. The eggs are generally six or seven in number, and, during the absence of the female, are carefully covered with down from her breast.

Philippi and Landbeck give to this species the same range along the west coast as Mr. Darwin, adding that it is occasionally seen at Valdivia. Its eastern range, according to Burmeister's latest observations, does not extend northward of the inlet of Santa Cruz, where it winters.

Little success has at present attended the efforts to introduce this species into England. One individual has reached this country alive up to the present time. (See Rev. List of Vert. 1872, p. 245.)

### Genus 3. CHENALOPEX.

Type.

*Chenalopex*\*, Stephens, Gen. Zool. xii. pt. 2,  
p. 41 (1824) ..... *C. ægyptiaca*.

#### CHENALOPEX JUBATA.

*Anser jubatus*, Spix, Av. Bras. ii. p. 84, t. 108 (1825); Burm. Syst. Ueb. iii. p. 433.

*Chenalopex jubata*, Gray & Mitch. Gen. B. t. 164; Cab. in Schomb. Guiana, iii. p. 762; J. E. Gray, Knowsl. Menag. ii. t. xv.; Taylor, Ibis, 1864, p. 96 (Orinoco); Scl. & Salv. P. Z. S. 1866, p. 200 (Ucayali); Nomencl. p. 128; Pelz. Orn. Bras. p. 319.

*Sarkidiornis jubata*, Gray, Hand-l. iii. p. 74.

\* Mr. G. R. Gray (Hand-l. iii. p. 74) refers to "*Chenonetta*, Brandt, 1836," as synonymous with *Chenalopex*. But *Chenonetta* was proposed by Brandt (Descr. et Ic. An. Ross. fasc. i. p. 5) for *Anas jubata*, Latham, of Australia, not for *Anser jubatus*, Spix.

*Anser polycomus*, Cuv. in Mus. Paris; Less. Traité d'Orn. i. p. 627 (1831); Schl. Mus. des P.-B. Anseres, p. 95.

*Anser pollicaris*, Licht. in Mus. Berol.

*Chenalopex pollicaris*, Licht. Nomencl. p. 101.

*Capite toto cum collo et pectore sordide albis, collo postico obscuriore; interscapulio fusco-nigro; dorso antico, scapularibus et hypochondriis castaneis; dorso imo alis et cauda purpurascenti-nigris, secundariis quinque internis macula magna alba, speculum alare formantibus, ornatis: tectricibus alarum majoribus viridescenti-nitentibus; abdomine medio et crisso albis, ventre imo utrinque nigro; rostro nigro mandibula nisi in apice flava; pedibus flavidis: long. totæ 20, alæ 11.5, caudæ 3.7, tarsi 3.7, dig. med. cum ungue 2.4* (Desc. spec. ex Amazonia Peruviana in Mus. S. & G.).

*Hab.* Valley of the Amazons (*Spix, Bartlett*); Guiana (*Schomburgk*); Orinoco (*Taylor*); Caiçara, Rio Guaporé et Rio Negro (*Natterer*).

The range of the species is restricted to the low-lying districts of the valley of the Amazons, and the adjoining countries of Guiana and Venezuela on the Orinoco, where, however, especially in the former region, it would appear to be abundant. Natterer obtained eight specimens during his journey, some on the head waters of the Madeira in Matogrosso, others on the Rio Negro.

Little has been recorded of the habits of this Goose. Schomburgk met with it in pairs frequenting sand banks; and Natterer states that the stomach of one he examined contained small seeds.

This species has its nearest ally in *C. ægyptiaca* of the African continent, with which it would appear to be strictly congeneric.

## Subfamily II. CYGNINÆ.

### Genus I. CYGNUS.

	Type.
<i>Cygnus</i> , Meyer, <i>Tasch. d. d. Vög. ii.</i> p. 497 (1810)	<i>C. olor</i> .
<i>Olor</i> , Wagl. <i>Isis</i> , 1832, p. 1234 . . . . .	<i>C. musicus</i> .
<i>Chenopsis</i> , Wagl. <i>Isis</i> , 1832, p. 1234 . . . . .	<i>C. atratus</i> .
<i>Coscoroba</i> , Reich. <i>Nat. Syst. d. Vög.</i> p. x. (1852)	<i>C. coscoroba</i> .

Two species of Swan, both very distinct from any of their northern congeners, are found in Antarctic America.

#### 1. CYGNUS NIGRICOLLIS.

*Anas nigricollis*, Gm. *S. N. i.* p. 502 (1788), ex Bougainville.

*Anas melanocephala*, Gm. *S. N. i.* p. 502 (1788), ex Molina.

*Anas melanocorypha*, Mol. *Saggio*, ed. 2, p. 199 (1810).

*Anser melanocoryphus*, Vieill. *Enc. Méth.* p. 108 (1823) ex Molina.

*Cygnus nigricollis*, Steph. *Shaw's Zool.* xii. p. 17; *Eyton*, *Mon.* p. 98 (1838); *Hartl. Ind. Az.* p. 27; *Gay*, *Faun. Chil.* p. 445, t. 14 (1848); *Burm. Syst. Ueb.* iii. p. 432; *La Plata-Reise*, ii. p. 512; *Journ. für Orn.* 1860, p. 266, et *P. Z. S.* 1872, p. 365;

Bibra, Denkschr. Akad. Wien, v. p. 131; cf. J. für Orn. 1855, p. 57; ScL. P. Z. S. 1859, p. 206, 1860, p. 388, 1867, pp. 331, 339; Abbott, Ibis, 1860, p. 159; Ph. & Landb. Cat. Av. Chil. p. 50; ScL. & Salv. P. Z. S. 1868, p. 145, et Ibis, 1869, p. 284 (Elizabeth Isle), et Nomencl. p. 139.

*Cisne de cabeza negra*, Az. Apunt. no. 425.

*Albus; capite et collo cum striga postoculari et mento nigris; loris nudis: long. tota circ. 48·0 poll. angl., alæ 17·5, caudæ 5·5, rostri a rictu 3·0, tarsi 3·5, dig. med. cum ungue 4·2* (Descr. exempl. ex inss. Falklandicis in Mus. S. & G.). *Rostro plumbeo, ungue albo; cera tumida ruberrima; iride fere nigra, pedibus pallide carneis (ave viva).*

*Hab.* Falkland Islands (*Abbott*); Straits of Magellan (*Bougainville, Cunningham*); La Plata (*Azara, Burmeister*); Chili (*Gay, Philippi & Landbeck*).

This Swan is abundant in the pampas of Buenos Ayres, and in the lower portion of the Argentine Republic, and thence southwards to Tierra del Fuego. It is also found in the Falkland Islands and along the western coast of South America beyond Valparaiso, perhaps almost up to the frontier of Bolivia. Dr. Cunningham observed both this species and *C. coscoroba* near Sandy Point in the Straits of Magellan, where they were breeding.

In the Falkland Islands the Black-necked Swan is found throughout the year, but is rather scarce and very wild. It seldom breeds on the main island, but retires to the adjacent islets for that purpose. Dr. Burmeister mentions its occurrence on the Paraná, and also states that it is found on the island of Santa Catharina off the coast of Brazil, this being probably nearly its most northern limit.

The Black-necked Swan has long been introduced into Europe; and seldom a year passes but one or more broods are reared in the Gardens of this Society.

## 2. CYGNUS COSCOROBA.

*Anas coscoroba*, Mol. Stor. Nat. Chili, p. 207; Gm. S. N. i. p. 503 (1788) ex Molina.

*Anser coscoroba*, Vieill. Enc. Méth. p. 112 (1823).

*Cygnus coscoroba*, Hartl. Ind. Az. p. 27; Eyd. & Gerv. Ois. de Favorite, in Mag. de Zool. 1836, p. 36; Gray and Mitch. Gen. of Birds, t. clxvi.; Gay, Faun. Chil. p. 446 (1848) (Chili); Burm. J. für Orn. 1860, p. 226, et La Plata-Reise, ii. p. 512 (Paraná); P. Z. S. 1872, p. 365; ScL. P. Z. S. 1867, pp. 334, 339 (Chili), 1860, p. 388 (Falklands); Abbott, Ibis, 1861, p. 159 (Falklands); Schl. Mus. des P.-B. Anseres, p. 83; Ph. & Landb. Cat. Av. Chil. p. 41; ScL. & Salv. Ibis, 1869, p. 284 (Rio Galegos); Nomencl. p. 129.

*Cygnus anatoides*, King, P. Z. S. 1830-31, p. 15 (Straits of Magellan); Eyton, Mon. Anat. p. 101 (1838).

*Cygnus chionis*, Ill. in Mus. Berol.; Licht. Nomencl. p. 101.

*Coscoroba chionis*, Bp. C. R. xliii. p. 648 (1856).

*Ganso blanco*, Az. Ap. no. 436 (La Plata), undè  
*Anser candidus*, Vieillot, N. D. xxiii. p. 331 (1816), et Enc.  
 Méth. p. 351 (1823).

*Coscoroba candida*, Reich. Nat. Syst. d. Vög. p. x.

*Albus*; *primariorum apicibus nigris*; *loris plumosis*; *rostro lato anatiformi ruberrimo, ungue carneo*; *iride fere nigra*; *pedibus rubro-carneis (ave viva)*: *long. tota circ. 40·0, alæ 17·5, caudæ 5·8, rostri a rictu 3·0, tarsi 3·5, dig. med. cum ungue 5·0* (Descr. exempl. ex Chilia in Mus. S. & G.).

*Hab.* Chili (*Molina, Gay, Philippi & Landbeck*); Straits of Magellan (*King, Cunningham*); Falkland Islands (*Abbott*); Buenos Ayres (*Azara, Burmeister*).

Burmeister observed the Coscoroba Swan in large numbers on the rivers Paraná and Salado, especially in the lagoons bordering the river near Santa Fé. During the winter, he says, it keeps in flocks like our Swan. He also observed it at Mendoza and in the large lakes of the Pampas.

Azara met with only two individuals of this species in Paraguay, and a small flock at about 28° S. lat. He says, however, that it abounds in enormous flocks in the lagoons bordering the La Plata.

The Coscoroba Swan is rare in Chili, according to Philippi and Landbeck, who, however, give no details respecting its range on the western coast, though they mention a young one having been brought to them from the Straits of Magellan.

Mare harbour is the only part of East Falkland where Capt. Abbott ever saw or heard of this species. At that spot there is usually a flock of eight or ten to be seen. They breed in the neighbourhood, young birds of about a month old having been observed.

Living specimens of this Swan were brought to England in 1870 and 1871, but as yet have not reproduced. A pair made a nest in the Society's Gardens; and eggs were laid in 1872, but no young birds were hatched.

### Subfamily III. ANATINÆ.

#### Genus 1. DENDROCYGNA.

Type.

*Dendronessa*, Wagl. Isis, 1832, p. 281 (nec Sw.). . *D. arcuata*.

*Dendrocygna*, Sw. Class. Birds, ii. p. 365 (1837). *D. arcuata*.

*Leptotarsis*, Eyt. Mon. Anatinae, p. 29 (1838) . . *D. eytoni*.

This genus is a good example of what may be called a Tropicopolitan group, being represented nearly everywhere within the tropics. In America four very distinct species are found, besides another that is scarcely more than a representative form.

#### 1. DENDROCYGNA FULVA.

*Penelope mexicana*, Briss. vi. p. 390 (Mexico), undè

*Anas fulva*, Gm. S. N. i. p. 530 (1788); Vieill. Enc. Méth. p. 136 (1823); Max. Beitr. iv. p. 918; Wagl. Isis, 1831, p. 532;

Burm. Syst. Ueb. iii. p. 435; J. f. Orn. 1860, p. 226 (Tucuman); La Plata-Reise, ii. p. 514.

*Dendrocygna fulva*, Baird, Birds N. Am. p. 770, t. 63 (Fort Tejon, Cal.); Sci. P. Z. S. 1864, p. 301, and 1866, p. 149; Sci. & Salv. P. Z. S. 1869, p. 635 (Buenos Ayres), et Nomencl. p. 129; Schl. Mus. des P.-B. *Anseres*, p. 87; Pelz. Orn. Bras. p. 319 (1870); Burm. P. Z. S. 1872, p. 377 (Buenos Ayres); Lawr. Mem. Bost. Soc. N. H. ii. p. 313 (Mazatlan).

*Anas virgata*, Max. Reise, i. p. 322.

*Pato roxo y negro*, Az. Apunt. no. 436, undè

*Anas bicolor*, Vieill. N. D. v. p. 136; Enc. Méth. p. 356; Hartl. Ind. Az. p. 28; Léot. Ois. Trin. p. 514 (1866) (Trinidad).

*Anas sinuata*, Licht. in Mus. Berol.

*Anas collaris*, Merrem, in Ersch. u. Grub. Enc. sect. i. vol. xxxv. p. 31.

*Dendrocygna major*, Jerdon, Birds of Ind. iii. p. 790 (India); Sci. P. Z. S. 1866, p. 148 (Madagascar).

*Castanea, pileo obscuriore, linea mediali colli postivi nigra; dorso nigro, in parte anteriore castaneo transfasciato; alis et cauda nigris; tectricibus alarum minoribus obscure badiis, tectricibus supracaudalibus albis; plumis hypochondriorum elongatis, castaneis, fascia mediali alba nigro utrinque marginata ornatis; rostro et pedibus nigris: long. tota 18·0, alæ 8·5, caudæ 2·0, rostri a rictu 2·3, tarsi 2·0, dig. med. cum ungue 3·0* (Descr. spec. ex Mexico, in Mus. S. & G.).

*Hab.* Mexico (*Brisson, Grayson*); S.E. Brazil (*Max.*); Paraguay and Buenos Ayres (*Azara, Burmeister*); Montevideo (*Sellow*).

*Dendrocygna fulva*, according to Burmeister, is found in the eastern and northern districts of the La-Plata basin, on the rivers Uruguay and Paraná, and as far north as Tucuman; and Azara observed it both in Paraguay and in Buenos Ayres. In the Brazilian empire it was obtained by Prince Maximilian on the river Belmonte and also on the sea-coast near Porto Seguro; but although Burmeister states that it is found throughout Central Brazil, Natterer seems to have failed to secure specimens. It appears, so far as we know, to be absent from the basin of the Amazons and from the whole of the northern portion of the southern continent; nor is it found in Central America or in the West Indies. In Mexico it reappears, and would seem to be by no means rare, occurring from the Rio-Grande frontier and California to Mazatlan and the valley of Mexico. Singular as this distribution is, it is still more remarkable when we consider that there appear to exist no tangible grounds for separating the American bird from that called *D. major* by Jerdon, which ranges throughout the peninsula of India and is also found in Madagascar!

## 2. DENDROCYGNA AUTUMNALIS.

*Red-billed Whistling Duck*, Edw. t. 194 (West Indies), undè

*Anas autumnalis*, Linn. S. N. i. p. 205 (1766).

*Dendrocygna autumnalis*, Eyton, Mon. Anat. p. 109 (1838);

Baird, B. of N. Am. p. 770 (1858) (Texas); Cassin, Pr. Ac. Phil. 1860, p. 197 (R. Truando); Scl. P. Z. S. 1858, p. 360; Scl. & Salv. Ibis, 1859, p. 231; Taylor, Ibis, 1860, p. 315 (Lake Yojoa); Scl. & Salv. P. Z. S. 1864, pp. 299 (partim) & 372 (Panamá), et Nomencl. p. 129; Lawr. Ann. Lyc. N. Y. viii. p. 13 (Panamá), et ix. p. 143 (Costa Rica); Mem. Bost. Soc. N. H. ii. p. 313 (Mazatlan); Salv. Ibis, 1865, p. 193.

*Capitis lateribus et gutture cinereis, hoc albicantiore, colli postici linea mediali brunnescenti-nigra; pileo (versus nucham obscuriore), collo inferiore et corpore toto antico cum dorso medio et scapularibus læte castaneo-brunneis, pectore paullo dilutiore; dorso postico, ventre toto et cauda nigris, ventre imo et tibiis albo variegatis, crisso fere albo; alis nigris, tectricibus alarum minoribus internis ochraceis, mediis canis, externis albis; remigibus (extimo excepto) in pogonio externo et remigum tectricibus lactescenti-albidis; rostro rubro, ungue nigro; pedibus flavis: long. tota 16·0, alæ 8·5, caudæ 2·8, tarsi 2·0, dig. med. cum ungue 2·6, rostri a rictu 2·0 (Descr. maris ex Panama in Mus. S. & G.).*

*Hab.* Mexico (Grayson); Guatemala (Salvin); Honduras (Taylor); Costa Rica (Arcé); Panama (M'Leannan).

Latham's description of his *Anas autumnalis* was based upon Edwards's plate 194; and upon reference to this figure we feel no doubt that a specimen of the Central-American form of this Duck was the subject of Edwards's drawing. Moreover Edwards says, in the text of his work, that his specimen was brought from the West Indies.

The birds described by Baird from the Rio Grande, on the Texan frontier, evidently agree with Central-American examples; but Baird seems to have had specimens of the South-American form also before him when writing his notes on this species in the 'Birds of North America.' He attributes the greyness of the lower neck and breast in a South-American specimen to greater maturity—a view which can hardly be maintained, seeing that this peculiarity is found, so far as our experience goes, *only* in examples from the southern part of America.

In Central America this species is only found in the hottest part of the country and in the lagoons near the sea-coast, especially in those which lie in such abundance along the Pacific coast of Guatemala. During Salvin's stay there in 1863 he not unfrequently saw small flocks of this Duck, and also obtained specimens. In Honduras Mr. Taylor found this Tree-Duck abundant on Lake Yojoa. From Costa Rica we have an example collected by Arcé on the Gulf of Nicoya; and at Panama, whence we also have a specimen, it is not uncommon. M'Leannan had a pair of this species alive when Salvin stayed at his Station at Lion Hill.

The bird found on the Truando by Lieut. Michler's party probably belongs to this race; but we cannot speak with certainty on this point. It may also extend its range along the west coast as far as

Guayaquil; but this, too, remains to be determined; nor can its eastward limit be as yet defined. The form found in Trinidad (as described by Léotaud) certainly belongs to the next species.

### 3. DENDROCYGNA DISCOLOR.

*Dendrocygna autumnalis*, Cab. in Schomb. Guian. iii. p. 762; Sel. P. Z. S. 1864, p. 299 (partim); Sel. & Salv. P. Z. S. 1866, p. 200 (Ucayali); Léot. Ois. Trin. p. 507 (1866) (Trinidad); Schl. Mus. des P.-B. *Anseres*, p. 92; Pelz. Orn. Bras. p. 320 (1870); Finsch, P. Z. S. 1870, p. 589 (Trinidad).

*Canard Siffleur de Cayenne*, Buff. Pl. Enl. 826.

*Dendrocygna discolor*, Sel. & Salv. Nomencl. p. 161 (1873).

*Capite, collo antico, pectore et dorso superiore griseis, pileo obscuriore; gutture albicante, torque colli inferi indistinctè castaneo; dorso medio læte castaneo; ventre, alis et cauda nigris; tectricibus alarum minoribus internis ochraceiscentibus, mediis canis, externis albis; remigibus (extimo excepto) in pogonio externo et remigum tectricibus albis; crisso albo nigroque vario, rostro rubro, ungue nigro; pedibus flavis: long. tota 16·0, alæ 8·0, caudæ 2·5, rostri a rictu 2·2, tarsi 2·0, dig. med. cum ungue 2·5* (Descr. exmpl. ex Surinam in Mus. S. & G.).

*Hab.* Columbia, S. Martha (*Deppe, in Mus. Berol.*); Surinam (*Kappler*); Trinidad (*Léotaud*); Guiana (*Schomb.*); Cayenne (*Buffon*); Ucayali (*Bartlett*); Barra do Rio Negro, and Minas Geraes (*Natterer*).

*Obs.* Similis præcedenti, sed dorso superiore et pectore canis nec castaneis.

This southern form of *D. autumnalis* is distinguishable at a glance from that of Central America by the upper portion of the back being of a different colour from the middle and lower back—the former being of a grey tint, the latter rich chestnut-brown. In the northern form no such difference is apparent, the whole upper surface being of the same chestnut tint. The breast in the former bird also is greyish, and in the latter chestnut.

*D. discolor*, as we have proposed to term it, is found in the northern part of South America, extending from the littoral of Columbia and Guiana over the great Amazon valley, and occasionally ranging as far south as Mato Grosso and the interior of Minas Geraes, where specimens were obtained by Natterer.

### 4. DENDROCYGNA ARBOREA.

*Anas arborea*, Linn. S. N. i. p. 207 (1766); Gm. S. N. i. p. 540 (1788); Vieill. Enc. Méth. p. 141 (1823).

*Dendrocygna arborea*, Eyton, Mon. Anat. p. 110 (1838); Gosse, B. Jam. p. 395 (Jamaica); Cab. J. f. Orn. 1857, p. 227 (Cuba); Thienem. J. f. Orn. 1857, p. 157 (Cuba); A. & E. Newton, Ibis, 1859, p. 366 (St. Croix); Sel. P. Z. S. 1864, p. 300; March, Pr. Ac. Phil. 1864, p. 70 (Jamaica); Gundl. Repert. F.-N. i. p. 387

(1866) et J. für Orn. 1875, p. 375 (Cuba); Bryant, Pr. Bost. Soc. N. H. xi. (1866) p. 70 (Inagua); Schl. Mus. des P.-B. *Anseres*, p. 84; Scl. & Salv. Nomencl. p. 73.

*Black-billed Whistling Duck*, Edw. Glean. t. 193.

*Canard Siffleur de la Jamaïque*, Buff. Pl. Enl. 804.

*Anas jacquini*, Gm. S. N. i. p. 536, ex Jacquin, Beitr. p. 5. n. 3 (?).

*Fusco-brunnea, capite ochraceo, nucha cum stria colli postici nigra, torque collaris nigro variegata; dorsi plumis et tectricibus ularum marginibus pallidioribus ornatis, his quoque nigro maculatis; subtus gutture toto albo, pectore fulvescente, abdomine, præcipue in hypochondriis, albo nigroque variegato; dorso postico et cauda nigris; alis cinereis, remigibus fusco terminatis; rostro et pedibus nigris: long. tota 18.5, caudæ 3.0, rostri a rictu 2.2, tarsi 2.5, dig. med. cum ungue 2.8* (Descr. exempl. ex Jamaica in Mus. Brit.).

*Hab.* Cuba (*Gundlach*); Jamaica (*Gosse, March*); St. Croix (*Newton fr.*).

This Tree-duck is a resident in Cuba, where, according to Dr. Gundlach, it is common. It is said to rest during the day and to visit the lagoons towards dusk. It nests from June to September. Mr. March remarks that it is a permanent resident in Jamaica, frequenting the lagoons and morasses where mangroves abound, and feeding by night as well as by day. The habits of this species in Jamaica are also fully described by Mr. Gosse (*l. c.*). Numerous flocks frequent the millet-fields in Jamaica from December to the end of February. They are described as beating down the corn as they descend in compact flocks, and then picking the grain from the ears trampled under foot, which they cannot otherwise reach as it stands erect. In this manner they do a considerable amount of damage. The species is easily tamed, but does not appear to breed in confinement.

In St. Croix the Messrs. Newton state that the "Mangrove-Duck" is pretty common; but they are unable to say for certain whether it breeds in the island. It is more often heard than seen, its habit being to resort to its feeding-ground at night and to rest during the day in the recesses of the mangrove-swamps.

##### 5. DENDROCYGNA VIDUATA.

*Anas viduata*, Linn. S. N. i. p. 205 (1766); Jacquin, Beitr. i. p. 3, t. i.; Gm. S. N. i. p. 536 (1788) (Cartagena); Vieill. Enc. Méth. p. 132 (1823); Max. Beitr. iv. p. 921 (Brazil); Burm. Syst. Ueb. iii. p. 434.

*Dendrocygna viduata*, Eyton, Mon. Anat. p. 110 (1838); Cab. in Schomb. Guiana, iii. p. 762; Hartl. Ind. Az. p. 28; Tsch. F.P. p. 54; D'Orb. Voy. i. p. 448; Burm. La Plata-Reise, ii. p. 515 (Tucuman); J. f. Orn. 1860, p. 266; Gundl. Repert. F.-N. i. p. 388, J. für Orn. 1875, p. 377 (Cuba); Scl. P. Z. S. 1864, p. 299; Léot. Ois. Trin. p. 509 (1866) (Trinidad); Scl. & Salv. P. Z. S. 1866, p. 200 (Ucayali), 1869, p. 160 (Rep. Arg.), et Nomencl. p. 129; Schl. Mus. des

P.-B. *Anseres*, p. 90; Pelz. Orn. Bras. p. 319 (1870); Reinh. Fugl. Bras. Camp. p. 21 (1870) (Lagoa Santa).

*Canard du Maragnon*, Buff. Pl. Enl. 808.

*Pato cara blanca*, Az. Apunt. no. 435.

*Facie tota et macula gutturali albis; nucha, collo antico, abdomine medio, cauda, dorso postico et alis nigris; collo postico et humeris castaneis; dorso medio et scapularibus brunneis, plumis singulis ochraceo marginatis; tectricibus alarum olivaceo-nigris; hypochondriis albo nigroque transfasciatis: rostro et pedibus nigris: long. tota 17.0, alæ 9.0, caudæ 2.5, tarsi 2.0, dig. med. cum ungue 2.6, rostri a rictu 2.2* (Descr. exempl. ex Columbia in Mus. S. & G.).

*Hab.* Columbia (*Mus. S. & G.*); Guiana (*Schomb.*); Rio Branco (*Natt.*); Trinidad (*Léotaud*); Upper Amazons (*Bartlett*); Peru (*Tschudi*); Bolivia (*D'Orbigny*); Paraguay (*Azara*); Tucuman (*Burmeister*); Brazil (*Maximilian*); Rio Paraná and Cuyaba (*Natterer*); Lagoa Santa (*Lund*); Bahia (*Wucherer*); Cuba (*Gundlach*).

This species has a very wide range in South America; but though its casual appearance in Cuba has been recorded, it has never yet been met with in Central America. Commencing from the valley of the Magdalena it spreads over the whole continent, including the island of Trinidad, as far as the vicinity of Buenos Ayres. In Paraguay, Azara saw it in large flocks of as many as two hundred individuals and more. He notes its cry as "bi-bi-bi," which is uttered as it flies at all hours of the night. The members of a flock fly in a straight line or crescent.

## Genus 2. SARCIDIORNIS.

Type.

*Sarcidiornis*, Eyton, Mon. Anat. p. 20 (1838) . . *S. melanonota*.

This genus appears to be truly Tropicopolitan, and is represented by two or three species or closely allied forms in India, Africa, and America.

### SARCIDIORNIS CARUNCULATA.

"*Anas carunculata*, Ill.," Licht. Abh. Ak. Berlin, 1816-17, p. 176.

*El Pato crestudo*, Az. Apunt. no. 438.

*Pato de crista*, Max. Beitr. iii. p. 942.

*Anser melanotus*, Burm. Syst. Ueb. iii. p. 434.

*Sarcidiornis regia*, Hartl. Ind. Az. p. 27 (1847); Burm. La Plata-Reise, ii. p. 513 (Tucuman); J. f. Orn. 1860, p. 266; ScL. P. Z. S. 1867, p. 339, 1868, p. 532; Pelz. Orn. Bras. p. 319; ScL. & Salv. Nomencl. p. 129.

*Hab.* Paraguay (*Azara*); Tucuman (*Burmeister*); interior of prov. Bahia (*Maximilian*); Matogrosso and Barra do Rio Negro (*Natterer*).

We are unable to give a description of this species, as no authentic South-American examples are at present accessible to us. It is therefore not possible for us to give independent testimony as to the identity or distinctness of the birds found in South America, Africa, and India; but we have good reason to believe that the South-American form is really separable.

Hartlaub (*l. s. c.*) says there is no sufficient difference between American and Indian specimens; but v. Pelzeln distinguishes the American form from the African and Indian birds by its darker flanks.

The South-American bird has, as will be seen from the above quotations, usually been identified with the Pato Real, or *Anas regia* of Molina; but we now know that the *Sarcidiornis* does not occur at all in Chili, and that the "Pato Real" of that country is *Mareca chiloensis*, according to Philippi and Landbeck (*Cat. Av. Chil.* p. 95), though Molina's vague description may have had some reference to *Cairina moschata*. If, then, as would appear to be the case, the American bird is really separable from the Indian, the proper name for this species is *carunculata*—a term based by Illiger on Azara's *Pato crestudo*, and published by Lichtenstein in 1818.

The range of this Duck in South America is by no means extended; and it has seldom been noticed beyond the upper waters of the basin of the Paraná. It occurs, however, in the interior of Bahia, according to Prince Maximilian; and Natterer met with it at Barra do Rio Negro, on the Amazons, in July 1832.

### Genus 3. CAIRINA.

*Cairina*, Fleming, *Phil. of Zool.* p. 260 (1822).

*Moschatus*, Less. *Ind. Orn.* i. p. 633 (1831).

*Gymnathus*, Nuttall, *Man. Orn.* ii. p. 403 (1834).

This genus contains a single form, originally American, but now introduced into the Old World and naturalized in many parts of the tropics.

#### CAIRINA MOSCHATA.

*Anas moschata*, Linn. *S. N.* i. p. 199; Max. *Beitr.* iv. p. 910 (Brazil); Schl. *Mus. des P.-B. Anseres*, p. 73.

*Cairina moschata*, Cab. in Schomb. *Guiana*, iii. p. 763; Tsch. *F. P.* p. 54; D'Orb. *Voy.* i. p. 111; Burm. *Syst. Ueb.* iii. p. 440 (Brazil), et *La Plata-Reise*, ii. p. 514 (Paraná and Tucuman); J. f. *Orn.* 1860, p. 266; Moore, *P. Z. S.* 1859, p. 65 (Honduras); *Sci. & Salv. Ibis*, 1859, p. 232 (Guatemala); *P. Z. S.* 1864, p. 373 (Panama), 1866, p. 200 (Ucayali), 1867, p. 979 (Pebas); *Salv. Ibis*, 1865, p. 198; Taylor, *Ibis*, 1860, p. 315 (Honduras); Léot. *Ois. Trin.* p. 521 (1866) (Trinidad); Pelz. *Orn. Bras.* p. 320 (1870); Reinh. *Fugl. Bras. Camp.* p. 21 (1870) (Lagoa Santa); Lawr. *Mem. Bost. Soc. N. H.* ii. p. 315 (Mazatlan).

*Carina moschata*, Eytton, *Mon. Anat.* p. 142 (1838).

*Cairina sylvestris*, Stephens, *Zool.* xiii. p. 69.

*Anas marianæ*, Shaw, *Nat. Misc.* ii. t. 69 (?).

*El Pato Grande o Real*, Az. *Apunt.* no. 437.

*Le Canard musqué*, Buff. *Pl. Enl.* 986.

*Capite toto, collo, et corpore subtus brunneo-nigris, abdomine lineis albis angustissimis transvittato; dorso iridescente purpureo, plumis singulis nigro marginatis, scapularibus et terturiis*

*elongatis cum cauda læte viridi-nitentibus; secundariis chalybeo-cæruleo indutis; primariis nigris; tectricibus alarum omnibus supra et subtus cum plumis axillaribus pure albis; hypochondriis viridi vix tinctis; rostri carunculis rubris, pedibus nigris: long. tota 29·0, alæ 15·0, caudæ 7·5, rostri a rictu 2·6, tarsi 2·3, dig. med. cum ungue 3·8 (Descr. maris ex Guatemala, in Mus. S. & G.). Fem. mari similis sed minor: long. tota 25·0, alæ 12·5, caudæ 5·5, rostri a rictu 2·3, tarsi 1·8, dig. med. cum ungue 2·9.*

*Hab.* Paraguay (*Azara*); Paraná and Tucuman (*Burmeister*); Lagoa Santa (*Reinhardt*); Bolivia (*D'Orbigny*); Peru (*Tschudi*); Brazil (*Maximilian, Burmeister*); Amazonia (*Bartlett, Hauwewell*); Guiana (*Schomburgk*); Trinidad (*Léotaud*); Panama (*M'Leannan*); Honduras (*Taylor*); Guatemala (*Salvin*); Mexico (*Grayson, Xantus*).

The Muscovy Duck, so well known in a domestic state nearly all over the world, is a native of the hottest portion of tropical America. It is usually found in lowland swampy districts; and where there are extensive forests it not unfrequently abounds. During the day the birds remain in the forest-swamps; but towards evening numbers may be seen sitting on the lower boughs of trees standing on the margin of a clearing.

In Guatemala, *Salvin* found this Duck abundant on the Pacific coast in lagoons near Santana Mixtan and also at Huamuchal. It is likewise met with on the Atlantic side on the Rio Polochic, and also between Lake Peten and Lake Yax-ha. Its extreme northern limit seems to be N.W. Mexico, where *Col. Grayson* found it at Mazatlan, and *Xantus* at Rio Zacatula.

Its southern range extends to the upper Paraná and Tucuman. It is not uncommon in Paraguay, according to *Azara*, although not found on the La Plata. It is to be seen usually in pairs or singly, but also in flocks of twenty or thirty. It always roosts in trees, usually resorting to the same trees night after night. The nest, in which from ten to fourteen eggs are deposited, is made in a hole or fork of a large tree at some elevation from the ground. It seeks its food not only in the rivers, but on moonlight nights resorts to the maize and corn-fields and also plucks up the roots of mandioca.

The native habitat of the Muscovy Duck was known to some of the earliest writers. The date of its introduction as a domesticated species into Europe and elsewhere does not appear to have been recorded, but doubtless dates back to soon after the Spanish conquests in America.

## Genus 4. ANAS.

Type.

<i>Anas</i> , Linn. S. N. i. p. 194 (1766).....	<i>A. boschas</i> .
<i>Boschas</i> , Sw. Class. B. ii. p. 367 (1857) .....	<i>A. boschas</i> .
<i>Chauliodus</i> , Sw. Faun. Bor.-Amer. p. 440 (1831)	<i>A. strepera</i> .
<i>Ktinorhynchus</i> , Eyton, Mon. Anat. p. 137 (1838)	<i>A. strepera</i> .
<i>Chaulelasmus</i> , G. R. Gray; Pr. Bonap. Geog. Comp.	
List of B. p. 58 (1838) .....	<i>A. strepera</i> .

Five species of true *Anas* (or, at least, not yet separated from the

Linnean type) occur within the Neotropical Region. Three of them are stray visitors from the north into the Antilles; the remaining two are peculiar Antarctic species.

### 1. ANAS BOSCHAS.

*Anas boschas*, Linn. S. N. i. p. 205 (1766); Baird, B. of N. Am. p. 774; Cab. J. f. Orn. 1857, p. 229 (Cuba); March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Gundl. Repert. F.-N. i. p. 388, et J. fur Orn. 1875, p. 378 (Cuba); Scl. & Salv. Nomencl. p. 129; Lawr. Ann. Lyc. N. Y. viii. p. 13 (Panama) et Mem. Bost. Soc. N. H. ii. p. 314 (Mexico).

*Anas maxima*, Scl. P. Z. S. 1859, p. 370 (Mexico).

*Hab.* Cuba (*Gundlach*); Jamaica (*March*); Mexico (*De Oca, Grayson*); Panama (*M'Leannan*).

According to Dr. Gundlach, *A. boschas* is rarely seen wild in Cuba; but in 1850 a flock on passage from the north settled in the lagoons near Cardenas, and the bird is occasionally to be seen in the market of Havana. Mr. March says it is rare in Jamaica. In Central America it has been recorded from Mexico and Panama, but nowhere else.

### 2. ANAS OBSCURA.

*Anas obscura*, Gm. S. N. i. p. 541 (1788); Baird, B. of N. Am. p. 775; Cab. J. f. Orn. 1857, p. 229 (Cuba); March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Scl. & Salv. Nomencl. p. 129; Lawr. Mem. Bost. Soc. N. H. ii. p. 314 (Mexico).

*Hab.* Jamaica (*March*); Tepic, Mexico (*Grayson*).

The Dusky Duck is said to be of rare occurrence in Jamaica. In Cuba, Dr. Gundlach formerly suspected its occasional presence, but does not mention it in his last 'Revista de las Aves Cubanas.' In Mexico it has hitherto only been noticed at Tepic by Grayson.

### 3. ANAS SPECULARIS.

*Anas specularis*, King, Zool. Journ. iv. p. 98 (1828); Eyton, Mon. Anat. p. 138 (1838); Jard. & Selb. Ill. Orn. iv. tab. 40; Gay, Faun. Chil. p. 450; Cassin, Gilliss's Exp. ii. p. 202; Scl. P. Z. S. 1867, p. 335 (Chili); Ph. & Landb. Cat. Av. Chil. p. 42; Scl. & Salv. Nomencl. p. 129.

*Anas chalcoptera*, Kittlitz, Mém. prés. Acad. St. Pétersb. ii. p. 471, t. 5 (1835); Schl. Mus. des P.-B., *Anseres*, p. 46; Gray, Hand-l. iii. p. 82.

*Supra chalybeio-nigra, cervice postica et uropygio fumoso-brunneis; dorsi superioris plumis hoc colore marginatis; capite toto et nucha nigris, plaga magna faciali utrinque et gutture medio in semitorquem collarem transeunte distinctissime albis; subtus valde dilutior et rufescentior, et fasciis transversis rufis in pectore variegata; alis et interscapulio chalybeio-nigris; speculo alari lato vivide cupreo, hujus parte distali velutino-nigra margine albo terminata; hypochondriis aeneo-nigro maculatis;*

*plumis axillaribus albis; rostro obscuro, pedibus flavis: long. tota 21·0, alæ 11·0, caudæ 4·8, tarsi 1·9, rostri a rictu 2·3.*

Fem. mari similis, sed coloribus minus claris.

*Hab.* Magellan Straits (*King*); Southern and Central Chili (*Phil. & Landb.*).

This Duck is very remarkable for its conspicuous white patch on each side of the face and pure white throat and neck, as well as the large richly coloured alar speculum. So far as we yet know, it is exclusively a western species. According to Philippi and Landbeck it is common from the Straits of Magellan as far north as Valdivia, but is rare in the central provinces of Chili.

#### 4. ANAS CRISTATA.

*Crested Duck*, Lath. Syn. iii. p. 543, undè

*Anas cristata*, Gm. S. N. i. p. 540 (1788) (Statenland); Gay, Faun. Chil. p. 449 (1848); Gould, P. Z. S. 1859, p. 96 (Falklands); Sel. P. Z. S. 1860, p. 389 (Falklands), 1867, p. 335 (Chili); Abbott, Ibis, 1861, p. 160 (Falklands); Ph. & Landb. Cat. Av. Chil. p. 41; Sel. & Salv. P. Z. S. 1867, p. 990 (Salinas, Peru); Ibis, 1870, p. 499 (Tuesday Bay), et Nomencl. p. 129; Schl. Mus. des P.-B. *Anseres*, p. 39.

*Anas specularoides*, King, Zool. Journ. iv. p. 98 (1838).

*Anas pyrrhogaster*, Meyen, Nov. Act. xvi. Suppl. p. 119, t. xxv. (Maipu, Chili).

*Dafila pyrrhogaster*, Eyton, Mon. Anat. p. 113 (1838).

*Supra terreno-fusca, colore pallidiore in dorso superiore variegata; pileo fusciscenti-nigro in cristam elongatam desinente; speculo alari lato cupreo-viridi, parte distali nigra, fascia externa alba terminata; subtus fusca, magis rufescens et maculis indistinctis in pectore notata; crisso et subalaribus fere nigris, harum plaga media alba; rostri maxilla nigra, mandibula flava, pedibus nigris: long. tota 20·0, alæ 10·5, caudæ 5·0, rostri a rictu 2·1, tarsi 1·8, dig. med. cum ungue 2·4.*

*Hab.* Falklands (*Abbott*); Magellan Straits (*Cunn.*); Chili (*Ph. & Landb.*); S. Peru (*Whitely*).

This species has a wider range than the last, extending northwards into Southern Peru, where Mr. Whitely obtained specimens in 1867 at Salinas, a salt lake on the Cordillera, above Arequipa, at an altitude of 14,000 feet. In Chili, Philippi and Landbeck tell us, it inhabits the high cordilleras in summer, but descends during winter to the plains, and is found along the coast down to the Magellan Straits, where Dr. Cunningham obtained specimens.

The Crested Duck is common everywhere on the Falkland islands, mostly frequenting salt water, though occasionally seen near fresh-water pools. Old birds are always found in pairs. They live upon shellfish. They retire inland to breed; and the duck lays five eggs, in a nest covered with down. The eggs are laid from the beginning of October to the beginning of November.

The only near ally of this Duck in the Neotropical region is the preceding species, from which it may be at once distinguished by the

absence of the conspicuous white face-markings and the small crest. It is, no doubt, the *Anas specularoides* of King.

#### 5. ANAS STREPERA.

*Anas strepera*, Linn. S. N. i. p. 100 (1766); Scl. & Salv. Nomencl. p. 129.

*Chaulelasmus streperus*, Baird, B. of N. Amer. p. 782; March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Gundl. Repert. F.-N. i. p. 389, et J. für Orn. 1875, p. 381 (Cuba); Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).

*Hab.* Cuba (*Gundl.*); Jamaica (*March*); Mexico (*Grayson*).

The occurrence of a single male bird of this species in the market of Havana is the sole authority for its admission into the list of Cuban birds. In Jamaica, however, Mr. March says, it is sometimes abundant, but of irregular occurrence. Its presence in Mexico is confined to the N.W. provinces, where Grayson observed it.

#### Genus 5. HETERONETTA.

Type.

*Heteronetta*, Salvadori, Atti de la Soc. Ital. d.

Sci. Nat. viii. p. 574 (1865) . . . . . *H. melanocephala*.

This is certainly an aberrant form of *Anas* in many respects; and Dr. Salvadori is probably correct in isolating it. Schlegel even goes so far as to put it with the *Fuligulae*; but before accepting this view, we require a knowledge of its tracheal formation.

#### HETERONETTA MELANOCEPHALA.

*Pato cabeza negra*, Az. Apunt. no. 438 (Buenos Ayres), undè *Anas melanocephala*, Vieill. N. D. v. p. 163 (1816), et Enc. Méth. p. 354 (1823); Hartl. Ind. Az. p. 28; Cassin, Gilliss's Exp. ii. p. 202, t. xxv. (1856); Sel. P. Z. S. 1867, p. 335 (Chili); Phil. & Landb. Cat. Av. Chil. p. 42; Scl. & Salv. Nomencl. p. 129.

*Heteronetta melanocephala*, Salvad. Atti Soc. Ital. viii. p. 374 (1866).

*Fuligula melanocephala*, Schl. Mus. des P.-B. *Anseres*, p. 32.

*Anas nigriceps*, Licht. in Mus. Berol.; Nomencl. p. 101.

*Anas atricapilla*, Merrem, in Ersch. u. Grub. Enc. sect. i. vol. xxxv. p. 26.

*Supra saturate nigricanti-fusca, rufescente minutissime vermiculata; capite colloque toto fuliginose nigris; secundariorum fascia terminali angusta alba; subtus sordide alba, in pectore summo hypochondriis et crisso rufescente irrorata; rostro nigricante, macula basali utrinque carnea; pedibus corneis: long. tota 14.5, alæ 6.3, caudæ 2.3, tarsi 1.1, rostri a rictu 2.0. Fem. pileo dorso concolori, genis fuscis nigro vermiculatis, gula et stria superciliari indistincta albidis diversa.*

*Hab.* Buenos Ayres (*Azara*); Chili prov. of Santiago (*Ph. & Landb.*); Brazil, Rio Grande do Sul (*Max.*); Mendoza (*Weisshaupt*).

This peculiar Duck was first described by Azara, who "bought a pair in Buenos Ayres," where, however, Burmeister does not seem to

have recognized it. Prince Maximilian tells us (Beitr. iv. p. 932) that he has received examples from Rio Grande do Sul; and Weisshaupt obtained a series of skins during his excursion from Santiago to Mendoza, some of which are in Salvin and Godman's collection.

In Chili, where it also occurs, Philippi and Landbeck say that up to the present time this species has not been found beyond the province of Santiago, and that the hunters confound it with *Erismatura ferruginea*.

## Genus 6. QUERQUEDULA.

Type.

- Querquedula*, Steph. Gen. Zool. xii. p. 142 (1824) .. *Q. circia*.  
*Nettion*, Kaup, Nat. Syst. p. 95 (1829) ..... *Q. crecca*.  
*Cyanopterus*, Eyton, Mon. Anat. p. 130 (1838) . . . . *Q. circia*.  
*Pterocyanea*, Bp. Cat. Met. Ucc. Eur. p. 71 (1842) .. *Q. circia*.

Ten *Querquedulæ* (under which head we embrace the Teals and Garganeys) occur within the Neotropical region. Of these, two are northern species, which visit the Antilles and Central America in winter; the remaining eight are endemic Neotropical species, one of which, however, has extended its northern range into the southern portion of the Nearctic region.

The ten Neotropical *Querquedulæ* may be diagnosed as follows:—

- a. Tetricibus alar. min. cæruleis.  
 Plaga faciei utrinque alba..... 1. *discors*.  
 Facie (cum corpore antico) rubra ..... 2. *cyanoptera*.  
 b. Tetricibus alar. min. fuscis.  
 b'. Pileo et cervicis lateribus in mare rubris ..... 3. *carolinensis*.  
 c'. Pileo et cervicis lateribus nigro fasciolatis.  
 c''. Rostro sup. ad basin flavo.  
 Major: interscapulio dorso fere concolori..... 4. *oxyptera*.  
 Minor: interscapulio nigro variegato..... 5. *flavirostris*.  
 d''. Rostro toto nigro ..... 6. *andium*.  
 d'. Pileo fuscescenti-nigro; cervicis lateribus albis.  
 Rostro superiore ad basin rubro ..... 7. *versicolor*.  
 Rostro toto nigro ..... 8. *puna*.  
 c. Tetricibus alar. min. nigris.  
 Pileo nigro .. 9. *torquata*.  
 Pileo fusco ..... 10. *brasiliensis*.

## 1. QUERQUEDULA DISCORS.

*Anas discors*, Linn. S. N. i. p. 205 (1766).

*Querquedula discors*, Steph. Gen. Zool. xii. p. 149; Baird, B. of N. Am. p. 779; Cab. J. f. Orn. 1857, p. 228 (Cuba); Sallé, P. Z. S. 1857, p. 237 (S. Domingo); ScL. P. Z. S. 1857, p. 206 (Jalapa, Mexico), 1859, p. 393, 1860, p. 254 (Mexico); ScL. & Salv. Ibis, 1859, p. 231 (Guatemala), et Nomencl. p. 129; Salv. Ibis, 1865, p. 193; Gundl. Repert. F.-N. i. p. 389, et J. für Orn. 1875, p. 380 (Cuba); March, Pr. Acad. Phil. 1864, p. 71 (Jamaica); Lawr. Ann. Lyc. N. Y. viii. p. 101 (Sombbrero), ix. (1868) p. 143 (Costa Rica); Mem. Bost. Soc. N. H. ii. p. 314 (Mexico); Bryant, Pr. Bost. Soc. N. H. xi. p. 97 (S. Domingo); Salvin, P. Z. S. 1870, p. 219 (Veragua).

*Pterocyanea discors*, Léot. Ois. Trin. p. 516 (Trinidad).

*Cyanopterus discors*, Tayl. Ibis, 1860, p. 315 (Honduras).

*Hab.* Cuba (*Gundl.*); Jamaica (*March*); St. Domingo (*Sallé, Bryant*); Sombrero (*Lawr.*); Trinidad (*Léotaud*); Mexico, Jalapa and Orizaba (*Sallé*); Mazatlan (*Grayson*); Guatemala (*Salvin*); Honduras (*Taylor*); Costa Rica (*Lawrence*).

In Cuba this is the commonest of the North-American migratory Ducks, arriving about the beginning of September and leaving the island again in April. In Jamaica Mr. March says he has never seen the "Bluewings" earlier than November, and that they again appear in full summer-plumage in March and April on their way to the north. This species is likewise met with in the other Antilles, as far down as Trinidad.

On the continent, *Q. discors* has been traced down as far as Veragua, as will be seen by our list of localities. In Guatemala, Salvin found it common in winter, arriving in September and leaving again in March and April. It is met with in the high and low districts alike, chiefly on the lakes.

## 2. QUERQUEDULA CYANOPTERA.

*Pato alas azulas*, Az. Apunt. no. 434 (La Plata, Buenos Ayres), undè

*Anas cyanoptera*, Vieill. N. D. v. p. 104 (1816), et Enc. Méth. p. 352 (1823); Merrem, in Ersch. & Grub. Enc. sect. i. vol. xxxv. p. 33; Burm. J. f. Orn. 1860, p. 226; La Plata-Reise, ii. p. 516 (Mendoza); Schl. Mus. des P.-B. *Anseres*, p. 51.

*Querquedula cyanoptera*, Cass. Ill. Orn. p. 84, t. xv. (Louisiana, Utah), et Gilliss's Exp. ii. p. 202 (1856); Baird, B. of N. Amer. p. 780; ScL. P. Z. S. 1855, p. 164 (Bogotá, St. Martha), 1856, p. 310 (Mexico), 1860, p. 389 (Falklands), 1867, p. 355 (Chili); Gould, P. Z. S. 1859, p. 96 (Falklands); Abbott, Ibis, 1861, p. 161 (Falklands); ScL. & Salv. P. Z. S. 1869, p. 160 (Buenos Ayres), et Ibis, 1868, p. 189 (Sandy Point).

*Anas cæruleata*, Licht. in Mus. Berol.; Bibra, Denkschr. Ak. Wien, v. p. 131 (1853) (Chili); cf. J. f. Orn. 1855, p. 57; Lawr. Ann. Lyc. N. Y. v. p. 220 (California).

*Querquedula cæruleata*, Gay, Faun. Chil. p. 452 (1848); Ph. & Landb. Cat. Av. Chil. p. 42.

*Pterocyanea cæruleata*, Hartl. Ind. Az. p. 27 (1847).

*Anas rafflesi*, King, Zool. Journ. iv. p. 97 (1828); Jard. & Selb. Ill. Orn. t. 23.

*Cyanopterus rafflesi*, Eyton, Mon. Anat. p. 132 (1838).

*Rubra, pileo nigro; interscapulio et scapularibus nigro variegatis; dorso postico nigricante; alarum tectricibus minoribus cæruleis; speculo alari viridi, fascia alba supra marginato; remigibus primariis nigris, secundariorum scapis albo et ochraceo flammulatis; rostro nigro, pedibus flavis: long. tota 18.0, alæ 7.6, caudæ 3.0, tarsi 1.3. Fem. supra nigricans, plumarum marginibus albidis; subtus sordide alba, fusco variegata,*

*gutturibus albo nigro punctulato; alarum tectricibus et speculo sicut in mari.*

*Hab.* Andes of Columbia (*Mus. S. G.*); St. Martha (*Verreaux*); Chili (*Ph. & Landb.*); Buenos Ayres (*Azara & Burm.*); Magellan Straits (*Cunningh.*); Falklands (*Abbott*).

This Duck, first discovered by Azara, has a very wide range in the New World, from the extreme south up to California on the west, and occurs accidentally in Louisiana. It was found by Azara only in the Rio de la Plata and Buenos Ayres; but Burmeister observed it at Mendoza and on the Parauá, in lagoons and rivers. Philippi and Landbeck say that it is frequently met with throughout the republic of Chili; and Dr. Cunningham obtained specimens in the Straits of Magellan. It seems not to be very common in East Falkland, though Capt. Abbott shot seven in one day at Mare Harbour. But it most probably breeds in these islands, as pairs were observed throughout the summer months.

In the eastern part of South America (that is, in Brazil, Amazonia, and Guiana) we do not find the occurrence of this Duck noticed; but it is certainly met with in the Andes of Columbia and on the northern littoral of Venezuela, and probably keeps to the line of the Andes. It has not yet been recorded from any part of Central America; but will probably be ultimately found there, as it is not uncommon in the Western United States and has occurred accidentally in Louisiana.

### 3. QUERQUEDULA CAROLINENSIS.

*Anas carolinensis*, Gm. S. N. i. p. 533 (1788).

*Querquedula carolinensis*, Steph. Gen. Zool. xii. p. 148; Baird, B. of N. Amer. p. 777; Jard. Ann. & Mag. N. H. xx. (1847) p. 377 (Tobago); Cab. J. f. Orn. 1857, p. 228 (Cuba); Moore, P. Z. S. 1859, p. 65 (Honduras); Sc. P. Z. S. 1857, p. 215, 1859, p. 370, 1860, p. 254 (Mexico); Sc. & Salv. Ibis. 1859, p. 231 (Honduras); Nomencl. p. 129.

*Nettion carolinensis*, March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Gundl. Repert. F.-N. i. p. 389, et J. für Orn. 1875, p. 381 (Cuba); Lawr. Mem. Bost. Soc. N. H. ii. p. 314 (Mexico).

*Hab.* Cuba (*Gundl.*); Jamaica (*March*); Tobago (*Kirk*); Mexico (*Sallé, De Oca, Grayson*); Honduras (*Dyson*).

The Green-winged Teal of the North-Americans occurs on passage in Cuba, but is rare. In Jamaica it is sometimes seen in autumn, but more generally in the spring. A single immature specimen was sent to Sir W. Jardine from Tobago by Mr. Kirk, who says that the species arrives in that island in October and November and departs in March or April. In Mexico it has been obtained at Mazatlan, Orizaba, and Jalapa. Leyland procured examples of it many years ago in Honduras, on the Aloor river. This is its furthest continental range to the south yet known to us.

### 4. QUERQUEDULA OXYPTERA.

*Anas oxyptera*, Meyen, Nov. Act. xvi. Suppl. p. 121, t. 26 (1833) (South Peru).

*Querquedula oxyptera*, Tsch. F. P. pp. 55, 309 (Sierra region of Peru); Scl. & Salv. P. Z. S. 1867, p. 990 (S. Peru), 1868, p. 570, 1869, p. 157 (Peru); Nomencl. p. 129.

*Querquedula angustirostris*, Ph. & Landb. Wieg. Arch. 1863, pt. i. p. 202 (Tacna).

*Supra pallide schistaceo-fusca, capite toto nigro frequenter transfasciolato; interscapulio rufescente lavato, plumis in centro obscurioribus; uropygio valde dilutiore; speculo alari lato nigro supra et subtus fascia ochracea terminato et fascia splendenti-cæneo-viridi intus inclusa; remigibus obscure schistaceis, secundariorum marginibus utrinque pallide rufescentibus; abdomine albo, pectore nigro punctato; rostro flavo, culmine et apice nigris; pedibus corneis: long. tota 17·5, alæ 8·7, caudæ 4·0, tarsi 1·4, rostri a rictu 1·8.*

*Hab.* Cordilleras of Peru, near Lake Titicaca (*Meyen*); Salinas above Arequipa (*Whitely*); Laguna of Cucullata above Tacna (*Froben*).

This Duck was first discovered by Meyen, who obtained specimens of it on the high cordillera of Peru, near Lake Titicaca. Meyen's name (*oxyptera*) having been wrongly applied to the next species, Philippi and Landbeck (as was pointed out by us in 1867) redescribed the bird in 1863 under the name *angustirostris*. Their specimens were obtained by Froben, on the Lake of Cucullata, in Southern Peru.

Our examples of this species were collected by Mr. Whitely on the salt lake of Salinas, situated at an elevation of 14,000 feet above Arequipa. Mr. Whitely subsequently procured other examples on the lagoon of Tungasuca and on the river near Tinta, in the district of Cuzco.

##### 5. QUERQUEDULA FLAVIROSTRIS.

*Pato pico amarillo y negro*, Azara, Apunt. no. 439 (Buenos Ayres), *unde*

*Anas flavirostris*, Vieill. N. D. v. p. 107 (1816), et Enc. Méth. p. 353 (1823); Schl. Mus. des P.-B. *Anseres*, p. 59.

*Querquedula flavirostris*, Burm. J. f. Orn. 1860, p. 226, et La Plata-Reise, ii. p. 516 (Mendoza); Scl. & Salv. P. Z. S. 1868, p. 146 (Buenos Ayres), et Nomencl. p. 129.

*Anas creccoides*, King, Zool. Journ. iv. p. 99 (1828).

*Querquedula creccoides*, Eyton, Mon. Anat. p. 128 (1838); Gay, Faun. Chil. p. 453 (1848); Cassin, Gilliss's Exp. ii. p. 203, t. xxvi. (1856) (Chili); Darwin, Voy. Beagle, iii. p. 135 (1848); Scl. P. Z. S. 1860, p. 389 (Falklands), 1867, p. 335 (Chili); Gould, P. Z. S. 1859, p. 96 (Falklands); Ph. & Landb. Cat. Av. Chil. p. 42; Abbott, Ibis, 1861, p. 160.

"*Querquedula oxyptera*, Meyen," Reich. Nat. t. lii. f. 164; Bibra, Denkschr. Ak. Wien, v. p. 131 (1853); cf. J. f. Orn. 1855, p. 57 (Chili).

*Similis præcedenti, sed minor, rostro brevior; interscapulii plumis in centro nigris, fusciscente ochraceo strictè marginatis; uro-*

*pygio paululum obscuriore; pectoris guttis magis distinctis et fere totum ventrem occupantibus; necnon alis et tarsi brevioribus distinguenda: long. tota 15·0, alæ 7·4, caudæ 3·5, rostri a rictu 1·65, tarsi 1·2.*

*Hab.* Buenos Ayres (*Azara, Hudson*); Mendoza (*Burm.*); Straits of Magellan (*Darwin*); Falklands (*Abbott*); Chili (*Philippi & Landb.*).

This Duck was first obtained by Azara in Buenos Ayres; and his name for it was not very correctly latinized by Vieillot. We have specimens from the same neighbourhood, obtained by Mr. W. H. Hudson. It seems to be distributed thence all over Antarctic America. According to Burmeister it is not unfrequently seen near Mendoza, in the lagoon of Rodeo del Medio. Philippi and Landbeck state that it is common in Chili, and southwards on the western coast to the Straits of Magellan. In the last-mentioned locality Mr. Darwin also obtained specimens.

In the Falkland Islands this species is more plentiful in the interior than in the neighbourhood of civilization, and is found in large flocks in some of the freshwater streams. It lays in September, and even as early as August; and the nest, with its complement of five eggs, placed in the dry grass in some retired unfrequented valley, is very difficult to find. As a rule, the bird is very tame.

#### 6. QUERQUEDULA ANDIUM. (Plate XXXIV.)

*Dafila* —, sp.?, *Sci. P. Z. S.* 1860, p. 83 (Ecuador).

*Querquedula andium*, *Sci. & Salv. Nomencl. Av. Neotr.* p. 162, et *P. Z. S.* 1875, p. 237.

*Capite undique nigro et albo frequentissime marmorato; dorso obscure cinereo, scapularibus æneo-nigris fusco circumcinctis; speculo alari æneo-nigro in secundariis dorso proximis nitidissime æneo-viridi, supra et subtus fascia pallide castanea marginato; abdomine albo cineraceo adumbrato; pectore maculis plumarum centralibus fusco-nigris; rostro nigro, pedibus carnis: long. tota 16·0, alæ 9·0, caudæ rigidiusculæ 3·5.*

*Hab.* High Ecuador, between Riobamba and Mocha (*Fraser*); Sierra Nevada of Merida (*Goering*).

*Obs.* Similis *Q. oxyptera* et *Q. flavirostri*, sed notæo obscuriore, rostro nigro, et speculo alari æneo neque viridi distinguenda.

Mr. Fraser obtained a single specimen of this Duck on the high plateau of Riobamba in 1859; but Sclater did not succeed in making out the species. Subsequently Salvin selected two examples of the same bird from a collection sent to this country from Quito; and we were thus enabled to describe it for the first time in our 'Nomenclator.'

Last year we had again the pleasure of recognizing an example of this species in Mr. Goering's last collection from the Sierra Nevada of Merida, where it was obtained at an altitude of 10,000 feet.

It would appear, therefore, that this Duck replaces the two preceding species in the Andes of Ecuador and Venezuela. We have not yet seen it from Columbia; but no doubt it occurs there also.

## 7. QUERQUEDULA VERSICOLOR.

*Pato pico de tres colores*, Az. Apunt. no. 440 (Paraguay) undè *Anas versicolor*, Vieill. N. D. v. p. 109 (1816), et Enc. Méth. p. 353 (1823); Schl. Mus. des P. B. *Anseres*, p. 57.

*Querquedula versicolor*, Cassin in Gilliss's Exp. ii. p. 203 (1856) (Chili); Scl. P. Z. S. 1860, p. 389 (Falklands); 1867, p. 335 (Chili); Abbott, Ibis, 1861, p. 161 (Falklands); Scl. & Salv. P. Z. S. 1868, p. 146 (Buenos Ayres); Ibis, 1870, p. 499 (Sandy Point), et Nomencl. p. 129; Salvin, Trans. Zool. Soc. iv. p. 499.

*Anas maculirostris*, Licht. Doubl. p. 84 (1823), ex Azara; Burm. J. für Orn. 1860, p. 266, et La Plata-Reise, ii. p. 516 (Mendoza); Sund. P. Z. S. 1871, p. 126 (Galapagos).

*Querquedula maculirostris*, Gay, Faun. Chil. p. 452, Phil. & Landb. Cat. Av. Chil. p. 42.

*Pterocyanea maculirostris*, Hartl. Ind. Az. p. 28.

*Anas fretensis*, King, P. Z. S. 1830-31, p. 15; Jard. & Selb. Ill. Orn. iv. t. 29.

*Cyanopterus fretensis*, Eyton, Mon. Anat. p. 131 (1838).

*Anas muralis*, Merr. Ersch. & Grub. Enc. sect. i. vol. xxxv. p. 42.

*Supra nigra albo transfasciolata, fasciis in uropygio frequentioribus et angustioribus; pileo funoso-nigro unicolori, capitis lateribus cum gutture lacteo-albis; abdomine albido, in pectore ochraceo induto et nigro guttato, in vertice magis albicante et nigro frequenter transfasciato; alis extus grisescenti-fuscis; speculo purpurascenti-viridi, supra et subtus albo marginato et subtus fascia altera subterminali nigra ornato; hypochondriis fasciis latis albis et nigris distincte notatis; rostro nigro, macula ad mandibulæ basin utrinque aurantiaca, pedibus corylinis: long. tota 16·5, alæ 7·6, caudæ 3·4, tarsi 1·3, rostri a rictu 1·9. Fem. mari similis sed coloribus paulo dilutioribus et speculo alari obscuriore [Descr. exempl. ex Chilia (Leybold)].*

*Hab.* Paraguay (Azara); Buenos Ayres (Hudson); Mendoza (Burm.); Magellan Straits (King); Falklands (Abbott); Chili (Phil. et Landb.); Galapagos (Sund.).

This Duck, first described by Azara from Paraguay, is found all over Antarctic America. Mr. Hudson obtained it at Conchitas near Buenos Ayres; and according to Burmeister it occurs at Mendoza (at the foot of the Cordillera) near marshes and brooks.

In Chili Philippi and Landbeck found this species somewhat rarer than *Q. cyanoptera*. In East Falkland it is not common; but when it does occur it is usually seen in numbers. It breeds in the Falklands; for Capt. Abbott had young birds brought to him, though he never found a nest.

The supposed extension of the range of this Duck to the Galapagos is rather surprising. It rests upon the authority of Sundevall, who determined the specimen.

## 8. QUERQUEDULA PUNA.

*Anas puna*, Tsch. Faun. Per. p. 309 (Peru); Burm. Syst. Ueb. ii. p. 439.

*Querquedula puna*, Scl. & Salv. P. Z. S. 1869, p. 157 (Peru);  
Ex. Orn. p. 197, t. 99, et Nomencl. p. 129.

*Supra pallide fuscescenti-cinerea, fusco variegata, plumis medioliter obscurioribus; pileo toto et linea nuchali nigris; alis extus fuscescenti-cinereis; tectricibus minoribus plumbeo tinctis et margine lato albo terminatis; secundariis in pogonio externo æneo-viridibus, albo late terminatis; subtus ochraceo-alba, pectoris plumis fusco obsolete guttatis; ventre toto et crisso nigricante minute transfasciolatis; tectricibus subalaribus et plumis axillaribus albis; rostro (in ave viva) cæruleo, culmine nigricante; pedibus cærulescenti-schistaceis: long. tota 18·0, alæ 8·5, caudæ 3, rostri a rictu 2·1, tarsi 1·3, dig. med. cum ungue 1·9.*

*Hab.* High Peru (*Philippi*); Bolivia, Cochabamba (*D'Orbigny*).

*Obs.* Affinis *Q. versicolori* sed rostro cærulescente, pileo nigro et hypochondriorum fasciis angustis distinguenda.

The first examples of this fine Duck that attracted our notice were those in the gallery of the Jardin des Plantes at Paris, one of which is marked as having been obtained in the province of Cochabamba in Bolivia by *D'Orbigny*, and the other in Chili by *Mr. Gay*, the latter locality, however, being probably erroneous.

The specimens were not named; and we were at first inclined to regard them as belonging to an undescribed species. Subsequently, however, we received Peruvian skins of the same bird from *Mr. H. Whitely*, and were thus induced to make a more accurate examination of it. This led to the discovery that it is the species described by *Tschudi* in his 'Fauna Peruana' as *Anas puna*, from a specimen obtained by *Philippi* in the highlands of Peru, and transmitted to the Berlin Museum. We should add that *Slater* has examined the typical example of *A. puna* in that collection, and is convinced of its identity with the present bird.

*Mr. Whitely* obtained two examples of this Duck on the lagoon of *Tungasuca*, which is situated in the Andes, south-east of *Cusco*, at an elevation of about 12,000 feet above the sea-level. The skins are both marked as "females;" but the male, we suppose, would hardly differ, except perhaps in possessing rather brighter plumage.

*Mr. Whitely* states that in the living bird the bill is light blue, with a streak of black down the centre of the upper mandible, the eye dark hazel, the legs and toes bluish slate-colour. He adds that he met with this Duck in pairs, but found it rather rare.

*Querquedula puna* is a very well-marked species, and can hardly be confounded with any other member of the family. It seems to be most nearly allied to *Q. versicolor*, but is readily distinguishable by its larger and uniformly coloured bill, blacker head, whiter throat, and by the finer markings above and on the flanks.

#### 9. QUERQUEDULA TORQUATA.

*Pato collar negro*, Azara, Apunt. no. 441 (Paraguay) undè  
*Anas torquata*, Vieill. N. D. v. p. 110 (1816), et Enc. Méth.  
p. 345 (1823); Schl. Mus. des P. B. *Anseres*, p. 61.

*Querquedula torquata*, Hartl. Ind. Az. p. 28 (1847); Gray, List Gall. Grall. & Ans. B. M. p. 139 (1844); Scl. P. Z. S. 1867, p. 335 (Chili); Scl. & Salv. P. Z. S. 1869, p. 635 (Buenos Ayres), et Nomencl. Av. Neotr. p. 129.

*Pato ceja blanca*, Azara, Apunt, no. 442 (Paraguay), undè

*Anas leucophrys*, Vieill. N. D. v. p. 156 (1816), et Enc. Méth. p. 354 (1823); Hartl. Ind. Az. p. 28 (♀).

*A. rubidoptera*, Dubois, Orn. Gal. p. 90, pl. lvii. (♂ et ♀) (1839).

*A. rhodopus*, Merrem, Ersch. & Grub. Enc. sect. i. vol. xxxv. p. 42.

*Supra terreno-fusca, pileo et cervice in semitorquem posticum utrinque expansis, tectricibus alarum minoribus, dorso postico et cauda supra nigerrimis; scapularibus pure castaneis; alis fusco-nigris, plaga magna in secundariorum tectricibus nivea, secundariis ipsis extus viridi-æneis; subtus capitis lateribus cum gutture sordide albis fusco striolatis; pectore rosaceo induto et nigro sparse guttato; ventre et hypochondriis albis griseo tenuissime transfasciatis, crisso medio nigro plaga utrinque nivea ornato; rostro nigro, pedibus flavissimis: long. tota 14·0, alæ 7·2, caudæ 2·7, tarsi 1·1, rostri a rictu 1·7. Fem. fusca, superciliis et stria capitis utrinque cum gula et colli lateribus albis; subtus alba fusco transfasciata; alis et cauda nigris; secundariis extus viridi-æneis; alis macula magna alba, sicut in mare, ornatis; rostro rubro, pedibus flavis.*

*Hab.* Paraguay (Azara); Buenos Ayres (Hudson).

This fine Duck, for our first knowledge of which we are indebted to Azara, is rather scarce in collections, and has yet only been recognized in few localities. Azara obtained examples of both the somewhat dissimilar sexes in Paraguay, and described them under different names, as was first pointed out by us (P. Z. S. 1869, p. 635) from Mr. Hudson's specimens collected near Buenos Ayres. Philippi and Landbeck (Cat. Av. Chil. p. 94) deny the occurrence of this Duck in Chili, which Sclater had given on the authority of certain specimens in the French national collection marked "Chili, Gay." But we now know full well that Gay's localities are utterly untrustworthy.

#### 10. QUERQUEDULA BRASILIENSIS.

*Anas brasiliensis*, Briss. Orn. iv. p. 360, undè

*A. brasiliensis*, Gm. S. N. i. p. 517 (1788) (Brazil); Max. Beitr. v. p. 936 (Brazil); Cab. in Schomb. Guiana, iii. p. 762 (Guiana); Burm. Syst. Ueb. iii. p. 437; J. für Orn. 1860, p. 267; La Plata-Reise, ii. p. 517 (Tucuman); Schl. Mus. des P. B. *Anseres*, p. 61; Reinh. Fugl. Bras. Camp. p. 21 (1870) (int. Brazil).

*Querquedula brasiliensis*, Scl. & Salv. P. Z. S. 1869, p. 635 (Buenos Ayres); Nomencl. p. 129; Pelz. Orn. Bras. p. 320 (1870).

"*Q. erythrorhyncha*, Spix," Eyton, Mon. Anat. p. 127 (1838); Darwin, Voy. Beagle, iii. p. 135 (1841) (Buenos Ayres and Straits of Magellan).

*Ipicutiri*, Az. Apunt. no. 437 (Paraguay), undè

*Anas ipicutiri*, Vieill. N. D. v. p. 120 (1816), et Enc. Méth. p. 354 (1823).

*Querquedula ipicutiri*, Hartl. Ind. Az. p. 28 (1847); Gay, Faun. Chil. p. 451; Ph. & Landb. Cat. Av. Chil. p. 42.

*Anas paturi*, Spix, Av. Bras. ii. p. 85, t. 109 (Rio S. Francisco).  
*A. notata*, Licht. in Mus. Berol.

*Supra fusca, pileo brunnescente; dorso postico, cauda et tectricibus alarum minoribus nigris; alis fusco-nigris, primariorum internorum et secundariorum pogniis externis nitenti-æneoviridibus, secundariorum internorum apicibus latis niveis, a colore æneo fascia nigra disjunctis; subtus dilutior, in pectore rubiginoso lavata, gutture albidiore, ventris plumis fusco obsolete transfasciatis; rostro nigricante, pedibus flavis: long. tota 15.5, alæ 7, caudæ 3.3, tarsi 1.2, rostri a rictu 1.8.*

*Hab.* Guiana (*Schomb.*); Rio Branco (*Natt.*); Rio San Francisco (*Spix*); S. E. Brazil (*Max. et Burm.*); S. Paulo and Matogrosso (*Natt.*); Bolivia (*Pearce*); Paraguay (*Azara*); Buenos Ayres (*Hudson*); Paraná and Tucuman (*Burm.*); Magellan Straits (*Darwin*).

This Duck seems to be very widely extended in Eastern South America from the north down to the extreme south. Schomburgk found it abundant in the marshy savannas of British Guiana; and Natterer obtained specimens on the Rio Branco. In S.E. Brazil it is said by Prince Maximilian to be the commonest species of Duck. According to Azara, *Q. brasiliensis* is much more abundant in Paraguay than in Buenos Ayres. It is usually seen in pairs, but sometimes in flocks of twenty, associating with other Ducks. He adds that it moults in May and nests in August.

Burmeister says this species is very common on the Paraná and in all marshes and lagoons of the northern districts. It is also common at Tucuman. Mr. Darwin obtained specimens from Buenos Ayres in October, and from the Straits of Magellan in February.

Gay has inserted this species (like many others) in his list of Chilian birds; but Philippi and Landbeck (Cat. Av. Chil. p. 42) state that so far as they know it does not occur in that Republic. Gay's specimen was probably from Bolivia, whence Salvin has obtained an example.

#### Genus 7. DAFILA.

Type.

*Dafila*, Stephens, G. Z. xii. pt. 2, p. 126 (1824).. *D. acuta*.

*Phasianurus*, Wagler, Isis, 1832, p. 1235 . . . . . *D. acuta*.

*Pæcilonetta*, Eyton, Mon. Anat. p. 32 (1838).. . . . *D. bahamensis*.

Three Pintails are met with in the Neotropical Region. One of these is the well-known European bird which penetrates in winter into the northern portion of the region; the others are endemic southern species, one of which is sometimes separated as generically distinct.

#### 1. DAFILA ACUTA.

*Anas acuta*, Linn. S. N. i. p. 202 (1766).

*Dafila acuta*, Baird, B. of N. Am. p. 776; Cab. J. für Orn. 1857,

p. 227 (Cuba); *Scl. P. Z. S.* 1857, p. 206 (Jalapa, Mexico); *Scl. et Salv. Ibis*, 1859, p. 231 (Guatemala), et *Nomencl. Av. Neotr.* p. 130; *March, Pr. Ac. Phil.* 1864, p. 71 (Jamaica); *Lawr. Ann. Lyc. N. Y.* viii. p. 13 (Panama), et ix. (1868) p. 143 (Costa Rica); *Mem. Bost. Soc. N. H.* ii. p. 314 (Mexico); *Gundl. Repert. F.-N.* i. p. 388, et *J. für Orn.* 1875, p. 378 (Cuba).

*Hab.* Cuba (*Gundlach*); Jamaica (*March*); Mexico, Jalapa (*Sallé*); Mazatlan (*Grayson*); Coahuaha (*Xantus*); Belize (*Salvin*); Guatemala, Dueñas (*Salvin*); Costa Rica (*Lawrence*); Panama (*M<sup>c</sup>Leannan*).

In Cuba the Pintail is very common on passage during the winter and autumnal months. It also occurs in Jamaica in numbers as a winter visitant. It was seen at Belize by Salvin, and is a common visitor to the Lake of Dueñas in winter. Its furthest recorded locality south appears to be the isthmus of Panama, where M<sup>c</sup>Leannan found it.

## 2. DAFILA SPINICAUDA.

*Pato cola aguda*, *Az. Apunt.* no. 429 (Buenos Ayres), undè *Anas spinicauda*, *Vieill. N. D. v.* p. 135 (1816) et *Enc. Méth.* p. 356; *Burm. La Plata-Reise*, ii. p. 515; *Schl. Mus. de P.-B. Anseres*, p. 39.

*Erisnatura spinicauda*, *Hartl. Ind. Az.* p. 27; *Pelz. Orn. Bras.* p. 321 (1870).

*Dafila spinicauda*, *Scl. P. Z. S.* 1870, p. 665, t. xxxviii. (Chili); *Scl. & Salv. P. Z. S.* 1868, p. 146 (*Rep. Arg.*), 1869, p. 157 (*Tinta, Peru*), et *Nomencl. Av. Neotr.* p. 130.

*Anas oxyura*, *Meyen, Nov. Act.* xiv. *Suppl.* p. 122 (1833); *Merrem, Ersch. & Gruber's Enc. sect. i. vol. xxxv.* p. 43; *Gay, Faun. Chil.* p. 449 (1848); *Cassin, Gilliss's Exp.* ii. p. 202 (1856); *Burm. La Plata-Reise*, ii. p. 515 (Mendoza); *Scl. P. Z. S.* 1867, p. 335 (Chili); *Ph. & Landb. Cat. Av. Chil.* p. 41.

*Dafila urophasianus*, *Scl. P. Z. S.* 1860, p. 389 (Falklands); *Abbott, Ibis*, 1861, p. 160 (Falklands).

*Dafila* — sp. ? *Scl. & Salv. Ibis*, 1868, p. 189 (Sandy Point).

*Anas caudacuta*, *Burm. J. für Orn.* 1860, p. 266 (Mendoza).

*Supra fusca, plumis in centro nigricantibus fusco circumdatis; pileo læte rufescente nigro punctulato; alis extus fuscis, speculo alari amplo æneo-nigro, fascia lata cervina utrinque marginato; subtus pectore et hypochondriis cum crisso rufescentibus, plumis in centro nigris; gutture sordide albo parce nigro punctato; ventre albo in parte inferiore fusco obsolete variegato; rostro nigro, mandibula ad basin utrinque flava; pedibus plumbeis: long. tota 19.0, alæ 9.7, caudæ rectr. med. 5.5, ext. 3, rostri a rictu 2.3, tarsi 1.6. Fem. mari similis.*

*Hab.* S. Brazil, S. Paulo (*Natt.*); Monte Video (*Sellow*); Buenos Ayres (*Azara, Hudson*); Rio Paraná et Mendoza (*Burm.*); Magellan Straits (*Cunningh.*); Falklands (*Abbott*); Chili (*Phil. et Landb.*); S. Peru, Tinta (*Whitely*).

This Pintail has a wide distribution in Antarctic America, extend-

ing from S. Brazil on one coast and the highlands of Peru on the western side down to the Magellan Straits and the Falklands.

Azara, its original discoverer, gives no particulars respecting its history, merely saying that he obtained four similar specimens in Buenos Ayres. It was procured in the adjoining State of Monte Video by Sellow, and in the Brazilian province of São Paulo by Natterer. Burmeister says this Duck is not unfrequently found in the lagoons bordering the Paraná. In his 'La Plata-Reise' he distinguishes a western race from the vicinity of Mendoza, for which he adopts Meyen's term *oxyura*. But after comparing eastern and western specimens together, we are of opinion that they belong to one species.

In Chili Philippi and Landbeck say that this is the commonest species of Duck. In the Falkland Islands it occurs rather sparingly in the freshwater ponds of the interior, where it resides throughout the year. The species is also found on the adjoining coast of Patagonia; and the specimen in Dr. Cunningham's collection left undetermined in our first list of his birds ('Ibis,' 1868, p. 189) certainly belongs to it, though not in full plumage. Mr. Whitely has sent several skins of this Duck home from the Cuzcan Andes, obtained on the lake of Tungasuca and on the river near Tinta.

### 3. DAFILA BAHAMENSIS.

*Ilatthera Duck* (*Anas bahamensis*), Catesby, Carolina, vol. i. p. 93, t. 93, undè

*Anas bahamensis*, Linn. S. N. i. p. 199 (1766); Max. Beitr. iv. p. 925 (S.E. Brazil); Burm. Syst. Ueb. iii. p. 436; J. für Orn. 1860, p. 266, et La Plata-Reise, ii. p. 515 (Uruguay); Schl. Mus. des P.-B. *Anseres*, p. 55.

*Dafila bahamensis*, Hartl. Ind. Az. p. 27 (1847); Cab. in Schomburgk's Guiana, iii. p. 763; Gay, Faun. Chil. vol. i. p. 448 (1848); Cassin, Gilliss's Exp. ii. p. 203 (1856); ScL. P. Z. S. 1867, p. 335 (Chili); Ph. & Landb. Cat. Av. Chil. p. 41; ScL. & Salv. P. Z. S. 1868, p. 146 (Rep. Arg.), 1870, p. 323 (Galapagos), et Nom. Av. Neotr. p. 130; Pelz. Orn. Bras. p. 320 (1870); Salvin, Trans. Zool. Soc. iv. p. 499.

*Pœcilonetta bahamensis*, Eyton, Mon. Anat. p. 116 (1838); Sclater, P. Z. S. 1860, p. 389 (Falklands); Darwin, Voy. Beagle, iii. p. 135 (Galapagos Islands); Abbott, Ibis, 1861, p. 160 (Falklands).

*Anas fimbriata*, Merrem, Ersch. u. Grub. Enc. sect. i. vol. xxxv. p. 35 (ex Azara).

*Anas urophasianus*, Vig. Zool. Journ. iv. p. 357 (1829); Zool. Beechey's Voy. p. 31, t. 14.

*Dafila urophasianus*, Eyton, Mon. Anat. p. 112, t. 20 (1838).

*Anas ilatthera*, Vieill. Enc. Méth. p. 152 (1823), ex Brisson, Orn. iv. p. 360.

*Pato pico aplomado y roxo*, Az. Apunt. no. 433 (Buenos Ayres), undè

*Anas rubrirostris*, Vieill. N. D. v. p. 108 (1816), et Enc. Méth. p. 353 (1823).

*Rufescenti-fusca, plumis in centro nigricantibus; dorso postico nigricante; tectricibus caudæ superioribus cum cauda cervinis, reatricibus mediis dilutioribus; alis obscure schistaceo-nigris, speculo læte cæneoviridi, supra et subtus fascia saturate cervina marginato et fascia altera subterminali subtus ornato; secundariorum intimorum marginibus externis cervinis, cum speculi marginibus concoloribus; subtus fuscescenti-cervina, omnino obsolete nigro guttata, gutture toto cum genis et cervice antica pure albis; rostro nigro, macula ad basin utrinque rubra; pedibus fuscis: long. tota 18·0, alæ 8·4, caudæ rectr. med. 5, ext. 2·8, tarsi 1·5, rostri a rictu 1·9. Fem. mari similis.*

*Hab.* British Guiana (*Schomb.*); Praia de Cajutuba, near Para (*Natt.*); S.E. Brazil (*Max. et Burm.*); Buenos Ayres (*Azara et Burm.*); Patagonia (*Darwin, King*); Falklands (*Abbott*); Chili (*Ph. et Landb.*); Galapagos (*Darwin et Habel*).

Linnæus established his *Anas bahamensis* upon the Hathera Duck of Catesby, of which that author tells us a single specimen was procured in the Bahama Islands. Catesby's figure most undoubtedly represents the present species; but if his locality is correct, the bird obtained was probably a straggler, as we have no other authentic record of its occurrence north of Guiana, where Schomburgk noticed it in flocks on the mouths of the rivers. Azara obtained two specimens of this Duck in a lagoon on the pampas of Buenos Ayres; and Darwin records it from Bahia Blanca in Northern Patagonia. Burmeister says it is spread abundantly over the whole of Brazil in ponds and marshes, and that it is nearly the commonest species of Duck there. He also observed it numerous in the La-Plata district, as well as on the Rio Uruguay. It is also common near Buenos Ayres, and is often seen exposed for sale in the market. On the Paraná and further westwards Burmeister did not observe it.

In Chili it is of uncertain occurrence, some years there being none to be seen, whilst in others it appears in plenty. Philippi and Landbeck remark that it is also found in Peru; but we have not yet seen examples from that locality. Mr. Darwin procured one specimen from a small salt-water lagoon in the Galapagos archipelago in the month of October; and Dr. Habel also obtained three individuals in that group of islands, and says it is not uncommon there. In the Falkland Islands it appears as a straggler from the mainland.

#### Genus 8. MARECA.

Type.

*Mareca*, Stephens, G. Z. xii. pt. 2, p. 130 (1824). . *M. penelope*.

Two Widgeons occur within the limits of the Neotropical Region, one of which is a winter migrant from the north, the other a peculiar Antarctic species of rather abnormal form.

##### 1. MARECA AMERICANA.

*Le Canard jensen*, Buff. Pl. Enl. 955, undè

*Anas americana*, Gm. S. N. p. 526 (1788).

*Mareca americana*, Steph. G. Z. xii. pt. 2, p. 135; Baird, B. of N. Am. p. 783; Cab. J. für Orn. 1857, p. 227 (Cuba); Scl. &

Salv. Ibis, 1859, p. 231 (Guatemala), Nomencl. Av. Neotr. p. 130; Newton, Ibis, 1860, p. 308 (St. Thomas); Salv. Ibis, 1865, p. 193; March, Pr. Ac. Phil. 1864, p. 71 (Jamaica); Léot. Ois. Trin. p. 511 (Trinidad); Gundl. Repert. F.-N. i. p. 388, et J. für Orn. 1875, p. 378 (Cuba); Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).

*Hab.* Mexico (*Grayson*); Guatemala (*Salvin*); Cuba (*Gundl.*); Jamaica (*March*); St. Thomas (*Newton*); Trinidad (*Léotaud*).

The American Widgeon is said to be very common in Cuba during the annual migration from September to April. In Jamaica, too, it is to be seen in all its forms and variety of plumage. Mr. Riise procured specimens in St. Thomas; and Léotaud records it as a regular winter visitant to Trinidad. In Central America it likewise occurs in winter, having been found by Salvin in all the Guatemalan lakes during that season.

## 2. MARECA SIBILATRIX.

*Anas sibilatrix*, Poeppig, For. Not. no. 529 (1829), p. 10 (Chili).

*Anas chiloensis*, King, P. Z. S. 1830-31, p. 15; Burm. J. für Orn. 1860, p. 227, et La Plata-Reise, ii. p. 517 (Mendoza); Schl. Mus. P.-B. Anseres, p. 46.

*Mareca chiloensis*, Eyton, Mon. Anat. p. 117, t. xxi. (1838); Hartl. Ind. Az. p. 27 (1847); Gay, Faun. Chil. p. 447 (1848); Cassin, Gilliss's Exp. ii. p. 201 (1856); Gould, P. Z. S. 1859, p. 96 (Falklands); Phil. & Landb. Cat. Av. Chil. p. 41; Sc. P. Z. S. 1860, p. 389 (Falklands); 1867, pp. 335 (Chili); 1870, p. 665 (Chili); Sc. & Salv. P. Z. S. 1869, p. 635 (Rep. Arg.); Ibis, 1869 p. 284 (Gregory Bay), et Nomencl. Av. Neotr. p. 130.

*Pato pico pequeno*, Az. Apunt. no. 432 (Buenos Ayres).

*Anas parvirostris*, Merr. Ersch. u. Grub. Enc. sect. i. vol. xxxv. p. 43 (1841).

*Supra nigra, in cervice albo transfasciata, dorsi et scapularium plumis albo utrinque marginatis; pileo et genis pure albis, nucha et cervice postica viridi-purpureo lucentibus; alis fuscis, tectricibus minoribus albis; secundariis velutino-nigris ad basin albis; subtus alba, gutture et cervice antica nigricantibus, pectore superiore nigro albo transfasciolato, hypochondriis ferrugineo lavatis; rostro et pedibus nigris: long. tota 20.0, ala 10.3, caudæ 4.3, tarsi 1.4, rostri a rictu 1.6. Fem. mari similis sed paulo obscurior.*

*Hab.* Paraguay (*Azara*); Buenos Ayres and Mendoza (*Burm.*); Falklands (*Abbott*); Chiloe (*King*); Valdivia and Central Chili (*Phil. et Landb.*).

Azara was the original describer of this fine Duck, from specimens obtained in Buenos Ayres; but Vieillot appears to have missed giving any Latin appellation to the species; and it was first provided with a scientific name by Poeppig, who gave an excellent description of it in his "Fragmenta Zoologica Itineris Chilensis," published in Froriep's 'Notizen' for July 1829. This was two years before Capt. King's term *chiloensis* (usually employed for this species) ap-

peared; and we have consequently found it necessary to revert to the older name.

This Duck is found near Mendoza, according to Burmeister, at the foot of the Cordilleras in the lagoons and rivers. It also occurs in the lakes of the Pampas and near Buenos Ayres, where birds are often sold in the market. In Southern Chili and Valdivia, as stated by Philippi and Landbeck, it is a rare species, but is more common in the central provinces. It is one of the wildest and scarcest birds in East Falkland. Capt. Abbott never found its nest, but says that young ones were seen in a pond near Port Louis in January.

#### Genus 9. SPATULA.

Type.

*Spatula*, Boié, Isis, 1822, p. 563. . . . . *S. clypeata*.

*Rhynchaspis*, Stephens, G. Z. xii. pt. 2, p. 114 (1824). *S. clypeata*.

Two Shovellers are likewise found within Neotropical boundaries. One of them is a northern immigrant, only met with in the Antilles; the other a fine well-marked southern endemic species.

##### 1. SPATULA CLYPEATA.

*Anas clypeata*, Linn. S. N. i. p. 200 (1766).

*Spatula clypeata*, Boie, Isis, 1822, p. 564; Baird, B. N. Am. p. 781; Scl. & Salv. Ibis, 1859, p. 231 (Guatemala), et Nom. Av. Neotr. p. 130; Scl. P. Z. S. 1862, p. 20 (Mexico); Newton, Ibis, 1860, p. 308 (St. Thomas); March, Pr. Ac. Phil. 1864, p. 71 (Jamaica); Gundl. Repert. F.-N. i. p. 389, et J. für Orn. 1875, p. 379 (Cuba); Léot. Ois. Trin. p. 518 (1866) (Trinidad); Lawr. Mem. Bost. Soc. N. H. ii. p. 314 (Mexico).

*Rhynchaspis clypeata*, Cab. J. für Orn. 1857, p. 228 (Cuba).

*Hab.* Mexico (*Boucard, Grayson*); Guatemala (*Salvin*); Cuba (*Gundlach*); Jamaica (*March*).

In Cuba, according to Dr. Gundlach, the Shoveller is a regular winter visitant, remaining from September to April. It also appears in Jamaica in considerable numbers. In Mexico it has been found at Guaymas and Mazatlan, as well as in S. Mexico. In Guatemala it is common in winter.

##### 2. SPATULA PLATALEA.

*Pato espatulato*, Az. Apunt. no. 431 (Buenos Ayres), undè

*Anas platalea*, Vieill. N. D. v. p. 157 (1816), et Enc. Méth. p. 357 (1823); Burm. La Plata-Reise, ii. p. 517 (Panama and Buenos Ayres); Schl. Mus. des P.-B. *Anseres*, p. 35.

*Spatula platalea*, Hartl. Ind. Az. p. 27; Scl. P. Z. S. 1867, p. 335 (Chili); Scl. & Salv. P. Z. S. 1868, p. 145 (Buenos Ayres), et Nomencl. Av. Neotr. p. 130.

*Rhynchaspis maculatus*, Gould, MS.; Jard. & Selb. Ill. Orn. t. 147; Eyton, Mon. Anat. p. 134 (1838); Phil. & Landb. Cat. Av. Chil. p. 43.

*Dafila cæσιο-scapulata*, Reich. Natat. tab. li. f. 180; Bibra,

Denkschr. Ak. Wien, v. p. 131 (1853), et J. für Orn. 1855, p. 57 (Chili).

*Rhynchaspis mexicana*, Licht. Nomencl. p. 102 (descr. nulla) (?).

*Supra et subtus rufescens, nigro guttata, capite et cervice undique dilutioribus et maculis minutis aspersis; uropygio nigro; dorso postico nigricante rufo undulato; alis fusco-nigris, tectricibus minoribus cæruleis, intermediis albis; secundariis extus cæneis viridi nitentibus, scapularibus et secundariis dorsi proximis linea scapum occupante alba ornatis; crisso nigro; cauda fusca, rectricibus lateralibus extus albo marginatis; rostro (in pelle) obscuro; pedibus flavis: long. tota 20·5, alæ 8·0, caudæ 4·5, tarsi 1·4, rostri a rictu 2·7. Fem. supra nigricanti-fusca, plumarum marginibus cervino-rufis; tectricibus alarum minoribus cærulescente lavatis; subtus cervino-rufescens nigro variegata et obsolete punctata; gula fere immaculata, crassitie minore.*

*Hab.* Buenos Ayres (Azara & Hudson); Paraná (Burm.); Chili (Phil. & Landb.); Falklands (Leconte).

According to Azara this species of Shoveller is found both in Paraguay and in Buenos Ayres. Burmeister also met with it on the Paraná and near Buenos Ayres. In Chili Philippi and Landbeck state that it is common in the central provinces, but rarer towards the south. Mr. Darwin obtained his specimen of this Shoveller from the Rio de La Plata; whence also the one described in Jardine and Selby's 'Illustrations of Ornithology,' under the name of *Rhynchaspis maculatus*, was procured by Mr. Gould.

A female of this species, in Salvin and Godman's collection, was obtained in the Falklands by Leconte when he went to obtain living Sea-lions in 1867.

#### Genus 10. AIX.

Type.

*Aix*, Boié, Isis, 1828, p. 329 . . . . . *A. sponsa*.

*Dendronessa*, Sw Faun. Bor.-Am. Birds, p. 497 (1831). *A. sponsa*.

*Lampronessa*, Wagler, Isis, 1832, p. 282 . . . . . *A. sponsa*.

*Aix* is an Arctic form, the American species of which has diffused itself as far south as Cuba and Jamaica.

#### AIX SPONSA.

*Anas sponsa*, Linn. S. N. i. p. 207 (1766).

*Aix sponsa*, Boié, Isis, 1828, p. 329; Baird, B. of N. Am. p. 785; Gundl. J. für Orn. 1857, p. 226, Repert. F.-N. i. p. 389, et J. für Orn. 1875, p. 381 (Cuba); March, Pr. Ac. Phil. 1864, p. 71 (Jamaica); ScL. & Salv. Nom. Av. Neotr. p. 130; Lawr. Mem. Bost. Soc. ii. p. 315 (Mexico).

*Hab.* Mexico (Abert); Cuba (Gundl.); Jamaica (March).

A resident species in Cuba, frequenting shady lagoons. It nests in the island; but at what time of year Dr. Gundlach had not ascertained. In Jamaica it is very rare. Mr. Lawrence gives Col. Abert as the authority for its occurrence near Mazatlan, Mexico.

## Subfamily IV. FULIGULINÆ.

The Sea-ducks are essentially arctic in their distribution. One peculiar form only (*Micropterus*) occurs on the coast of Antarctic America. A second form (*Metopiana*), though belonging to this group, seems to be only met with on fresh water.

## Genus 1. METOPIANA.

Type.

*Metopiana*, Bp. C. R. xliii. p. 146 (1856) . . . . . *M. peposaca*.

Some authors have been inclined to associate this peculiar Duck with the Anatinae; but though it is, we believe, strictly an inhabitant of fresh water, and has not the lobated hind toe of the typical Fuligulinae, it possesses their peculiarity in the structure of the trachea, as mentioned by Burmeister (La-Plata Reise, ii. p. 518), and as recently described and figured by Garrod (P. Z. S. 1875, p. 154).

## METOPIANA PEPOSACA.

*Pato negrizco ala blanca*, Az. Apunt. no. 430 (Paraguay and Buenos Ayres), undè

*Anas peposaca*, Vieill. N. D. v. p. 132 (1816), et Enc. Méth. p. 357 (1823); Hartl. Ind. Az. p. 27; Burm. La Plata-Reise, ii. p. 518, J. für Orn. 1860, p. 227 (Paraná).

*Fuligula peposaca*, Schl. Mus. des P.-B. *Anseres*, p. 31.

*Anas metopias*, Pöppig, Fror. Notiz. no. 529, p. 9 (1829).

*Fuligula metopias*, Gay, Faun. Chil. p. 456 (1848); Hartl. Naum. 1853, p. 217; Cassin, Gilliss's Exp. ii. p. 204, t. xxvii. (1856) Chili; Scl. P. Z. S. (1867), 335; Reich. Nat. t. cclxxxv. f. 2350; Phil. & Landb. Cat. Av. Chil. p. 43.

*Metopiana peposaca*, Bp. C. R. xliii. p. 146 (1856); Scl. & Salv. P. Z. S. 1868, p. 146 (Buenos Ayres), et Nom. Av. Neotr. p. 130; Scl. P. Z. S. 1870, p. 666, t. 37; Garrod, P. Z. S. 1875, p. 154.

*Anas albipennis*, Licht. MS.

*Nigra*, in dorso minutissime albo irrorata, cervice postica et capite superiore toto nitore purpureo indutis; secundariis albis, nigro terminatis et tectricibus nigris obtectis, speculum album efficientibus; primariis grisescenti-albis, horum quatuor externis in pogonio exteriori et omnium apicibus nigris; ventre toto griseo et albo minutissime vermiculato; crisso albo; rostro rosaceo, ad basin tumido; pedibus flavis: long. tota 19·0, ala 9·4, caudæ 2·8, tarsi 1·7, rostri a rictu 2·3. Fem. supra brunnea, campterio et speculo alari albis; subtus alba, pectore et hypochondriis rufescenti-brunneis, rostro obscuro, pedibus corneis (Descr. exempl. ex Monte Video).

*Hab.* Paraguay (*Azara*); Buenos Ayres (*Hudson*); Monte Video *Johnston* in Mus. S.-G.); Paraná (*Burm.*); Chili (*Phil. et Landb.*).

This beautiful Duck was first obtained by Azara, who, however, gives no details respecting it; but Burmeister tells us it is very common on the Parana; and Mr. Hudson obtained specimens near Buenos Ayres. In the central part of Chili, Philippi and Landbeck state that it is common, but rare in the southern provinces.

Judging from the description of Prince Maximilian, his *Anas erythrophthalma* (Beitr. iv. p. 929), as already suggested by Salvin (Ibis, 1874, p. 319), would appear to be very closely allied to the present species, if not identical with it. The male, as described, seems to be in immature plumage. The female agrees tolerably well with that of the present bird. Prince Maximilian obtained his two specimens of *A. erythrophthalma* in a small lake near Villa de Belmonte, in S.E. Brazil, in the month of November. No subsequent travellers seem to have recognized the species so far north.

The Rosy-billed Duck has been successfully introduced into Europe, and has bred on more than one occasion in our Gardens. In the 'Proceedings' for 1870 (*l. s. c.*) Selater has given an account of it, and figures of both sexes from the living birds.

## Genus 2. FULIGULA.

Type.

- Branta*, Boié, Isis, 1822, p. 564 (nec Scop.).. *F. rufina*.  
*Fuligula*, Stephens, G. Z. xii. pt. 2, p 187 .. *F. rufina*.  
*Callichen*, Brehm, Vög. Deutschl. p. 921 (1831) *F. rufina*.  
*Fulix*, Sund. Vet. Ak. Handl. 1835, p. 129 (1836) = *Fuligula*.  
*Nyroca*, Fleming\*, Phil. of Zool. ii. p. 260 (1822) *F. leucophthalma*.  
*Aythya*, Boié, Isis, 1822, p. 564..... *F. ferina*.  
*Marila*, Reichenb. Nat. Syst. p. ix. (1852) .. *F. ferina*.

*Fuligula*, as here considered, is a purely northern form, of which five species occur in winter within the Neotropical Region.

## 1. FULIGULA MARILA.

- Anas marila*, Linn. S. N. i. p. 196.  
*Fuligula marila*, Stephens, Zool. xii. p. 198.  
*Fulix marila*, Baird, B. N. A. p. 791; Lawrence, Mem. Bost. Soc. N. H. ii. p. 315 (Mazatlan).  
*Hab.* Mazatlan, Mexico (*Grayson*).  
 Col. Grayson found the Scaup near Mazatlan in the winter months.

## 2. FULIGULA AFFINIS.

- Fuligula affinis*, Eyton, Mon. Anat. p. 157 (1838); Gosse, B. Jamaica, p. 408; Sel. & Salv. Ibis, 1859, p. 231 (Guatemala) Salv. P. Z. S. 1870, p. 219 (Veragua).  
*Fulix affinis*, Baird, B. of N. Am. p. 791; Gundl. Repert. F.-N. i. p. 390, et J. für Orn. 1875, p. 382 (Cuba); Lawr. Ann. Lyc. N. Y. ix. (1868), p. 143 (Costa Rica); March, Pr. Ac. Phil. 1864, p. 71 (Jamaica); A. & E. Newton, Ibis, 1859, p. 366 (St. Croix); Sel. et Salv. Nom. Av. Neotr. p. 130; Lawr. Ann. Lyc. N. Y. ix. p. 210 (Yucatan), et Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).  
*Fuligula mariloides*, Cab. J. für Orn. 1857, p. 230 (Cuba).  
*Fuligula marila*, Jard. Ann. & Mag. N. H. xx. 1847, p. 377 (Tobago); Léot. Ois. Trin. p. 522 (1866) (Trinidad).  
*Hab.* Cuba (*Gundlach*); Jamaica (*March*); Tobago (*Kirk*);

\* Fleming puts *Anas ferina* first on the list; but *A. nyroca* should be considered his type, if that bird is separated from *Fuligula*.

Trinidad (*Léotaud*); Mexico (*Grayson*); Yucatan (*Schott*); Guatemala (*Salvin*); Costa Rica (*v. Frantzius*); Veragua (*Arcé*).

This Duck is rather rare in Cuba, but occurs during the autumnal and winter months on passage on the large lagoons which are not choked with high reeds. In Jamaica it is seen in considerable numbers in winter. Mr. Kirk also records it from Tobago, but says it is very rare; and *Léotaud* gives it as a frequent visitor to Trinidad, where it arrives in November, and departs in April.

In Guatemala *Salvin* found it abundant on the lakes in winter; *v. Frantzius* obtained it in Costa Rica; and *Arcé* has sent specimens from Veragua.

### 3. FULIGULA COLLARIS.

*Anas collaris*, *Donov. Brit. B. vi. t. 147 (1809)*.

*Fuligula rufitorques*, *Gosse, B. Jamaica, p. 408; Sclater, P. Z. S. 1862, p. 20.*

*Fuligula collaris*, *Cab. J. für Orn. 1857, p. 230 (Cuba); Salv. & Scl. Ibis, 1860, p. 277 (Guatemala).*

*Fuligula affinis*, *Scl. P. Z. S. 1859, p. 369 (err.)*.

*Fulix collaris*, *Baird, B. of N. Am. p. 792; March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Gundl. Repert. F.-N. i. p. 390, et J. für Orn. 1875, p. 383 (Cuba); Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mazatlan); Scl. et Salv. Nom. Av. Neotr. p. 130.*

*Hab. Cuba (Gundlach); Jamaica (March); E. Mexico (Boucard); N.W. Mexico (Grayson et Xantus); Guatemala (Salvin).*

One of the commonest of the northern migrants in Cuba, where it frequents open lagoons not choked with reeds. In Jamaica it is rarely met with.

We have examined Mexican skins of this Duck collected by *Boucard* and *De Oca*; and *Salvin* found it on the lakes of Guatemala sparingly in winter.

### 4. FULIGULA AMERICANA.

*Fuligula americana*, *Eyton, Mon. Anat. p. 155 (1838)*.

*Aythya americana*, *Baird, B. of N. Am. p. 793; Gosse, B. Jamaica, p. 408, et March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Scl. et Salv. Nom. Av. Neotr. p. 130; Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).*

*Hab. Jamaica (March); valley of Mexico (Le Strange); Mazatlan (Grayson).*

According to *Mr. March* this Pochard is not uncommon in Jamaica in winter. We know of but few instances of its occurrence on the mainland within the limits of the Neotropical region. *Mr. Le Strange* brought one specimen from the valley of Mexico; and *Col. Grayson* obtained it at Mazatlan.

### 5. FULIGULA VALISNERIA.

*Anas valisneria*, *Wills. Am. Orn. viii. p. 103, t. 70 (1814)*.

*Fuligula valisneria*, *Cab. J. für Orn. 1857, p. 230 (Cuba)*.

*Aythya valisneria*, Baird, B. of N. Am. p. 794; March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Salv. Ibis, 1866, p. 198 (Guatemala); Gundl. Repert. F.-N. i. p. 390, et J. für Orn. 1875, p. 382 (Cuba); Sci. et Salv. Nom. Av. Neotr. p. 130; Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).

*Hab.* Cuba (*Gundlach*); Jamaica (*March*); Mexico (*Grayson*); Guatemala (*Salvin*).

An occasional winter visitant in Cuba, having been observed by Dr. Gundlach in some numbers in 1839 and 1850. Mr. March says that it is sometimes found in Jamaica in company with the Pintail. Col. Grayson found it at Mazatlan.

Salvin once killed a single specimen of the Canvas-back on the Lake of Dueñas; but this is the only instance of its occurrence so far south that we are acquainted with.

### Genus 3. CLANGULA.

Type.

*Clangula*, Fleming, Phil. of Zool. ii. p. 260 (1822) *C. glaucion*\*.

*Glaucion*, Kaup, Nat. Syst. p. 53 (1829)..... *C. glaucion*.

*Bucephala*, Baird, B. of N. A. p. 796 (1860).... *C. albeola*.

*Clangula* is another high northern genus, of which two species have been casually met with just within the confines of the Neotropical Region.

#### 1. CLANGULA GLAUCION.

*Anas clangula* et *A. glaucion*, Linn. S. N. i. p. 201.<sup>a</sup>

*Clangula americana*, Cab. J. für Orn. 1857, p. 230 (Cuba).

*Bucephala americana*, Baird, B. of N. Am. p. 796; Lawr. Mem. Bost. Soc. N. H. ii. p. 315 (Mexico).

*Hab.* Cuba (*Lembeye*); Mexico (*Grayson*).

Dr. Gundlach tells us that *Lembeye* believed he had seen an example of the Golden-eye on a pool in Cuba, but was not able to get it. We observe that Dr. Gundlach omits this species altogether in his 'Revista,' and still more recently published notes in the 'Journal für Ornithologie' (1875). It may, however, find a place in this paper on the authority of Col. Grayson, who shot it at Mazatlan.

#### 2. CLANGULA ALBEOLA.

*Anas albeola*, Linn. S. N. i. p. 199 (1766).

*Clangula albeola*, Bp. Comp. List, p. 58; Cab. J. für Orn. 1857, p. 230 (Cuba).

*Bucephala albeola*, Baird, B. of N. Am. p. 797; Gundl. Repert. F.-N. i. p. 390, et J. für Orn. 1875, p. 383 (Cuba).

*Hab.* Cuba (*Gundlach*).

A specimen of this Duck has been once observed in the market of Havana, and was procured by Gundlach.

\* Fleming, it is true, puts *Anas glacialis* first in his list; but *A. clangula* is obviously his type, and therefore we do not use Baird's term *Bucephala*.

## Genus 4. ŒDEMIA.

*Oedemia*, Fleming, Phil. of Zool. ii. p. 260 (1822).

One species only of this northern group is recorded to have been obtained within our limits.

## ŒDEMIA PERSPICILLATA.

*Anas perspicillata*, Linn. S. N. i. p. 201 (1766).

*Edemia perspicillata*, Baird, B. of N. Am. p. 806; March, Pr. Ac. Phil. 1864, p. 72 (Jamaica); Scl. et Salv. Nom. Av. Neotrp. p. 130.

*Hab.* Jamaica (*Gosse*).

The Surf-scoter has been obtained in Jamaica, according to *Gosse*, only once. *March* also says it is very rare.

## Genus 5. TACHYERES.

Type.

*Micropterus*, Less. Traité d'Orn. p. 630 (1831) .. *T. cinereus*.

*Tachyeres*, Owen, Trans. Zool. Soc. ix. p. 254 (1875). *T. cinereus*.

This is a peculiar Antarctic type, rather questionably placed with the other Fuliginæ\*.

## TACHYERES CINEREUS.

*Anas cinereus*, Gm. S. N. p. 506 (1788), ex *Pernety* (Falklands).

*Micropterus cinereus*, Gay, Faun. Chil. p. 457 (1848); Gould, P. Z. S. 1859, p. 96 (Falklands); Phil. & Landb. Cat. Av. Chil. p. 43; Scl. P. Z. S. 1860, p. 389 (Falklands); Scl. & Salv. Ibis, 1868, p. 189 (Sandy Point), 1870, p. 499 (Gallegos river), et Nom. Av. Neotr. p. 130; Cunningham, Ibis, 1868, p. 127.

*Fuligula cinerea*, Schl. Mus. des P.-B., Anseres, p. 13.

*Anas brachyptera*, Lath. Ind. Orn. ii. p. 834; Q. & G. Voy. Uran. p. 139, t. 39.

*Micropterus brachypterus*, Eyton, Mon. Anat. p. 144 (1838); Darwin, Voy. Beagle, iii. p. 136 (1841).

*Oidemia patachonica*, King, P. Z. S. 1830-31, p. 15.

*Micropterus patachonicus*, Eyton, Mon. Anat. p. 143 (1838); Scl. P. Z. S. 1861, p. 46.

*Tachyeres brachypterus*, Owen, Trans. Zool. Soc. ix. p. 254.

*Grisescenti-brunneus*; *pectore, hypochondriis, scapularibus et dorso antico cinereo maculatis*; *guttore rufescente*; *stria post-oculari et fascia alari albis*; *abdomine toto clare albo*; *alis et cauda pure griseis, hujus reatricibus duabus mediis elongatis retrorsum curvatis*: long. tota 27·0, alæ 10·8, caudæ 4·5, tarsi 2·4, dig. med. 4·0, rostr. 2·7.

*Hab.* Falklands (*Pernety, Abbott*); Magellan Straits (*Cunningham*); Chili, Valdivia (*Ph. et Landb.*).

This peculiar Sea-duck, originally discovered in the Falkland Islands, is found also on the west coast of S. America, according to *Philippi* and *Landbeck*, from the Straits of Magellan as far north as Valdivia in Chili.

\* Cf. Eyton, Mon. Anat. p. 51.

Mr. Darwin, in describing its habits, says that its wings are too small and weak to allow of flight, but that by their aid, partly swimming and partly flapping the surface of the water, it is enabled to move very quickly. He adds that he is nearly sure that it moves its wings alternately instead of, as in the case of other birds, both together. It is able to dive only a short distance. It feeds on mollusks, obtained from floating kelp and tidal rocks.

Dr. Cunningham remarks that the Loggerhead Duck is very plentiful in the eastern part of the Straits of Magellan, and that it also occurs in abundance at the Falkland Islands. He adds that the bird is exceedingly hard to kill.

In the latter islands Capt. Abbott found them in great numbers, where they breed along the coast. The nests are readily found by searching the shore just opposite where the male bird is seen swimming by himself. The old female flutters off to the water, being quite unable to fly. It lays from the end of September to the end of November, making its nest in the long grass or a bush of some kind. The usual complement of eggs is seven, as many as nine being sometimes found.

The "Flying Loggerhead" is probably the young bird of this species, though it would appear from Capt. Abbott's remarks that it breeds when still able to fly; for one flew out of a nest that he found, high up into the air. Capt. Abbott considers the flying bird distinct; but Dr. Cunningham's view seems to be the correct one, viz. that "the so-called *M. patachonicus* is only the young of *M. cinereus*, the peculiarity being that the power of flight departs from the bird as it grows old" \*.

The anatomy of this Duck is fully described in Dr. Cunningham's memoir in the Society's 'Transactions.'

#### Subfamily V. ERISMATURINÆ.

##### Genus ERISMATURA.

Type.

*Oxyura*, Bp. Syn. N. A. Birds, p. 390 (1828) . . . . . *E. rubida*.

*Gymnura*, Nuttall, Man. Ornith. ii. p. 426 (1834) .. *E. rubida*.

*Undina*, Gould, B. of Eur. vol. v. pl. 383 (1836) .. *E. mersa*.

*Erismatura*, Bp. Comp. List, p. 59 (1838) . . . . . *E. mersa*.

*Cerconectes*, Wagler, Ibis, 1832, p. 282 . . . . . *E. mersa*.

*Bythონessa*, Gloger, Handb. d. Nat. p. 472 (1842) .. *E. mersa*.

Of the three species of this quasi-cosmopolitan group one is only found in the northern part of the Neotropical region, a second is very widely spread in tropical America, and the third may be regarded as an Antarctic form.

#### 1. ERISMATURA RUBIDA.

*Anas rubida*, Wils. Am. Orn. vii. p. 128, t. 81 (1814).

*Erismatura rubida*, Bp. Comp. List, p. 59; Baird, Bird of N. A. p. 811; Eyton. Mon. Anat. p. 171; Gundl. Repert. F.-N. i. p. 390, et J. für Orn. 1875, p. 384 (Cuba); Cab. J. für Orn. 1857, p. 230

\* See P. Z. S. 1871, p. 262, and Trans. Zool. Soc. vii. 493.

(Cuba); Scl. & Salv. Ibis, 1859, p. 231 (Guatemala) et Nom. Av. Neotr. p. 136; Scl. P. Z. S. 1859, p. 393 (Mexico); Lawr. Mem. Boston Soc. N. H. ii. p. 315 (Mexico).

*Biziura rubida*, Schl. Mus. des P.-B., Anseres, p. 11.

*Jamaica Shoveler*, Lath. Syn. iii. pt. 2, p. 513, undè

*Anas jamaicensis*, Gm. S. N. i. p. 529; Lath. Ind. p. 857, et Vieill. Enc. Méth. p. 127 (1823) (?).

*Hab.* Cuba (*Gundlach*); Mexico, Oaxaca (*Boucard*); Tepic (*Grayson*); Guatemala, Lake of Dueñas (*Salvin*).

Although certainly resident in Cuba, this is a rare species. Dr. Gundlach has found it only in the neighbourhood of Havana. Salvin met with it breeding on the Lake of Dueñas in Guatemala, where it is the only Duck resident throughout the year. He observed that it diminished in numbers during the period of the spring migration. It builds in May amongst the reeds on the margin of the lake, making a nest of dead flag with a little down. The eggs are rough in texture, and much resemble those of the European *E. mersa*.

## 2. ERISMATURA FERRUGINEA,

*Erismatura ferruginea*, Eyton, Mon. Anat. p. 170 (1838) (Chili); Gray, List Gallinæ &c. (1844), p. 146; Gray & Mitch. Gen. B. t. 169 (1844); Bridges, P. Z. S. 1843, p. 119 (Lake of Quintero, Chili); Gay, Faun. Chil. p. 458 (1848); Bibra, Denksch. Ak. Wien, v. p. 131, et J. für Orn. 1855, p. 57; Cassin, Gilliss's Exp. ii. p. 204; Phil. & Landb. Cat. Av. Chil. p. 43, et 1872, p. 549 (Rio Negro); Scl. P. Z. S. 1867, p. 335 (Chili); Scl. & Salv. P. Z. S. 1868, p. 177 (S. Peru), et Nom. Av. Neotr. p. 131; Burm. P. Z. S. 1872, p. 369; Taczanowski, P. Z. S. 1874, p. 554.

*Biziura ferruginea*, Schl. Mus. des P.-B., Anseres, p. 10.

*Erismatura vittata*, Ph. & Landb. Wieg. Arch. 1860, p. 26 (Chili); Scl. P. Z. S. 1867, p. 335.

*Erismatura cyanorhyncha*, Licht. M.S. (teste Burmeister).

*Supra castanea, capite et collo toto nigris; alis et cauda fuscis; subtus sordide alba, fusco irrorata, pectore et hypochondriis castaneis corpore concoloribus; rostro cæruleo, pedibus fuscis: long. tota 16·0, alæ 5·5, caudæ 3·8, tarsi 1·2, rostri a rictu 1·6. Fem. fusca, cervino (præcipue in dorso et pileo) irregulariter transfasciata; vitta suboculari albida; subtus sordide alba, fusco (præcipue in pectore et in hypochondriis) transvittata.*

*Hab.* Central Peru (*Nation, Jelski*); S. Peru (*Whiteley*); Chili (*Bridges, Phil. et Landb.*); Buenos Ayres (*Burm.*); Rio Negro (*Hudson*).

This *Erismatura* was first obtained in Chili by Mr. C. Crawley, and described by Eyton from his specimens in the British Museum. Philippi and Landbeck state it is common on all the lakes of the Central Provinces. They at one time described the female as of a different species (*E. vittata*), but subsequently acknowledged their error (see P. Z. S. 1868, p. 531). From Chili this species spreads north-

wards along the Andes as far as Central Peru, where Jelski observed it breeding on the Lake of Junin, and obtained skins and eggs. It likewise crosses the Andes into the Argentine Republic, as Burmeister met with it on the Laguna Matanza, near Buenos Ayres, and Mr. Hudson collected examples on the Rio Negro.

### 3. ERISMATURA DOMINICA.

*Anas querquedula dominicensis*, Briss. Orn. vi. p. 472 (S. Domingo), undè

*Anas dominica*, Linn. S. N. i. p. 201 (1766); Max. Beitr. iv. p. 938 (Bahia); Burm. Syst. Ueb. iii. p. 439 (Lakes of S.E. Brazil).

*Erismatura dominica*, Eyton, Mon. Anat. p. 172 (1838); Cab. J. für Orn. 1857, p. 231 (Cuba); Gundl. Repert. F.-N. i. p. 391, et J. für Orn. 1875, p. 384 (Cuba); A. & E. Newton, Ibis, 1859, p. 367 (St. Croix?); ScL. P. Z. S. 1857, p. 206 (Jalapa), et 1860, p. 254 (Orizaba); Léot. Ois. Trin. p. 525 (1866) (Trinidad); Pelz. Orn. Bras. p. 320 (1870); Reinh. Fugl. Bras. Camp. p. 20 (1870) (Lagoa dos Pitos); Lee, Ibis, 1873, p. 137 (Entrerios); Lawr. Mem. Boston Soc. N. H. ii. p. 316 (Mexico).

*Biziura dominica*, Schl. Mus. des P.-B. Anseres, p. 9.

*Sarcelle de la Guadeloupe*, Buff. Pl. Enl. 967 (♀), undè

*Anas spinosa*, Gm. S. N. i. p. 522 (1788) (Cayenne et Guiana); D'Orb. in La Sagra's Cuba, Aves, p. 201 (Cuba et Bolivia).

*Erismatura spinosa*, Gosse, Birds Jam. p. 404 (Jamaica).

"*Erismatura ortygoides*, Hill," Gosse, Birds Jam. p. 406, et Ill. pl. 113.

*Ferruginea, nigro variegata et maculata; pileo nigro, vitta superciliari et altera suboculari, cum mento et genis infimis, albidis nigro punctatis; alis fuscis plaga magna secundariorum alba; cauda nigra; abdomine sordide albo rufescente irrorato; axillaribus pure albis; rostro cæruleo, pedibus nigris: long. tota 13.0, alæ 5.5, caudæ 3.8, tarsi 1.0, rostri a rictu 1.5. Fem. fusco-nigra, dorso cervino maculato; capitis lateribus et corpore subtus cervinis, illo nigro bivittato; pectore nigro variegato.*

*Hab.* Cuba (*Gundlach*); S. Domingo (*Briss.*); Jamaica (*Gosse*); S. Croix (*Newton*); Trinidad (*Léotaud*); Mexico, Jalapa (*Sallé*); Tepic (*Grayson*); Veragua (*Arce*); S.E. Brazil (*Max. et Burm.*); Mattodentro et São Paulo (*Natt.*); Uruguay (*Sellow*); Entrerios (*Lee*); Bolivia, Chiquitos (*D'Orb.*)

*Obs.* Ab *E. rubida* et *E. ferruginea* crassitie minore, dorso variegato et macula alari alba prorsus distinguenda.

This species of *Erismatura* is widely diffused in Tropical America, from Mexico and the Antilles down to Uruguay, inhabiting the fresh-water lakes like other members of the genus. It nests in Cuba, where Dr. Gundlach says it is common, resident, and an excellent diver. Mr. Gosse noticed this species in a broad piece of water near Redonda, in Jamaica, where as many as three may be seen at one time. They appear to be tame, but when alarmed sink rather than

dive into the water. They seldom fly, and then only with a heavy laboured flight. The bird referred to by Mr. Gosse as the Quail-duck, or *E. ortygoides* of Mr. Hill, is the male of this species.

Mr. A. Newton describes what he believes to have been a flock of this Duck in St. Croix. He observed them for some time, but was unable to obtain a specimen. Léotaud tells us it is not rare in Trinidad.

In Central America this Lake-duck occurs as far north as the neighbourhood of Mazatlan, where Col. Grayson obtained it, and Jalapa, where Sallé collected specimens. Further south, down the Isthmus, it has not yet been recorded; but Salvin has recently received a skin obtained by Arcé somewhere in Veragua.

We have no recent testimony as to the occurrence of this species in Guiana and Amazonia; but in South and Central Brazil it appears to be found in all the freshwater lakes. In Entrerios it was obtained by Mr. Lee near Guauguaychu, and in the adjoining republic of Uruguay by Sellow. In La Sagra's 'Cuba' D'Orbigny mentions that he procured examples of it in the small lakes of the province of Chiquitos in Bolivia, its furthest known range in this direction.

#### Subfamily VI. MERGANETTINÆ.

The Torrent-ducks form a peculiar and somewhat isolated group of the Anatidæ, restricted to the Andes of South America from Colombia to Chili.

#### Genus MERGANETTA.

Type.

*Merganetta*, Gould, P. Z. S. 1841, p. 95 . . . . . *M. chilensis*.

*Raphipterus*, Gay, Faun. Chil. p. 459 (1848) . . . . *M. chilensis*.

The three species may be diagnosed from the male dress as follows:—

- |  |                        |
|--|------------------------|
| a. Gutturæ nigro .....                         | 1. <i>armata</i> .     |
| b. Gutturæ albo.                               |                        |
| Ventre nigro, medialiter fusco variegato ..... | 2. <i>turneri</i> .    |
| Ventre albo griseo flammulato .....            | 3. <i>leucogenys</i> . |

In the females the under surface is of a uniform chestnut-red.

#### 1. MERGANETTA ARMATA.

*Merganetta armata*, Gould, P. Z. S. 1841, p. 95 (Chile); Des Murs, Icon. Orn. t. 48 ♀ (Chili); Gray & Mitch. Gen. of B. t. 170 (♂); Bibra, Denkschr. Akad. Wien, v. p. 132, et J. für Orn. 1855, p. 37; Cassin in Gilliss's Exp. ii. p. 204 (1856); Scl. P. Z. S. 1867, p. 340; Scl. & Salv. Ex. Orn. p. 200, et Nom. Av. Neotr. p. 131.

*Biziura armata*, Schl. Mus. des P.-B., Anseres, p. 12.

*Raphipterus chilensis*, Gay, Faun. Chil. p. 459 (1848); Phil. & Landb. Cat. Av. Chil. p. 43.

*Merganetta chilensis*, Des Murs, Icon. Orn. t. 5 (♂).

*Supra nigra, plumis albo utrinque marginatis; capite colloque postico et laterali albis, pileo medio in strigam nuchalem pro-*

*ducto et linea utrinque ab oculis ad collum imum descendente nigris; alis extus cærulescenti-schistaceis; tectricibus et secundariis albo anguste terminatis, speculo alari æneo-viridi; dorso postico cinereo, uropygio fasciis minutis albis variegato; subtus rufescenti-ochracea, lineis nigris ornata; mento, linea ad rostri basin, spatio suboculari cum gutture conjuncto et pectore superiore utraque ex parte nigerrimis; rostro flavo, pedibus rubellis: long. tota 16·5, alæ 7, caudæ 4·5, rostri a rictu 1·6, tarsi 1·9. Fem. supra ardesiaca, dorsi plumis nigro flammulatis; collo et uropygio lineis albis nigrisque vermiculatis; subtus omnino castanea.*

*Hab.* Rivers of the Chilian Andes (*Bridges, Gay*).

We are indebted to the researches of Mr. Bridges among the Chilian Andes for the discovery of this curious form. He sent home specimens of the present species in 1841, which were described by Mr. Gould before this Society in November of that year. Mr. Bridges remarks that it swims and dives against the flow of the Chilian mountain-torrents with a rapidity truly astonishing.

## 2. MERGANETTA TURNERI.

*Merganetta turneri*, *Sci. & Salv. P. Z. S.* 1869, p. 600 (Peru), *Ex. Orn.* p. 199, t. 100, et *Nomencl.* p. 131.

*Merganetta leucogenys*, *Sci. & Salv. (nec Tsch.) P. Z. S.* 1869, p. 157.

*Supra nigra, interscapulio et scapularibus rufo marginatis; capite colloque toto albis, linea rostrum cingente, pileo medio in strigam nuchalem producto et linea utrinque ad imum collum descendente nigerrimis; alis extus cærulescenti-cinereis; speculo alari æneo-viridi; tectricibus alarum et secundariis albo anguste terminatis; abdomine nigro, ventre medio fusco variegato; crisso et uropygio nigris, albo minute vermiculatis; cauda fuscescenti-cinerea unicolori; tectricibus subalaribus cinereis; rostro et pedibus obscure rubris: long. tota 16·0, alæ 7·5, caudæ 5·0, rostri a rictu 1·5, tarsi 1·8, digiti medii cum ungue 2·3. Fem. supra cinerea, lateribus cervicis et uropygio albo nigroque minute vermiculatis; dorso nigro flammulato; alis albo bifasciatis; speculo alari obscure æneo-viridi; subtus fulvo-rufa unicolor: long. tota 16·0, alæ 6·4, caudæ 4·0, rostri a rictu 1·35.*

*Hab.* S. Peru; Rivers of the Cuzcan Andes (*Whitely*).

When we first received examples of this bird from Mr. H. Whitely we referred it to the species described by Tschudi as *Merganetta leucogenys*. Having, however, made a reinvestigation of the group, we convinced ourselves that Tschudi's bird is, so far as can be decided by his figure and description, inseparable from the *Merganetta columbiana* of New Granada, and that the present species must be regarded as undescribed, being equally distinct from the New-Granadan form, and from the Chilian *Merganetta armata*. From the former it differs in its larger size, and black breast and flanks, which are only relieved by some brownish marks in the middle of the belly. In the New-Granadan bird, which is well represented in Des Murs's

'Iconographie' (tab. vi.), the whole abdomen is white, sparingly striped with narrow blackish markings, and the bill is narrower and much less elevated than in this species. *Merganetta armata*, of which an excellent figure will be found in Gray and Mitchell's 'Genera of Birds,' resembles the present bird in having a black breast; but the edges of the scapularies are white instead of rufous, and the throat and fore neck are black, instead of being pure white as in its two northern allies. It would seem, therefore, that this species occupies an intermediate position as regards the differential characters of the male, just as it does in geographical range, between the two known species. As regards the female, our specimen does not appear to differ in colour from the corresponding sex of *Merganetta armata* (Des Murs, Icon. t. xlviii.).

### 3. MERGANETTA LEUCOGENYS.

*Anas leucogenys*, Tsch. Wieg. Arch. 1843, p. 390.

*Erismatura leucogenys*, Tsch. Faun. Peru. p. 311, t. xxxvi.

*Merganetta leucogenys*, Scl. & Salv. Ex. Orn. p. 200; P. Z. S. 1869, p. 601, et 1874, p. 679, et Nomencl. p. 131; Tacz. P. Z. S. 1874, p. 554.

*Merganetta columbiana*, Des Murs, Rev. Zool. 1845, p. 179, et Icon. Orn. t. 6; Scl. P. Z. S. 1855, p. 164 (Bogotá).

*Supra cinerea, dorsi plumis nigris rufescente utrinque marginatis; uropygio fasciis minutis albis nigrisque variegato; capite colloque toto albis, linea circum rostrum, pileo medio in strigam nuchalem producto et linea ab oculis ad collum imum utrinque descendente nigerrimis; alis cærulescenti-schistaceis, tectricibus et secundariis albo anguste marginatis; speculo alari æneoviridi; abdomine albo obsolete nigro striolato; rostri flavi culmine nigricante, pedibus rubellis: long. tota 12·5, alæ 6·0, caudæ 4·5, rostri a rictu 1·4, tarsi 1·5. Fem. supra cinerea, dorso nigro flammulato; genis, cervicis lateribus et corpore toto inferiore fulvo-rufis unicoloribus: long. tota 15·5, alæ 5·3, caudæ 4, tarsi 1·5, rostri a rictu 1·4.*

*Hab.* Columbian Andes near Bogotá (Goudot); Quindiu range (Salmon); Ecuador (*Mus. S.-G.*); Central Peru (*Tschudi et Jelski*).

This *Merganetta* was originally discovered by Goudot, a well-known French collector, in the neighbourhood of Bogotá. There is a skin in Salvin and Godman's collection from Ecuador; and Tschudi and Jelski obtained it in Central Peru.

### Subfamily VII. MERGINÆ.

#### GENUS MERGUS.

Type.

*Mergus*, Linn. S. N. i. p. 207 (1766). . . . . *M. cucullatus*.

*Lophodytes*, Reich. Av. Syst. Nat. p. ix. (1852) *M. cucullatus*.

Besides the Hooded Merganser, which occasionally intrudes from the north, one peculiar endemic species of this group is found in the Neotropical region.

1. *MERGUS CUCULLATUS.*

*Mergus cucullatus*, Linn. S. N. i. p. 207 (1766); Cab. J. für Orn. 1857, p. 231 (Cuba); Schl. et Salv. Nom. Av. Neotr. p. 131.

*Lophodytes cucullatus*, Baird, B. of N. Am. p. 816; Gundl. Repert. F.-N. i. p. 391, et J. für Orn. 1875, p. 385 (Cuba); Selater, P. Z. S. 1859, p. 369 (Jalapa).

*Hab.* Cuba (Gundlach); Mexico (*De Oca*).

The Hooded Merganser is of rare occurrence on passage in Cuba, and does not appear to have been noted elsewhere within our limits, except in South-eastern Mexico.

2. *MERGUS OCTOSETACEUS.*

*Mergus octosetaceus*, Vieill. N. D. xiv. p. 222 (1817), et Enc. Méth. p. 351 (1823) (Brazil).

*Mergus brasilianus*, Vieill. Gal. des Ois. ii. p. 209, t. 283 (1834); Eyton, Mon. Anat. p. 176 (1838); Burm. Syst. Ueb. iii. p. 441; Pelz. Orn. Bras. p. 322 (1870); Schl. Mus. des P.-B. *Anseres*, p. 6; Schl. et Salv. Nom. Av. Neotr. p. 131.

*Mergus fuscus*, Licht. Doubl. p. 85 (1823).

*Mergus lophotes*, Cuv. MS. (teste Schlegel).

*Supra fusco-niger purpureo vix tinctus; plaga alarum duplici, fascia nigra divisa, alba; cervice postica æneo micante; pileo et crista elongata tenui saturate fumoso-nigris; abdomine saturate cinereo, fasciis numerosis albis in ventre signato; cervice antica et pectoris lateribus griseo et nigro confertim vermiculatis; rostro nigro, pedibus flavidis; long. tota 19.0, alæ 7.2, caudæ 4.0, tarsi 1.4, rostri a rictu 2.2.*

*Hab.* S. E. Brazil, São Paulo (*Licht.*); Rio Ytarare (*Natt.*).

This scarce Merganser was first described by Vieillot from Delalande's specimens in the Paris Museum, and subsequently figured by the same author under another name. Lichtenstein gives São Paulo as its locality; and Natterer obtained five examples on the River Ytarare in the southern part of that province in August 1820. One of these skins, marked as the female sex, is now in the collection of Salvin and Godman, whence our description is taken.

IV. *Table of the Geographical Distribution of the Neotropical Anatidæ, with remarks thereon.*

On referring to the last column of the Table (pp. 410 & 411), it will be seen that out of the 62 species of Anatidæ included in the Neotropical list 25 are likewise found in North America. Of these 25, however, two (*Dendrocygna fulva* and *Querquedula cyanoptera*) are visitors from the south; and the Nearctic species which intrude into the Neotropical region (mostly in winter) are, so far as is at present known, 23 in number, namely

*Anser hyperboreus,*

— *cærulescens,*

— *gambeli,*

*Bernicla canadensis,*

*Anas boschas,*

— *obscura,*

— *strepera,*

*Querquedula carolinensis,*

*Querquedula discors*,  
*Dafila acuta*,  
*Mareca americana*,  
*Spatula clypeata*,  
*Aix sponsa*,  
*Fuligula marila*,  
 — *affinis*,  
 — *collaris*,

*Fuligula americana*,  
 — *valisneria*,  
*Clangula glaucion*,  
 — *albeola*,  
*Edemia perspicillata*,  
*Erismatura rubida*,  
*Mergus cucullatus*.

Deducting these 23, there remain 39 in the purely Neotropical list, which may be divided as follows.

In the first place, the genera *Chenalopex*, *Dendrocygna*, *Sarcidiornis*, and *Cairina* are essentially tropicopolitan. We may therefore associate the birds of these genera together as an intertropical division containing eight species, namely

*Chenalopex jubata*,  
*Dendrocygna fulva*,  
 — *autumnalis*,  
 — *discolor*,

*Dendrocygna arborea*,  
 — *viduata*,  
*Sarcidiornis melanonota*,  
*Cairina moschata*.

	Falkland Islands.	Tierra del Fuego and Patagonia.	Chili.	Argent. Republ.	Paraguay.	S. Brazil.	Bolivia.	Peru.	Amazonia.	Guiana.	Venezuela and Trinidad.	U. S. of Colombia.	Ecuador.	Galapagos Islands.	Central America and Mexico.	Antilles.	N. America.
1. <i>Anser hyperboreus</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2. — <i>caerulescens</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3. — <i>gambeli</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4. <i>Bernicla canadensis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*5. — <i>melanopectera</i> .....	..	..	*	..	..	..	..	*	..	..	..	..	..	..	..	..	..
*6. — <i>magellanica</i> .....	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*7. — <i>dispar</i> .....	..	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*8. — <i>poliocephala</i> .....	*	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*9. — <i>rubriceps</i> .....	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*10. — <i>antarctica</i> .....	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*11. <i>Chenalopex jubata</i> .....	..	..	..	..	..	..	..	..	*	..	*	..	..	..	..	..	..
*12. <i>Cygnus nigricollis</i> .....	*	*	*	*	..	*	..	..	..	..	..	..	..	..	..	..	..
*13. — <i>coscoroba</i> .....	*	*	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..
*14. <i>Dendrocygna fulva</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*15. — <i>autumnalis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*16. — <i>discolor</i> .....	..	..	..	..	..	..	..	..	..	*	..	..	..	..	..	..	..
*17. — <i>arborea</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*18. — <i>viduata</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*19. <i>Sarcidiornis carunculata</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*20. <i>Cairina moschata</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21. <i>Anas boschas</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22. — <i>obscura</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*23. — <i>specularis</i> .....	..	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..
*24. — <i>cristata</i> .....	*	*	*	..	..	..	*	*	..	..	..	..	..	..	..	..	..
	7	8	7	3	4	5	2	2	4	3	5	1	0	0	7	8	7

	Falkland Islands.	Tierra del Fuego and Patagonia.	Chili.	Argent. Republic.	Paraguay.	S. Brazil.	Bolivia.	Peru.	Amazonia.	Guiana.	Venezuela and Trinidad.	U. S. of Colombia.	Ecuador.	Galapagos Islands.	Central America and Mexico.	Antilles.	N. America.
25. <i>Anas strepera</i> .....	7	8	7	3	4	5	2	2	4	3	5	1	0	0	7	8	7
*26. <i>Heteronetta melanocephala</i> .....			*	*											*	*	*
27. <i>Querquedula discors</i> .....											*				*	*	*
*28. — <i>cyanoptera</i> .....	*	*	*	*								*			*	*	*
29. — <i>carolinensis</i> .....																	
*30. — <i>oxyptera</i> .....								*									
*31. — <i>flavirostris</i> .....	*	*	*	*													
*32. — <i>andium</i> .....													*				
*33. — <i>versicolor</i> .....	*	*	*	*										*			
*34. — <i>puna</i> .....							*	*						*			
*35. — <i>torquata</i> .....				*													
*36. — <i>brasiliensis</i> .....		*		*	*	*											
37. <i>Dafila acuta</i> .....															*	*	*
*38. — <i>spinicauda</i> .....	*	*	*	*													
*39. — <i>bahamensis</i> .....	*		*	*		*				*				*			
40. <i>Mareca americana</i> .....											*				*	*	*
*41. — <i>sibilatrix</i> .....	*	*	*	*													
42. <i>Spatula clypeata</i> .....											*				*	*	*
*43. — <i>platalea</i> .....	*		*	*											*	*	*
44. <i>Aix sponsa</i> .....															*	*	*
*45. <i>Metopiana peposaca</i> .....			*	*													
46. <i>Fuligula marila</i> .....															*	*	*
47. — <i>affinis</i> .....											*				*	*	*
48. — <i>collaris</i> .....															*	*	*
49. — <i>americana</i> .....															*	*	*
50. — <i>valisneria</i> .....															*	*	*
51. <i>Clangula glaucion</i> .....															*	*	*
52. — <i>albeola</i> .....															*	*	*
53. <i>Cedemia perspicillata</i> .....																*	*
*54. <i>Tachyeres cinereus</i> .....	*	*															
55. <i>Erismatura rubida</i> .....															*	*	*
*56. — <i>ferruginea</i> .....				*				*									
*57. — <i>dominica</i> .....						*	*	*	*	*	*				*	*	
*58. <i>Merganetta armata</i> .....			*														
*59. — <i>turneri</i> .....								*									
*60. — <i>leucogenys</i> .....								*				*	*				
61. <i>Mergus cucullatus</i> .....															*	*	*
*62. — <i>octosetaceus</i> .....						*											
	15	15	18	14	5	9	5	7	5	5	10	3	2	2	25	25	25

Secondly, the quasi-cosmopolitan genus *Erismatura* has 2 representatives peculiar to the Neotropical region—namely, *E. ferruginea* and *E. dominicana*.

After deducting these two categories, the remaining 29 species form the Antarctic division of the Neotropical Anatidæ, and consist mostly of species belonging to genera also found in the north—*e. g.* *Bernicla* (6), *Cygnus* (2), *Anas* (2), *Querquedula* (8), *Dafila* (2), *Mareca* (1), *Spatula* (1), and *Mergus* (1). Adding these together,

we have the following 23 species of Neotropical Anatidæ belonging to genera also met with in the north—namely

<i>Bernicla melanoptera,</i>	<i>Querquedula flavirostris,</i>
— <i>magellanica,</i>	— <i>andium,</i>
— <i>dispar,</i>	— <i>versicolor,</i>
— <i>poliocephala,</i>	— <i>puna,</i>
— <i>rubidiceps,</i>	— <i>torquata,</i>
— <i>antarctica,</i>	— <i>brasiliensis,</i>
<i>Cygnus nigricollis,</i>	<i>Dafila spinicauda,</i>
— <i>coscoroba,</i>	— <i>bahamensis,</i>
<i>Anas specularis,</i>	<i>Mareca sibilatrix,</i>
— <i>cristata,</i>	<i>Spatula platalea,</i>
<i>Querquedula cyanoptera,</i>	<i>Mergus octosetaceus.</i>
— <i>oxyptera,</i>	

Lastly, there are 4 generic forms of Anatidæ peculiar to the Antarctic portion of the Neotropical region (*Heteronetta*, *Metopiana*, *Tachyeres*, and *Merganetta*), embracing the following six species—

<i>Heteronetta melanocephala,</i>	<i>Merganetta armata,</i>
<i>Metopiana peposaca,</i>	— <i>turneri,</i>
<i>Tachyeres cinereus,</i>	— <i>leucogenys.</i>

The Neotropical Anatidæ may therefore be summarized as follows:—

A. Nearctic species, mostly occurring only in winter within the Neotropical Region . . . . .	23
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