

[Mar. 14,

of *Antilope gutturosa* (Spic. Zool. vii. 14, t. 2, 3. f. 14-17). The horns are like those of *Gazella dorcas*, but rather longer and with more numerous and closer rings.

The "Yellow Sheep of Mongolia" (*Procapra gutturosa*) is known from the nearly allied "Goa" of Tibet (*Procapra picticauda* of Hodgson) by its larger size and the shortness and thickness of the horns, which have their tips turned upwards. The two species agree in the length, softness, and colour of the fur, and in having a distinct white rump-spot. The horns of the Goa are much more slender, compressed, and longer than those of the Yellow Sheep, and have the tips bent rather forwards. The length of the horn, along the curves, of the adult Yellow Sheep is $9\frac{1}{2}$ inches, of the Goa $11\frac{1}{2}$ inches. The latter has about twenty-four or twenty-five, and the former only twenty rings. There are also several differences in the skulls. The aperture of the front blood-vessels at the base of the horn in *P. gutturosa* is very much larger than that in *P. picticauda*. Pallas describes the horns of *P. gutturosa* as "*lutescenti-opaca*;" but in the two specimens in the British Museum they are of a dark blackish horn-colour, in this respect very different from those of the "Goa."

March 14, 1867.

Dr. J. E. Gray, F.R.S., V.P., in the Chair.

The Secretary read the following extract from a letter addressed to him by Mr. J. H. Thomson, of New Bedford, Massachusetts :—

"I notice in the 'Proceedings' (1865, pp. 390 &c.) some account of 'Deformity of the Lower Jaw of the Sperm-Whale,' by Dr. J. Murie. Such deformed jaws are by no means uncommon; there are at this time some four or five specimens of such in the collection of our High School and the Natural-History Society of this place, and I have seen quite a number besides. As to the cause of this deformity, whalers generally attribute it to the fighting-propensities of the young 'Bull' Whales. I have never seen a specimen except from male Whales. The difference of teeth mentioned on page 396, 'Proceedings' (1865), is not in accordance with my observations. The lower jaws are very frequently brought home in whalers, to use up as bone for manufacturers and for ornaments &c.; you can find them lying about in a great many places in this vicinity. I have myself seen Sperm-Whale jaws with the sides of the same jaw differing by one or two teeth—that is, one or two more on one side than the other. The male Sperm-Whales in the rutting-season are very jealous of each other; the old 'bulls' at that time fight and drive off the young males from the 'school' or herd. Their mode of fighting is with their jaws mostly, so much so that you can approach a Whale directly behind to fasten or harpoon

them. They use their 'flukes,' or caudal fins, much less than the Right or Whalebone Whales. They will often lock their jaws, and turn on their sides and twist about. As to this being the cause of deformity, of course it is only opinion, but the general opinion. Such deformed Whales are generally fat; but this is accounted for by the fact that they are generally 'lone,' or single Whales, and their food, which is the Squid or Cuttlefish, can be nearly as easily captured by the deformed jaw as by the other. The Sperm-Whale will often in his 'flurry,' or death struggle, vomit up large pieces of Squid. Our place being eminently a whaling city, portions of the skeleton of the Sperm-Whale, such as jaws, skulls, &c., are often brought home in our whale-ships. Should any of these be of use to you, I will endeavour to send you such as you may require, or any other specimens of natural history which may be of service to your honourable Society.

"I notice also a paper in the 'Proceedings' (1864, p. 170) on the Bonnet of the Right or Whalebone Whale. Such appendage or bonnet is an invariable portion of the Right Whale from the Northwest Coast and Arctic Sea; it is a development of the cuticle, similar to the nails of Mammalia, or the hoofs of the Ruminants."

The following papers were read:—

1. On the Skull of *Indris diadema*.

By ST. GEORGE MIVART, F.Z.S. &c.

(Plate XVIII.)

INDRIS DIADEMA.

Propithecus diadema, Bennett, Proc. Zool. Soc. 1832, p. 20.

Macromerus typicus, A. Smith, South African Journal, 2nd. ser. ii. p. 49 (1833).

Lemur diadema, De Blainville, Ostéographie, Primates, Lemur, pp. 23 & 37, pl. 8 (skull), pl. 11 (immature dentition).

Habrocebus diadema, Wagner, Schreber, Suppl. i. (1840), p. 260; v. p. 141.

Propithecus diadema, Lesson, Species des Mammifères (1840), p. 219; Van der Hoeven, Tijdschr. v. Nat. Gesch. xi. p. 44 (1844); Isid. Geoff. St.-Hilaire, Catalogue des Primates, p. 68 (1851); Dahlbom, Studia Zool. p. 203; J. E. Gray, Proc. Zool. Soc. 1863, p. 133; St. George Mivart, Proc. Zool. Soc. 1864, p. 638, and 1866, p. 167.

In March 1866 I had the honour of laying before the Society a description of a skin, a skull, and some other parts of the skeleton of the Woolly Lemur (*L. laniger* of Linnæus). At the end of that paper I gave the distinctive characters of that form and those of the Indri, adding such ones of *P. diadema* of Bennett as I had been able to gather from the scanty materials then accessible.

I am now enabled to complete that memoir, through the remarkable kindness and liberality of Professor Peters of Berlin, who has not only transmitted to me for examination a perfect and nearly adult skull of the *Propithecus diadema* of Bennett, but has expressly

authorized me to communicate the results of my examination to the Zoological Society.

Before proceeding to do so, however, I am desirous of correcting an error of nomenclature in my previous communication. The Woolly Lemur is there described under the generic name *Microrhynchus*, which I had adopted because it was the original one proposed by M. Jourdan in 1834. Professor Peters, however, has been kind enough to call my attention to the fact that this generic term was at the time of its proposal by M. Jourdan already appropriated, it having been employed in the group Coleoptera as long ago as the year 1823.

Under these circumstances I think the generic name *Avahis* should have been adopted (as was done by M. Isid. Geoff. St.-Hilaire*), as that term was proposed in 1835†; the other generic designations (*Habrocebus* of Wagner‡ and *Semnocebus* of Lesson§) having both appeared in works which have each on their titlepage the date 1840. This question, however, is of little importance, if, as I now believe, both terms must be abandoned. The examination of the skull sent by Dr. Peters has convinced me that sufficient grounds do not exist for the generic separation of the three forms|| of *Indrisinæ*, all of which I shall therefore henceforth designate by the oldest¶ and very generally received generic name *Indris*,—the three being respectively *I. brevicaudatus*, *I. diadema* (instead of *Propithecus*), and *I. laniger* (instead of *Microrhynchus* or *Avahis*).

The subject of the present communication is, as is well known, as yet a rare animal. Mounted skins, indeed, exist in the British Museum, but no extracted skulls or other bones of the species are preserved in the osteological collections either of that institution or of the College of Surgeons. No adult skull or complete dentition has hitherto been figured; but the immature condition has been represented by De Blainville**.

I find, as I strongly suspected††, that the cranium of this species does closely resemble the crania of the other *Indrisinæ*; and, to avoid repetition, it may be understood to correspond completely with

* Catalogue des Primates, p. 68.

† Is. Geoff. St.-Hilaire, 'Leçons de Mammalogie,' published by M. Gervais, p. 23 (1835).

‡ Schreber, Suppl. i. p. 257.

§ Species des Mammifères, p. 209.

|| This union has already been proposed by M. Vinso, who has described a fourth form, under the name *Indris albus*; but as scarcely any osteological characters are given, I can only allude to it in the present communication. It may be remarked, however, that if, as is asserted, the tail is somewhat longer than that of the common Indri, it so far tends to justify the union of *I. brevicaudatus* in one genus with the other *Indrisinæ* (see Ann. des Sc. Nat. xix. p. 253; and Revue et Mag. de Zoologie, 1862, p. 494). The muzzle is said to be shorter than in *I. brevicaudatus*; but the form of the skull and the dentition appear to be as in that species.

¶ Proposed by Geoff. St.-Hilaire, 'Mém. sur les Makis' (1796), where, however, it is without the final s, which appears in 'Tabl. des Quadrup.' (1812). Illiger's term *Lichanotus* was proposed in 1811.

** Ostéographie, Primates, Lemurs, pls. 8 & 9.

†† P. Z. S. 1866, p. 165.

the description before given of the dentition and skull of *I. laniger*, except where the contrary is stated.

Of the two incisors in each *præmaxilla*, the anterior one is *very considerably* larger than the posterior one.

The upper canine is not yet in place in the skull transmitted by Dr. Peters; but from the mounted specimens in the British Museum it has already been determined to decidedly exceed the incisors in length.

The vertical prominence on the internal surface of the tooth is (unlike that of the canine of *I. laniger*, and more like that of *I. brevicaudatus*) very much nearer to the anterior margin of the tooth than to its posterior edge.

The anterior upper premolar is quite like that of *I. laniger*, and has the anterior process more developed than is the case in the corresponding tooth of *I. brevicaudatus*.

Fig. 1.



Inside of left dental series. Scale, nat. size.

The posterior upper premolar differs from the anterior one just as in *I. laniger*, and the internal cingulum is very marked indeed. It also, of course, more resembles the second than it does the third premolar of any Lemuroid*.

The first upper molar, as in *I. laniger*, is the largest grinding-tooth in the upper jaw. The difference in size, however, between it and the posterior premolar is not quite so great as that between the second and third upper molars.

It may be said to have seven cusps, as, beside the four principal ones, there are three developed from the external cingulum and placed as in *I. laniger*. The posterior one of these three, however, is (as in *I. brevicaudatus*) much smaller relatively than in the Woolly Lemur, and much smaller than the two anterior ones; also the small cusp, which in *I. laniger* exists between the two large anterior ones, is here wanting.

In other respects this tooth agrees with its homologue in the Woolly Lemur, and has a similar slightly marked ridge running from the postero-external cusp to the antero-internal one†.

The second upper molar quite resembles the corresponding tooth

* Dr. Peters, in his very interesting memoir on the Aye-Aye (in the 'Abhandlungen der Königl. Akad. der Wissenschaften zu Berlin,' 1865), in a note (p. 87), observes that it is not always the homologues of the most anterior premolars of one genus which are the first to disappear in another in which the number is less. He refers, as examples, to the *Phyllostomata* and *Rhinolophi*.

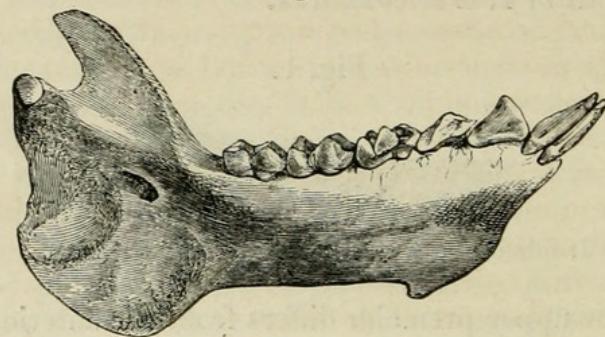
† In the immature dentition of *Indris diadema*, which is represented by De Blainville in his 'Ostéographie, Primates, Lemur' (pl. 11), the first upper molar is represented with the posterior cusp of the external cingulum quite rudimentary. There is also an indication of the oblique ridge extending between the postero-external and the antero-internal principal cusps.

in *I. laniger*, the third cusp of the external cingulum being more developed than in the first upper molar.

The third upper molar is relatively smaller than in either of the other genera of *Indrisinæ*. It has indeed two anterior cusps, one external, and the other internal; but these are much smaller than are the principal cusps of the more anterior molars. Behind these the posterior part of the tooth has a slightly irregular surface and margin, but is without any distinct cusps.

The inferior incisors and canines are quite like those of *I. laniger*, except that the inner surface of each canine has a wider groove than even in *I. brevicaudatus*, owing to the greater development of the lateral external prolongation of the basal cingulum.

Fig. 2.



Inside of left half of mandible. Scale, nat. size.

The anterior lower premolar is very much like that of *I. laniger*, but is more vertically and less antero-posteriorly extended than even in *I. brevicaudatus*.

The posterior lower premolar is quite like that of *I. laniger*, except that the median longitudinal ridge does not extend upwards as far as the external margin of the tooth does, though it does so rather more than in the short-tailed form.

The first lower molar is distinctly quinquecuspidate, the two processes of the antero-external cusp of *I. laniger* being here distinct cusps. In other respects it quite resembles its homologue in that species. The same is the case, at least sometimes, in *I. brevicaudatus*. This tooth has a great resemblance to the lower molars of many insectivora, the three anterior cusps together forming a triangular prism with one angle turned outwards; while the postero-internal angle of the prism is connected by a ridge with the molar's postero-external cusp.

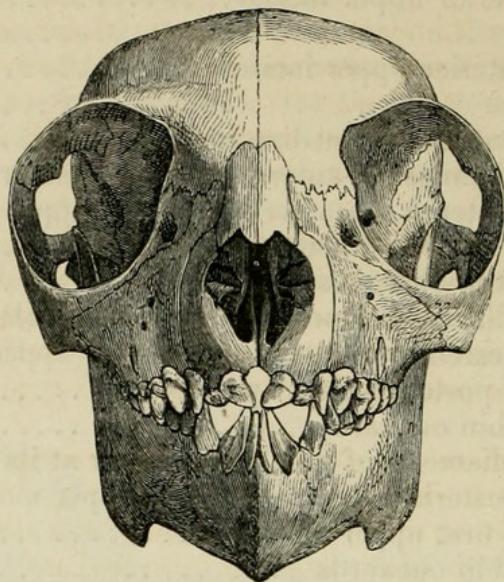
The second molar resembles the first, except that there are but four cusps (the most anterior of the three internal ones of the first molar aborting), that the antero-internal cusp is more vertically extended, and the antero-external one less so, and finally that (as in *I. laniger*) the anterior half of the tooth is not narrower transversely than is its posterior half.

The third and last lower molar is like that of *I. brevicaudatus*, and has its supplemental fifth (posterior) cusp rather more developed than it is in *I. laniger*.

	inch.
Length of the anterior upper incisor.....	·16
Breadth " " " "	·13
Length of the posterior upper incisor	·10
Breadth " " " "	·10
Interspace between the two median incisors	·10
Antero-posterior diameter of anterior upper premolar at its base*	·19
Extreme antero-posterior diameter of anterior upper premolar..	·25
Vertical extent of anterior upper premolar	·19
Breadth from within outwards	·12
Antero-posterior diameter of posterior upper premolar at its base ·20	·20
Extreme antero-posterior diameter of posterior upper premolar. ·22	·22
Vertical extent of posterior upper premolar	·15
Breadth from within outwards	·15
Antero-posterior diameter of first upper molar at its base ..	·22
Extreme antero-posterior diameter of first upper molar	·29
Vertical extent of first upper molar	·14
Breadth from within outwards	·22
Antero-posterior diameter of second upper molar at its base ..	·21
Extreme antero-posterior diameter of second upper molar	·27
Vertical extent of second upper molar	·13
Breadth from within outwards	·22
Antero-posterior diameter of third upper molar	·17
Vertical extent of third upper molar.....	·09
Breadth from within outwards	·16
Length of inferior incisor	·30
Transverse diameter of inferior incisor	·05
Antero-posterior diameter of inferior incisor	·09
Length of inferior canine	·31
Transverse diameter of inferior canine	·09
Antero-posterior diameter of inferior canine	·13
Antero-posterior diameter of anterior lower premolar at its base ·16	·16
Extreme antero-posterior diameter of anterior lower premolar.. ·23	·23
Vertical extent of anterior lower premolar	·22
Breadth from within outwards	·10
Antero-posterior diameter of posterior lower premolar at its base ·17	·17
Extreme antero-posterior diameter of posterior lower premolar.. ·25	·25
Vertical extent of posterior lower premolar	·15
Breadth from within outwards	·11
Antero-posterior diameter of first lower molar at its base.....	·22
Extreme antero-posterior diameter of first lower molar	·27
Vertical extent of first lower molar	·16
Breadth from within outwards	·17
Antero-posterior diameter of second lower molar	·25
Vertical extent of second lower molar	·15
Breadth from within outwards	·16
Antero-posterior diameter of third lower molar	·25
Vertical extent of third lower molar	·11
Breadth from within outwards	·16

* The dimensions of the upper canine cannot be given, it not being yet in place.

Fig. 3.



Front view of skull. Scale, nat. size.

The skull.—De Blainville remarks* of the skull of this species, of which he had only a very immature specimen,—“Tout ce que je puis en dire, c'est qu'elle a la plus grande ressemblance avec une de pareil âge environ, provenant de l'*Indri* ordinaire ; seulement le museau est notablement plus court, l'espace inter-orbitaire un peu plus large, et l'os incisif plus développé.”

The facial part is indeed very decidedly shorter than in *I. brevicaudatus*, though it is longer than in *I. laniger*; and the antero-posterior extent of the anterior opening of the orbit falls short of the length of the muzzle in front of it, though by no means so decidedly so as in the former species.

As in *I. laniger*, the skull, when viewed from above, is seen to be broadest between the outer margins of the orbits; while the greatest width of the cranium proper is in a transverse line passing just behind the posterior ends of the zygomatic arches.

The mastoidal region, as in the other *Indrisinae*, is not inflated, but the prominence just above the aperture of the external auditory meatus, which is so marked in *I. laniger*, is represented by only a very slight enlargement in the species now described.

The skull is not concave externally, either between the orbits or elsewhere on its roof; but there is a flattening in the former situation, which may become a concavity with age, as this region in *I. brevicaudatus* thus alters with time. The same may be said with regard to the development of temporal ridges, which are not indicated in the skull examined.

There is no interparietal.

The nasals are rather strongly convex, and become slightly narrower transversely towards their upper ends. They are shut out from the lachrymals by a tolerably broad process of the maxilla,

* *Loc. cit.* p. 23.

the fronto-maxillary suture being a little anterior to their posterior termination.

As in the other *Indrisinæ*, there is no malar foramen, and the lachrymal opening is very near the margin of the orbit.

The floor of this latter part (the orbit) is not so large relatively as in *I. laniger*; but, as in that species, it is placed lower down than in *I. brevicaudatus*, so as to be but little above the alveolar margin of the upper jaw.—

The malar is wide and extends back very nearly to the glenoid surface; but its lower part does not offer a vertically ridged and grooved space for the attachment of the *masseter* (though such may very probably be developed with age), neither is there any process given off from its posterior border above the zygomatic process of the squamosal.

The glenoid surface and the post-glenoid process and foramen are all as in the other *Indrisinæ*.

There are two small suborbital foramina; and the posterior palatine foramina are also small, and are intermediate, as to their development, between the conditions presented by *I. laniger* and *I. brevicaudatus* respectively; for the foramen behind the last molar and the two in front of the posterior margin of the palate are all of moderate size.

The anterior palatine foramina are rather large, and the palate is much as in *I. brevicaudatus*, except that its posterior border is scarcely at all thickened. The most anterior point of its posterior border is in a line with the anterior margin of the last molar. There is a small but distinct paroccipital process, and much smaller than that of the last-named species; but in the union of the foramen rotundum with the sphenoidal fissure, the conspicuous Vidian foramen, and the other points before mentioned* in describing *I. laniger*, *I. diadema* agrees with both the other species of *Indrisinæ*. I am unable to say, however, whether there is or is not a *crista galli*.

A very large and conspicuous stylo-mastoid foramen opens immediately behind and beneath the aperture of the meatus auditorius externus.

In the form of the mandible, *I. diadema* presents an interesting intermediate condition between *I. brevicaudatus* and *I. laniger*, the posterior part of the articular surface of the condyle being much flattened, but not vertically grooved, and the digastric fossa and ridge above the mylohyoid foramen being more marked than in the former species, but not so much so as in the latter one. The bending downwards of the angle of the mandible is also intermediate.

Dimensions.

inch.

Length from anterior end of the præmaxilla to anterior margin of the foramen magnum	2·35
Length from anterior end of præmaxilla to most anterior point of orbital margin	0·65

* P. Z. S. 1866, p. 162.

	inch.
Length between vertical planes traversing the most anterior and most posterior points of orbital margin	0·46
Length from orbital margin to posterior end of skull	1·66
Extreme width between outer margins of orbits....	1·81
Extreme width behind posterior roots of zygomata..	1·49
Width between nearest points of orbits	0·61
Length of palate	1·20
Breadth of palate between first premolars	0·45
Breadth of palate at its posterior end	0·63
Length of nasals	0·65
Breadth of nasals	0·34
Length of lower alveolar margin from front of first premolar to behind last molar	1·15
Length of symphysis	0·80
Height of condyle above alveolar margin	0·43
Height of coronoid process above alveolar margin ..	0·70

Of the rest of the skeleton of *I. diadema* I am entirely ignorant ; but I have no doubt that when examined it will show an agreement with the skeletons of the two other species, similar to that which exists between their crania and dentition.

As I have before observed, I feel convinced that sufficient grounds do not exist for the generic separation of the species now described, the Woolly Lemur, and the Short-tailed Indri. The dental characters are all but identical ; and as regards the crania the main distinctions are those of the size of the entire skull, the proportional length of the muzzle, and the development of the orbit—characters which in other genera of Primates vary considerably amongst species of the same genus, especially when such genus contains species of very different dimensions.

The tail is short indeed in *I. brevicaudatus*, as compared with the same part in either of the two other species ; but length of tail varies much in *Macacus* and *Cynocephalus*, especially if, as I believe should be the case, *M. inuus* be included in the former genus.

The posterior incisors in *I. diadema* are decidedly larger than the anterior pair, while the reverse is the case in *I. laniger* ; but, as before observed*, *I. brevicaudatus* appears to be subject to some variation as to the relative size of the two pairs of upper incisors.

The shortness of the upper canine in *I. laniger* distinguishes it (as far as my observations have gone, and judging from De Blainville's figure) from the two other *Indrisinae* ; but Prof. Van der Hoeven's figure† and that of Prof. Vrolik ‡ leave it doubtful whether this is not merely a sexual peculiarity.

In other points given in my former paper as characters distinguishing *I. laniger* from *I. brevicaudatus*, we have seen that *I. diadema* presents an intermediate condition ; and the characters offered

* P. Z. S. 1866, note in p. 154.

† Loc. cit. pl. 1. fig. 6.

‡ Todd's 'Cyclopædia,' iv. p. 215. fig. 136.

by the three forms (which I consider together constitute but a single genus) may perhaps be expressed as follows:—

INDRISINÆ. INDRIS.

$$\text{I. } \frac{2-2}{2}. \quad \text{C. } \frac{1-1}{1-1}. \quad \text{P.M. } \frac{2-2}{2-2}. \quad \text{M. } \frac{3-3}{3-3} = \frac{16}{14} = 30.$$

Characters.—Ears short; muzzle moderate, or rather or very short; hind legs much longer than the fore limbs; index very short, much shorter than the fifth digit; pollex short and placed far back; hallux very long and covered with hair; tail long, or very short and rudimentary; internal condyle of the humerus perforated; carpus destitute of an os intermedium; tarsus short; first upper molar with four principal cusps, and from two to four supplementary ones; last upper molar with only two well-developed cusps; each lower incisor with its outer surface longitudinally grooved; posterior lower premolar much antero-posteriorly extended; first lower molar with five more or less distinct cusps; last lower molar quinquecuspis; a paramastoid process; no malar foramen; lachrymal foramen very near the margin of the orbit; a process depending from zygoma in front of, and external to, the glenoid surface; a glenoid foramen; anterior palatine foramina very large; mandibular symphysis very long; condyle rounded, but very little transversely extended; articular surface prolonged somewhat down the back of ascending ramus; digastric fossa more or less deep.

Hab. Madagascar exclusively.

INDRIS BREVICAUDATUS.

Characters.—Ears exserted; muzzle moderately long; tail short; posterior pair of upper incisors not much larger, sometimes decidedly smaller, than anterior pair; upper canine longer than first premolar; skull not concave between the orbits; antero-posterior extent of the anterior opening of the orbit less than the length of the muzzle in front of that opening; no protuberance above the external auditory meatus; no process of the malar projecting over the anterior end of the zygomatic process of the squamosal; floor of orbit considerably above the upper alveolar margin; a large palatine foramen behind the third molar; palate with its posterior margin thickened; mandibular symphysis much less than three times the length of the lower incisors; fossa for digastric not very deep; posterior part of articular surface of condyle not grooved, nor always much flattened; angle very much bent downwards, making the inferior margin of the mandible exceedingly concave.

Hab. Madagascar, but not St. Mary's Island.

INDRIS DIADEMA.

Characters.—Ears short, in the fur; muzzle rather short; tail long; posterior pair of upper incisors much smaller than the anterior pair; upper canine larger than first premolar; last upper molar very small; skull not concave between the orbits; antero-posterior

extent of the orbit about equal to the length of the muzzle in front of that opening; a very slight protuberance above the external auditory meatus; no process of the malar projecting above the anterior end of the zygomatic process of the squamosal; floor of orbit not much above the upper alveolar margin; all posterior palatine foramina moderate; mandibular symphysis not much less than three times the length of the lower incisors; fossa for digastric very deep; posterior part of articular surface of condyle very much flattened; angle much bent downwards, making inferior margin of mandible decidedly concave.

Hab. Madagascar.

INDRIS LANIGER.

Characters.—Ears very small and hidden in the fur; muzzle very short indeed; fur woolly: supinator ridge of humerus very large; posterior pair of upper incisors considerably larger than the anterior pair; upper canine (sometimes at least) scarcely exceeding first premolar in vertical extent; skull strongly concave between the orbits; antero-posterior extent of the anterior opening of the orbit exceeding the length of the muzzle in front of that opening; a marked protuberance above the external auditory meatus; an obtuse process projecting from the malar over the anterior end of the zygomatic process of the squamosal; floor of orbit very little above the upper alveolar margin; no large palatine foramen behind the last molar; palate with its posterior margin not thickened; anterior palatine foramina very large; mandibular symphysis nearly three times the length of the lower incisors; fossa for digastric very deep indeed; a vertical groove on posterior part of articular surface of condyle; inferior margin of mandible only slightly concave.

Hab. Madagascar and St. Mary's Island.

EXPLANATION OF PLATE XVIII.

- Fig. 1. Upper surface of the skull of *Indris diadema*.
 - 2. Under surface of the same.
 - 3. Side view of the same.
 - 4. Side view of the outside of the mandible of *I. diadema*.
 - 5. Grinding-surface of the right dental series of the same.
- (All the figures are of the natural size.)

2. Supplementary Note on *Potamogale velox*.

By Prof. ALLMAN, F.R.S., Corr. Memb. Zool. Soc.

Mr. St. George Mivart having recently expressed a wish to inspect the skull of the *Potamogale velox*, described by me at a former Meeting of the Society*, I had much pleasure in placing it at his disposal. Shortly afterwards I received from him a note reminding me of the discrepancy between the number of teeth in the dental

* Trans. Zool. Soc. vi. pt. 1, June 1863.

formula of this animal as given by Prof. J. V. Barboza du Bocage* and that in the formula given by myself, the Lisbon zoologist describing ten teeth on each side in both jaws, while in my specimen only nine were apparent on each side. Mr. Mivart, however, thought that he saw indications of a tooth still confined within the mandible at the extreme posterior end of each ramus, while a small, apparently fractured, surface in the corresponding part of the maxilla appeared to afford evidence of a portion of the upper alveolar margin with its tooth having been here carried away.

I have now the satisfaction of being able to confirm in great part the suspicion of Mr. Mivart. In the case of the mandible, it was easy enough to set the question at rest. On removing a portion of the side of the mandible, where the missing tooth was supposed to be concealed, a small cavity was exposed, in which, with some care, a minute calcareous point, the commencing calcification of the dental papilla, still enveloped in the remains of its capsule, was detected.

There can thus be no doubt of the presence of a rudimental tooth on each side in the mandible of my specimen, behind the most posterior of those previously described by me.

Of the existence of a corresponding tooth in the maxilla, no such direct evidence can be adduced. There is certainly a very small rough surface at the most posterior end of the alveolar margin at each side, and I agree with Mr. Mivart in thinking it probable that a portion of this margin has been here broken off; the missing fragment, however, must have been extremely small, and the tooth which it contained must have been in at least as rudimentary a state as that of the mandible.

Had I become acquainted with Prof. Du Bocage's determination of the dental characters of *Potamogale* before my own communication had been printed, I should perhaps have made a search in the same direction for the missing teeth; but as it was, my specimen gave me no reason to suspect that it did not offer an exposition of the complete series, though it is now plain that it had not yet developed its last molars.

The facts now stated render necessary a correction of the formula which I had already given as that of the teeth of *Potamogale*, and which must henceforth be regarded as applying to the dentition of this genus before the adult state had been attained in the development of the last molars. In the corrected formula the incisors and premolars must remain as before, but to the true molars one must now be added. The dental formula, as amended for the adult, will accordingly stand as follows:—

$$\text{I. } \frac{3-3}{3-3}. \quad \text{C. } \frac{0-0}{0-0}. \quad \text{P. } \frac{3-3}{3-3}. \quad \text{M. } \frac{4-4}{4-4} = 40.$$

PS. Since the above note was communicated to the Society, I have been enabled, through the kindness of M. Jules Verreaux, of

* Noticia acerca los Caractéres e Affinidades Naturaes de un novo Genero de Mammiferos Insectivoros. Lisboa, 1865.

the Jardin des Plantes, Paris, to examine a skull of *Potamogale* in which the entire series of teeth has been developed. It is that of a specimen brought from the Gaboon by M. Aubry Le Compte, the stuffed skin of which now forms part of the French Colonial Collection in the International Exhibition, Paris.

In this skull the last molars have made their appearance, so that there are ten teeth on each side in both upper and lower jaws. The most posterior molar of the mandible entirely resembles that in front of it, except in its crown being on a slightly lower level. In the maxilla the posterior molar is considerably narrower from before backwards than the tooth which immediately precedes it, but in other respects it resembles it.

By an error overlooked in correcting the proof of my former paper on *Potamogale velox*, the first, second, and third true molars of the lower jaw are stated to be equal in height to the *second* premolar; it ought to have been written the *third* premolar.

3. Notes on the Skulls of the Cats (*Felidæ*).

By Dr. J. E. GRAY, F.R.S., V.P.Z.S., &c.

Having had occasion, while revising the nomenclature of the specimens of *Felidæ* in the British Museum Collection, to examine a large series of the skulls of the family, I herewith submit the result of that examination.

The examination confirms the separation of several of the genera that have been proposed, and shows the distinctness of some species which it has been suggested should be united.

The British Museum Collection contains the skulls of a large number of species of *Felidæ*—the largest series of skulls of that group, I believe, that has ever been brought together—nearly twice as many as are figured in M. de Blainville's 'Ostéographie,' which embraces figures of all the species contained in the French collections, in Paris and elsewhere. Of most of the species there are several examples, and almost all of them are obtained from the skins of the specimens in the collection: therefore there can be no doubt of the accuracy of their determination; and should any doubt arise it can be solved by the examination of the skin from which the skull was obtained. I have referred to the work in which the best figures of the skull of each species is to be found, and I have added figures of some of the more interesting forms, which, I believe, are now published for the first time.

The form of the flesh-tooth of the Hunting-Leopard (*Gueparda*) at once separates it from all the other Cats as distinctly as its long slender legs and round face. The flesh-tooth of the upper jaw, instead of being stout and having a more or less large but always distinctly marked prominence with a conical crown on the front of the inner edge, as is common to the skulls of all the Cats and Lynxes, in the *Gueparda*, on the contrary, is thin, compressed longitudi-

nally, and has only a very slightly raised scarcely visible keeled ridge on that part. This process is represented as rather more prominent in M. de Blainville's figure of the skull (*Ostéographie, Felis*, t. 9) than it is in the specimens in the British Museum.

The peculiarity in the formation of the skull, which separates the Lynxes from the Cats, is not very striking; but as it is common to the skulls of all the species of Lynxes, both from the eastern and western hemispheres, it shows how important it is to observe even slight differences.

In the *Felidæ* generally the upper processes of the intermaxillæ and the front edge of the frontal bone on each side are provided with a more or less elongated conical process, which separates a part of the nasal from the maxilla; and in the Lynxes these processes are very slender and so much elongated that those of the intermaxilla and the frontals nearly or quite unite, and entirely separate the nasals from the upper front edge of the maxillæ. This is not altogether peculiar to the Lynxes, the same structure being found in a Cat which has been called *F. marmorata*; and the processes of the intermaxillary, often very long, reach up one-third the length of the side margin of the nasal in some of the larger Leopards. But the lateral processes of the frontal not being so long as in the Lynxes and *F. marmorata*, the two processes do not unite and separate the nasal bones from the maxillæ as is found in all the species of the genus *Lynxus*.

The skulls of the species of true Cats are so similar and uniform in their structure that they present very few tangible characters for the separation of the species into groups. In looking at a small series of skulls it is easy to perceive that some are remarkable for having a broad rather lengthened nose and moderate-sized orbits, and others a narrow, short nose, pinched up behind, and above with a more or less distinct concavity on the sides in front of the orbits, and the orbits generally large. The former structure is confined to the skulls of the larger species, as the Lion, Tiger, Leopard, Ounce; and the second is more marked in the small kinds. If a larger series of skulls is examined, the two forms gradually pass into each other, and it is found that the intermediate gradation of form occurs in the skulls of some of the species that are intermediate in size between the two extremes; while some of the skulls of the middle-sized species retain the characters of the larger broad-nosed species.

In some species, while the skulls of the adult animals are similar to those of the larger broad-nosed group, the skulls of the younger or half-grown specimens have the sides of the nose more or less concave and narrower behind, like those of the second group.

The skull of a Chinese Leopard, presented by Dr. Lockhart, from Pekin, presents one of those anomalies in dentition which now and then occur in most families of Mammalia. It has a small subcylindrical short tubercular grinder behind the flesh-tooth on one side of the lower jaw, and none on the other, thus having on one side the formula of dentition that is peculiar to the genus *Canis*. But

no one could make a mistake as to what it was, as the teeth are all those of the Cats (*Felidæ*).

The skulls of species of *Felis* which have the same system of colouring are not always alike: thus the skulls of *Felis uncia*, *F. marmorata*, and *F. macrocelis*, of *Felis viverrina*, *F. bengalensis*, and *F. nepalensis*, and of *F. pardina* and *F. macroura* are very different in form and structure. On the other hand, the skulls of the Lion, the Tiger, the Leopard, and the Jaguar are nearly similar in form and teeth, and chiefly to be distinguished by their size and other slight characters.

Keyserling and Blasius have pointed out the differences in the skulls of the Wild Cat and the Lynx of Europe. The characters mentioned are common to most of the species of the genera *Felis* and *Lynx*; but *Felis marmorata* has a skull like that of the Lynxes; and the *Chaus* group, which have the pencilled ears of the Lynxes, but not their long legs, have a skull like that of the Domestic Cat.

The *Felis macrocelis* has very long, rather compressed canine teeth in the upper and lower jaws. Its skull presents the nearest approach to those of the fossil Cats with very long sharp-edged canines, such as *Felis cultridens* of England, Germany, France, and Italy, *F. megatherion* and *F. smilodon* of Brazil. The latter has exceedingly long sword-like canines in the upper jaw. These animals form the genera *Machairodus* and *Agnotherium* of Kaup (see Blainville, *Ostéographie*, *Felis*, t. 17 & 20).

In most *Felidæ* the orbits are furnished with an imperfect bony ring; in *F. viverrina*, *F. subrugosa*, *F. planiceps*, and some other spotted Cats these orbits are complete even at an early age.

The Domestic Cat has nocturnal eyes, with an elongated erect pupil, and this has been generally given as the character of the entire genus; but the Lion, Tiger, Leopard, and some of the other larger species have a round pupil, and do not, under any circumstances, ever contract their eyes into an erect linear shape; so they may be called diurnal eyes.

The Domestic Cat, and the species of the genus that are known to have nocturnal eyes with linear erect pupils when contracted, have a very large eyeball and large orbits in the skull, while the eyeball and orbit of the skulls of the Lion and other Cats, which are known to have diurnal eyes, have a moderate-sized eyeball and orbit to the skulls.

Observing that the Cats, which are well known to have vertical pupils, have large eyeballs and orbits in the skulls, I have taken it for granted that all Cats which have large orbits in the skull have vertical pupils. This is important, as we can observe the size of the orbit in museums, while the form of the pupil can only be observed in the living animal. The animals which have nocturnal eyes, generally have short small faces to the skulls; but the *Felis viverrina*, which certainly has nocturnal eyes, has a rather elongated nose to the skull.

As regards the form of the pupil in the *Felidæ* there is a great

want of information. Years ago I remarked that, contrary to the general belief, the pupils of the larger species, such as the Lion, the Tiger, the Leopard, the Jaguar and some other species, had a round pupil, and I therefore separated them from the true Cats, which had linear erect pupils; but the number of species that belonged to each group was left for further verification. Very few zoologists have noted the form of the pupils in the species they have described. Sometimes two observations on the same species do not coincide: thus Burmeister describes the pupils of the eyes of *F. jaguarondi* and *F. eyra* as round; but Berlandier represents the pupil of the latter (*F. eyra*) as linear and vertical. Then Mr. Hodgson has figured the eye of *F. macrocelis* as circular; but Mr. Bartlett says that in the example living in the Society's Gardens it is oblong erect.

Mr. Bryan Hodgson had prepared by native artists a series of drawings of Nepalese animals from life, with the intention of publishing a 'Fauna of Nepal.' These drawings he presented to the British Museum along with his large collection of specimens; and I find that the eyes of the Leopard, the Ounce, the Tortoise-shell Tiger (*F. macrocelis*), and the Murma Cat (*F. murmensis*) are represented with round pupils. The Viverrine Cat of the Tarai (*F. viverriceps*, Hodgs.), the small Nepal Cat (*F. nepalensis* and *F. pardochrous*, Hodgs.), the *F. nigripectus*, the Chaus (*Chaus lybicus*), and the Lynx of Thibet (*L. isabellina*, Blyth) are all represented with linear erect pupils.

Mr. Bartlett, in reply to my inquiries, kindly observes, "A great difficulty exists in determining the form of the pupils in the eyes of many of the Cats, as in some lights and conditions they are all round. It depends upon the light and other causes that you find them sometimes oblong; but from a careful and oft-repeated observation of the following list, I feel safe in saying that in the Ocelot, Puma, Jaguar, Leopard, Tiger, Lion, and Cheetah they are round, and in the Caracal, Clouded Tiger, Chaus, and Serval are oval.

"There are no others on your list that I can speak of with certainty."

"P.S. In my former list I told you the Ocelot had a round pupil. I have this day had the animal in the sunlight, and I must say the pupil of the Ocelot is oblong when exposed to the bright sunlight."

Section 1. Normal Cats.—*The flesh-tooth of the upper jaw with a well-marked prominent internal lobe on the front part of its inner side. The legs moderate.*

Tribe I. True Cats—FELINA.

The head oblong; face slightly produced. Legs moderate, nearly of equal length. The skull oblong; intermaxillæ and frontal bones with short processes, which extend between the ends of the nasal bones and the maxillæ. The front upper false grinder small (rarely deciduous and wanting).

A. Diurnal Cats.—*The eyes diurnal, with a round pupil. The orbits of the skull moderate-sized, compared with the size of the skull; face of the skull elongate, high, broad, flattened above.*

* *Forehead of skull suddenly elevated above the line of the face.*

1. Uncia.

Skull broad; face broad, short, flat above; forehead suddenly raised; crown convex in front and on the sides, concave behind; nasal bones broad, short, not reaching so far back as the upper edge of the maxillæ; upper processes of the intermaxillæ rather elongate, extending about one-third up the sides of the nasals; orbits moderate, incomplete behind; canines conical, moderate; zygomatic arch very strong and high.

This genus is at once known from the Lion, Tiger, Leopard, and Tortoise-shell Tiger by the shortness and breadth of the face, and the sudden elevation of the forehead. “Pupil round.”—Hodgson.

UNCIA IRBIS. (Fig. 1.)

Felis uncia, Schreb.

F. pardus, Pallas.

F. panthera, Erxl.

F. irbis, Ehr.

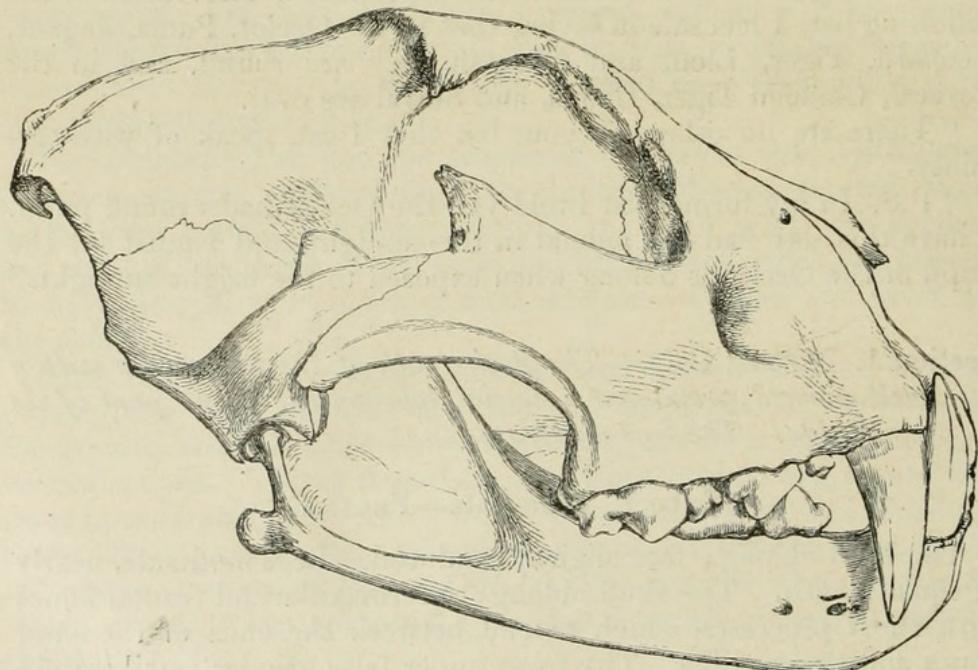
F. tulliana, Valenc.

F. uncoides, Hodgson.

Hab. Tibet (? Smyrna, Val.).

Skull imperfect behind, nearly to the occiput. Length $6\frac{1}{2}$ inches, width $4\frac{7}{8}$ inches.

Fig. 1.



Uncia irbis.

** Nose on the same plane as the forehead.

2. LEO.

Head, neck, sides of body, and legs maned. Tail elongate, tufted at the end. Pupil round. Skull: nose on the same plane as the forehead; nasals flat, nearly as long as maxillæ. The orbits of the skull moderate, incomplete behind.

LEO NOBILIS.

Felis leo, Linn.

Leo africanus et *L. persicus*, Swains.

L. gambianus, Gray.

L. goorgrattensis, Gmel. &c.

Blainv. Ostéogr. *Felis*, t. 5 & 9.

Hab. Asia; Africa.

Skull: length $14\frac{1}{2}$ inches, width $9\frac{5}{8}$ inches.

3. TIGRIS.

Cheeks with spreading whiskers. Tail elongate, tapering at the end. Pupil round. Skull: nose on same plane as the forehead; orbits of the skull moderate, incomplete behind. Nasals very large, reaching beyond the back edge of the maxillæ. Internal nostrils broad. Palate truncated behind.

TIGRIS REGALIS.

Felis tigris, Linn.

Blainv. Ostéogr. *Felis*, t. 7.

Hab. Asia.

Skull: length 14 inches, width $10\frac{1}{8}$ inches.

4. LEOPARDUS.

Hair of head and neck uniform. Tail elongate (rarely shorter than the body). Pupil round. Orbita of the skull moderate, incomplete behind. Nose on same plane as the forehead. The upper process of the intermaxilla very narrow, and much produced up the side of the maxilla, often one-third the length of the nasal.

† Large rose-spotted Leopards.

1. LEOPARDUS PARDUS.

Felis leopardus, *F. varia*, et *F. uncia*, Schreb.

F. pardus, Linn.

F. panthera, Erxl.

F. chalybeata, Herm.

F. minor, Ehr.

F. antiquorum, Fischer.

F. poecilura, Valenc.

F. palæopardus, Fitz.

Blainv. Ostéogr. *Felis*, t. 8; Temm. Monogr. t. 9, f. 1, 2.

Var. Black.—*F. melas*, Péron. *F. fusca*, Meyer.

Hab. Southern Asia; North, South, and West Africa.

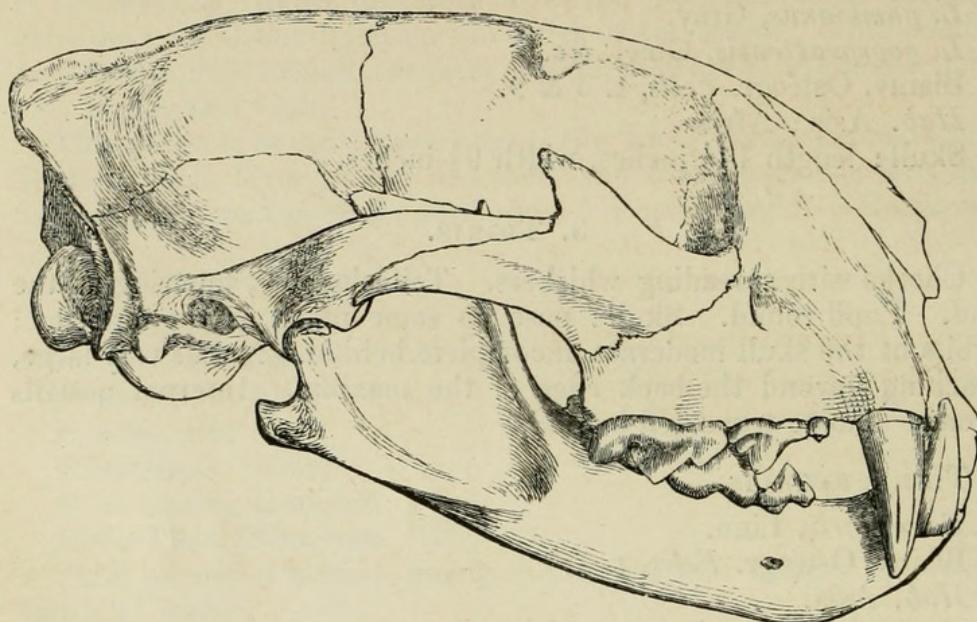
Pupil round.—*Bartlett*; *Gray*.

Very variable in the size and number of the spots. Skull: nasal elongate, back edge on a line with back edge of maxilla; internal nostril rather narrow. Length $9\frac{1}{4}$ inches, width $5\frac{5}{8}$ inches.

2. LEOPARDUS JAPONENSIS, Gray, P. Z. S. 1862, p. 262, t. 33.

Hab. Japan.

Fig. 2.



Leopardus chinensis.

3. LEOPARDUS CHINENSIS. (Fig. 2.)

Skull (in British Museum) very like that of a Leopard, but shorter; and the nose, instead of being nearly flat, is regularly arched before the orbits.

Hab. Pekin, mountain-forests of the west.

Skull: length $6\frac{7}{8}$ inches, width $4\frac{5}{8}$ inches. Nasal wide, flat; apex produced rather behind the back edge of the maxilla. Processes of the intermaxilla very slender, short; forehead broad, convex.

This may be the skull of *L. brachyurus*. There are two or three skulls of Leopards in the Museum received from Utrecht without habitats, that rather resemble the Pekin specimen, which was presented to us by Dr. Lockhart.

4. LEOPARDUS ONCA.

Felis onca, Linn.

F. panthera, Schreb.; Cuvier, Oss. Foss. t. 34. f. 3, 4.

Jaguar, Buffon.

Var. Black.—*Felis nigra*, Erxl.

Var. *Leopardus hernandezii*, Gray, P. Z. S. 1857, p. 278, t. 18 ;
Blainv. Ostéogr. *Felis*, t. 3.

Hab. South America.

Pupil round.—*Bartlett*.

Skull : nasals broad, their hinder end and the back edge of maxillæ nearly on a line ; forehead convex ; nose broad, flat above ; orbit with a prominence in the middle of the front or nasal edge. Length 9 inches, width 6 inches.

Var. Black.—Skull : length $9\frac{1}{2}$ inches, width $6\frac{3}{4}$ inches. Brazil.

†† *Large one-coloured Cats.*

5. LEOPARDUS AURATUS.

Felis aurata, Temm.

F. chrysorthrix, Temm.

F. moormensis et *F. murmensis*, Hodgson.

Junior. *F. temminckii*, Vigors.

Hab. Himalaya, Sumatra ; Borneo.

Pupil round.—*Hodgson*.

6. LEOPARDUS CONCOLOR.

Felis concolor, Linn.

F. discolor, Schreb.

F. puma, Shaw.

F. fulva, Brisson.

Puma, Penn.

Blainv. Ostéogr. *Felis*, t. 6 ; Baird, Mam. N. A. t. 71 (skull).

Var. Black.

Hab. North and South America.

Pupil round.—*Bartlett*.

Skull : length $7\frac{7}{8}$ inches, width $5\frac{3}{8}$ inches.

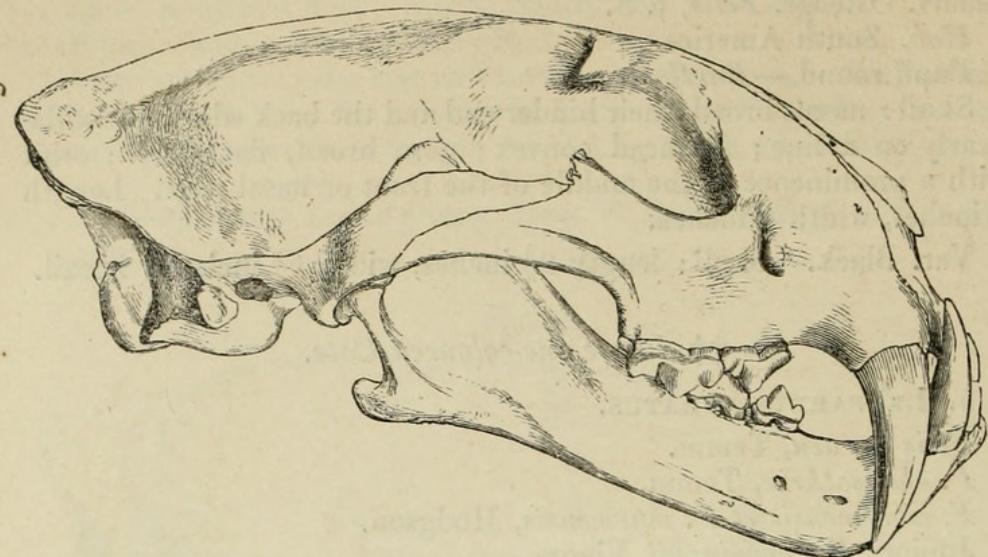
Nasals rather narrow, with a central sunken line rather behind the back end of maxillæ ; cheeks in front of the orbits rather concave ; the upper part of the intermaxilla much produced up the side of the nasal for one-third the length of that bone.

5. NEOFELIS.

Skull elongate ; face broad, rather produced, on the same plane as the forehead. Nasal large, elongate. Orbit moderate, very incomplete behind. Lower jaw truncated and high in front. Canine teeth, upper and lower, very long, conical, with a sharp cutting hinder edge ; the front upper and lower false grinders distinct, early deciduous. The front lateral process of the frontal bone rather elongate. The hinder entrance to the nostrils very narrow, elongate ; sides parallel ; front edges rounded. Pupil round (*Hodgson*), oblong erect (*Bartlett*).

This skull most nearly resembles that of the celebrated fossil *Felis smilodon* (Blainv. Ostéogr. *Felis*, t. 20), with a very much elongated upper canine.

Fig. 3.

*Neofelis macrocelis.*1. **NEOFELIS MACROCELIS.** (Fig. 3.)*Felis macrocelis*, Temm.*F. diardii*, Desmoul.*F. macroceloides*, Hodgson.*F. nebulosa*, H. Smith.*Hab.* Himalaya (*Hodgson*) ; Malacca (*Temm.*) ; Siam.Pupil oval.—*Bartlett*.Skull : length $7\frac{3}{4}$ inches, width $4\frac{3}{4}$ inches.Var. Smaller. Skull : length 5 inches, width $3\frac{1}{2}$ inches (adult).*Hab.* Siam.2. **NEOFELIS BRACHYURUS.***Leopaadus brachyurus*, Swinhoe, P. Z. S. 1862, p. 352, t. 43.*Hab.* Formosa (*Swinhoe*).

B. Nocturnal Cats.—*The pupil of the eye oblong or linear erect when contracted; the eyeball large. The orbits of the skull large for the size of the face. The nose of the skull generally short, compressed above behind, with a more or less marked concavity in front of the orbits.*

In some genera and species the orbits of the eyeballs are much larger, compared with the size of the face and skull, than in others.

* *Skull short and high.*

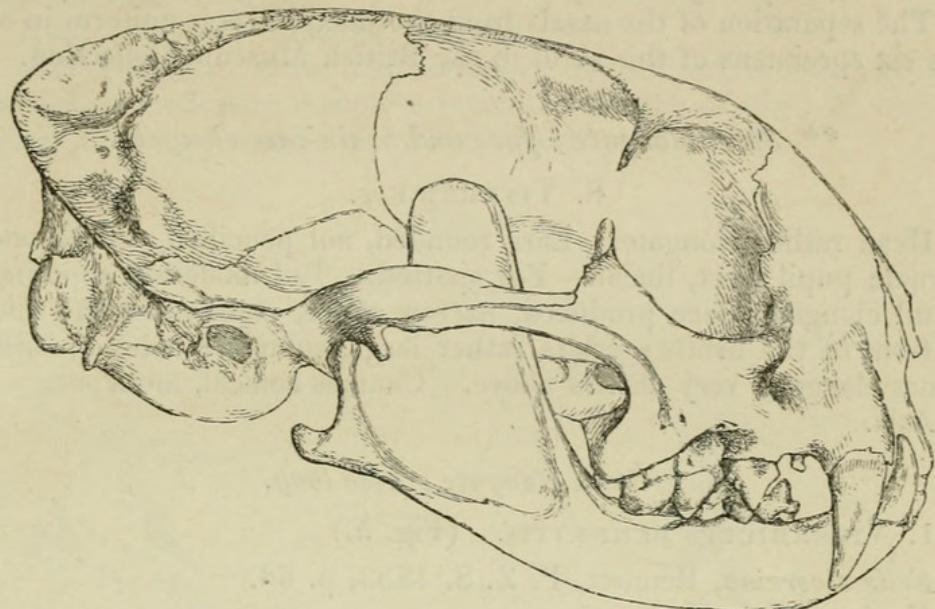
6. **PARDALINA.**

Face round. Eyes moderate; pupil —? Skull short, high; face short; forehead arched in front; brain-case swollen, short; orbits moderate, incomplete behind. First upper false grinder small.

Canines conical, moderate. Hinder aperture to the nose truncated in front.

This genus differs from *Leopardus* in having a much shorter-faced skull.

Fig. 4.



Pardalina warwickii.

PARDALINA WARWICKII. (Fig. 4.)

Felis himalayanus, Warwick.

F. viverrina, var., Blyth.

Leopardus himalayanus, Gray, List Mam. B. M. p. 44.

Hab. Himalaya (Warwick). Probably from South America?

Skull, adult, from Mr. Warwick. Length $4\frac{1}{4}$, breadth $3\frac{1}{6}$, height $2\frac{1}{4}$ inches.

7. CATOLYNX.

Head round. Ears rounded. Pupil oblong erect. Tail very long, cylindrical. Skull ovate; face short, rather broad; nose slightly flattened on the sides; forehead arched; the nasal bones moderate, elongate, separated from the maxillæ by the long slender processes of the intermaxillæ and frontal bones. First upper false grinder small, distinct. Orbita large, subcircular, complete or nearly complete behind. Internal nostril narrow, arched in front.

This genus is peculiar for having the same form of the nose-bones as the Lynxes.

1. CATOLYNX MARMORATUS.

Felis marmoratus, Martin.

F. diardi, Jardine.

F. ogilbii, Hodgson.

F. longicaudata, Blainv. Ostéogr. Felis, t. 9 (skull).

Hab. India; Borneo.

2. CATOLYNX CHARLTONI.

Felis charltoni, Gray, P. Z. S. 1856, p. 396.*Hab.* Nepal; Darjeeling (*Charlton*).The spotting of this species is rather different from that of *F. marmoratus*; they may be only local varieties.

The separation of the nasals from the maxillaries is uniform in all the six specimens of this skull in the British Museum Collection.

** *Skull elongate; face and brain-case elongate.*

8. VIVERRICEPS.

Head rather elongate. Ears rounded, not pencilled. Eyes nocturnal; pupil erect, linear. Fur spotted. Tail moderate, tapering. Skull elongate; face produced, narrow above, concave on the sides in front of the orbits; orbits rather large, complete behind; nasal bones elongate, very narrow above. Canines conical, moderate.

Asia.

† *Skull elongate; nose long.*

1. VIVERRICEPS BENNETTII. (Fig. 5.)

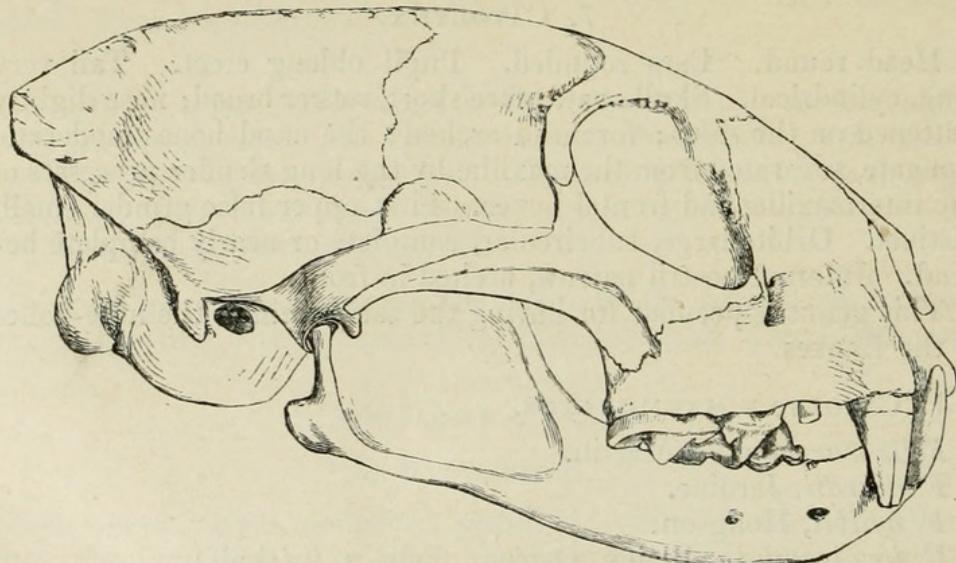
Felis viverrina, Bennett, P. Z. S. 1833, p. 68.*F. viverriceps*, Hodgson.*F. bengalensis*, B. Hamilton.*F. himalayana*, Jardine.

F. celidogaster, Gray, List of Hodgson's Collection, B. M. (not Temm.).

Hab. East Indies.Pupil linear erect.—*Hodgson*.

Skull: length 5 inches 5 lines, width 3 inches 8 lines.

Fig. 5.

*Viverriceps bennettii.*

†† *Skull : nose shorter, concave on sides.*

2. VIVERRICEPS PLANICEPS. (Fig. 6.)

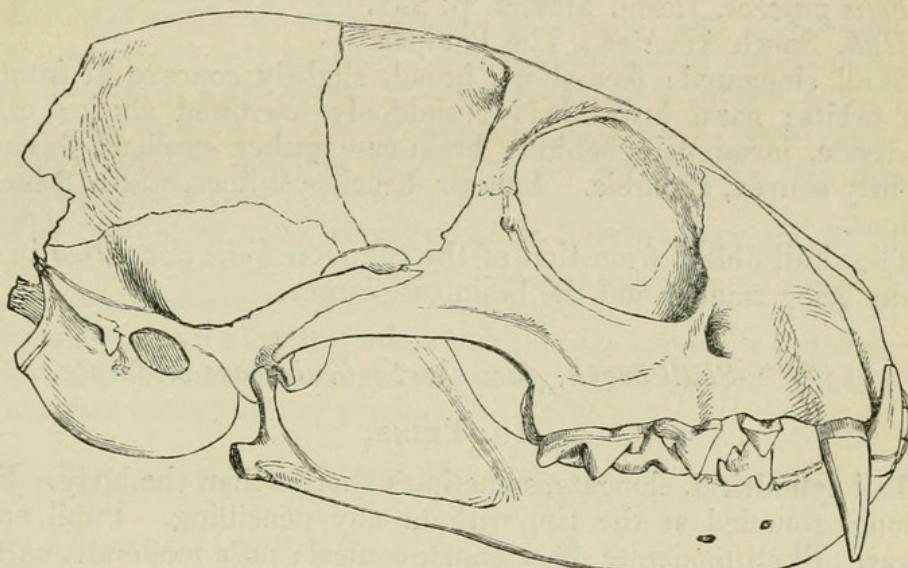
Felis planiceps, Vigors & Horsfield, Zool. Journ. vii. t. 2; Blainv. Ostéogr. Felis, t. 9.

F. diardii, Crawfurd.

Hab. Malacca ; Sumatra ; Borneo.

Skull elongate ; crown flat, rhombic ; face rather produced, broad ; the orbits moderate, complete behind. Length of adult $3\frac{3}{4}$ inches, width 2 inches 5 lines. Very like that of *F. viverrina*.

Fig. 6.



Viverriceps planiceps.

3. VIVERRICEPS ELLIOTI.

Leopardus ellioti, Gray, Ann. & Mag. N. H. x. p. 260.

F. bengalensis, var., Blyth ?

Hab. Madras.

Skull elongate ; crown flat, rhombic ; face concave in front of the orbits ; orbits moderately complete behind.

The skull very like that of *F. rubiginosa*, but larger, 3 inches 10 lines long and 2 inches 7 lines wide.

4. VIVERRICEPS RUBIGINOSA.

Felis rubiginosa, I. Geoffr. Voy. Bélanger, t. .

Hab. India ; Madras.

Skull 2 inches 10 lines long, 2 inches wide at the back of the zygomatic arch ; crown flat, rhombic.

9. PAJEROS.

Head elongate. Ears rounded. Pupil round ?? Skull elongate and swollen behind ; face short, broad ; orbits moderate, incomplete

behind. The front upper false grinder very early deciduous, always wanting in the half-grown skull.

The skull of the *Pajeros* is like that of the Common Cat; but the orbits are small, as in the other diurnal Cats, and the face broader, and the brain-case is rather more produced behind; but it differs from that of the Leopards and Cats in the upper front false grinders being very early deciduous, as in the Lynxes.

In the four skulls in the Museum the holes for these teeth are only to be observed in the skull of a very young animal; in the other three older skulls the holes even are obliterated.

PAJEROS PAMPANUS.

Felis pajeros, Desm. Mamm. p. 231.

Hab. South America; The Pampas.

Skull elongated; face short, broad, slightly concave in front of the orbits; nasal broad below, suddenly narrowed above; orbits moderate, incomplete behind; brain-case rather swollen; forehead slightly convex, rhombic. Length 4 inches 2 lines, width 2 inches 4 lines.

The skull differs from that of the common *Felis domestica* in the orbits being smaller and the brain-case larger.

*** *Skull ovate; face short; brain-case moderate.*

10. FELIS.

Tail cylindrical, elongate, sometimes shorter than the body. Ears oblong, rounded at the tip, without any pencilling. Pupil erect, linear. Skull moderate; face short, conical; nose moderate, narrow above behind, concave in front of the orbits; brain-case oblong, broad; front upper false grinders distinct, small; orbits large, or very large, incomplete.

† *Moderate-sized large-headed Cats, with lines of spots on the sides.* Pardalis.

Face of skull elongate.

Pupil round, oblong, erect in sunlight.—Bartlett.

1. **FELIS PARDALIS**, Linn.; Baird, Mam. N. A. p. 87, t. 72 (skull).

? *F. armillata*, F. Cuvier.

? *F. griffithsii*, H. Smith.

Hab. America, tropical or subtropical.

Skull, adult: length $5\frac{1}{8}$, width $3\frac{1}{2}$ inches.

2. **FELIS GRISEA**.

Leopardus griseus, Gray, Ann. & Mag. N. H. x. p. 260, 1842.

Hab. Guatemala.

Skull, adult: length $5\frac{1}{8}$, width $3\frac{3}{8}$ inches. Nose rather concave on the sides before orbits.

3. *FELIS MELANURA*, Ball, P. Z. S. 1844, p. 128!*Hab.* America.Skull, adult: length $5\frac{1}{2}$, width $3\frac{1}{2}$ inches.

The skulls of these three species are very similar, only differing a little in size; perhaps they are only local varieties of the same species.

4. *FELIS PICTA*.*Leopardus pictus*, Gray, Ann. & Mag. N. H. x. p. 260, 1842.*Hab.* Central America.Skull: length $5\frac{1}{2}$, width $3\frac{1}{2}$ inches.The skull of *F. pardalis* and the typical specimens of *F. grisea* and *F. melanura* are very similar in shape, size, and structure. The nasal bones vary in shape; in some skulls they are short, broad, and gradually attenuated; in others the nasal bones are longer, very broad in front, and then suddenly narrowed at about half their length; but the different skulls vary in this respect, and the two forms gradually pass into each other.The skull of an adult *F. pardalis* is 5 inches long and $3\frac{1}{2}$ inches wide, of the typical *F. grisea* $5\frac{1}{6}$ inches long and $3\frac{1}{4}$ inches wide; the nose rather concave on the sides behind. In the typical *F. melanura* the length of the adult skull is $5\frac{1}{2}$ inches, width 3 inches 7 lines; intermaxillæ elongated; orbits moderate, incomplete behind; face broad, rather produced.†† *Smaller, small-headed, spotted American Cats.* Margay.5. *FELIS MACROURA*, Pr. Max. Abhild. t.*F. wiedii*, Schinz.Var. *Leopardus tigrinoides*, Gray, Cat. Mamm.*Hab.* Brazil.

Skull, adult: 4 inches long, 2 inches 2 lines wide. The nasals narrow, with the outer edges curved inwards.

Length about $3\frac{1}{2}$ (imperfect behind), width $2\frac{1}{2}$ inches.6. *FELIS MITIS (chati)*, F. Cuv. Mamm. Lithogr. t.*F. chati*, Griffith.*Jaguar*, Buffon, H. Nat. ix. t. 18.*F. onca*, Schreb. from Buffon.*Hab.* Paraguay.7. *FELIS TIGRINA*, Schreb. t. 100.*F. margay*, Griffith.*F. guigna*, Molina.*Margay*, Buffon.*Hab.* South America.Skull as in *F. macroura*; the nasals rather wider, and the orbits not quite so large, compared with the size of the skull. Length about $3\frac{1}{2}$ (rather imperfect behind), width $2\frac{1}{2}$ inches.

See also—

8. **FELIS GEOFFROYII**, D'Orb. Voy. Amér. Mérid. t. 13 (skull).
Hab. South America.

9. **FELIS COLOCOLLA**, Molina; F. Cuv. Mamm. Lith. t. .
Hab. South America; Chili (*Molina*); Surinam (*H. Smith*).

††† *Smaller one-coloured American Cats.*

10. **FELIS JAGUARONDI**, Lacép.

F. mexicana, Desm.

F. calomitli, Baird, Mam. N. A. t. 74. f. 2 (skull, adult).
Hab. South America. Skull, B.M.

Pupil round.—*Burmeister*.

Nose much higher and forehead flatter than the skulls in the British Museum.

11. **FELIS EYRA**, Desm.

F. unicolor, Trail, Baird, Mam. N. A. t. 73. f. 2 (skull, young).

Hab. Tropical America. Skull, B.M.

Pupil round.—*Burmeister*.

Pupil linear and vertical.—*Berlandier*.

†††† *Moderate-sized, African, spotted Cats. Skull: face rather produced; cheeks without the cheek-streaks. Serval.*

12. **FELIS SERVAL**, Schreb.

F. capensis, Forst.

F. galeopardus, Desm.

Serval, Buffon.

Chaus servalina, Gerrard, Blainv. Ostéogr. Felis, t. 16.

Hab. South and West Africa.

Length of skull 5 inches, width $3\frac{1}{4}$ inches. Nasals large.

Pupil oblong, erect.—*Bartlett*.

13. **FELIS RUTILA**, Waterhouse, P. Z. S. 1842, p. 130.

Hab. Sierra Leone.

Skull oblong; orbits incomplete behind. Length $4\frac{3}{4}$, width $3\frac{1}{8}$ inches. Very like that of *F. serval*, but smaller.

See also—

14. **FELIS NEGLECTA**, Gray, Ann. & Mag. N. H. 1838, i. p. 27.

F. servalina, Ogilby.

Hab. Gambia.

15. **FELIS CELIDOGASTER**, Temm. Monag. i. p. 140; Esquiss. Zool. p. 87 (not Gray).

F. chalybeata, H. Smith (not good).

Hab. Guinea (*Mus. Leyden*).

16. *FELIS SENEGALENSIS*, Lesson; Guérin, Mag. Zool. Mamm. t. .*Hab.* Senegal.Very like *F. viverrina* from India. Can it be the same?

††††† *Clouded or marbled Old World Cats. Orbita of skull very large.*

17. *FELIS CAFFRA*, Desm.? *F. nigripes*, Burchell; Blainv. Ostéogr. t. 6.*Hab.* South Africa.Skull 4 inches 5 lines long, 3 inches 2 lines wide. Orbita subquadangular, $1\frac{1}{6}$ inch high, incomplete behind.Var. Hybrid with *F. domestica*.18. *FELIS INCONSPICUA*.*Leopardus inconspicuus*, Gray, 1844.*Felis torquata* (*Chat de Nepaul*), F. Cuvier, Mamm. Lithogr. ii. t.? *F. bengalensis*, Desm. from F. Cuvier?*Hab.* India (domesticated, or perhaps a hybrid).

Skull: length 3 inches 2 lines, width 2 inches 1 line.

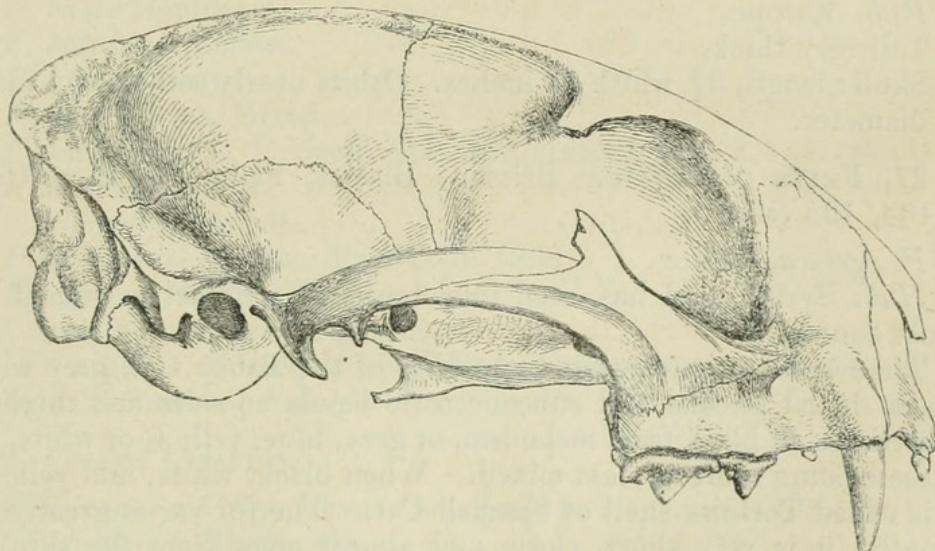
Face moderate, broad, rather concave in front of orbits; orbits large, rather oblong, incomplete behind; forehead slightly convex, rhombic. Like skull of *Chaus libycus*, but smaller, and the forehead not so convex.

††††† *Small-sized spotted Asiatic Cats.*

19. *FELIS MINUTA*, part., Temm.*F. undata*, part., Fischer.*F. sumatrana*, Horsfield, Z. Java, t. .*Hab.* Sumatra.

B.M.

Fig. 7.

*Felis pardochrous.*

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20. **FELIS PARDOCHROA**, Hodgson, P. Z. S. 1856, p. 396. (Fig. 7.)
F. nepalensis, Hodgson, Icon.
Hab. Nepal.
 Pupil linear, erect.—*Hodgson.*
21. **FELIS CHINENSIS**, Gray, Mag. N. H. 1837 !
F. bengalensis, var., Blyth, P. Z. S. 1863, p. 184.
Hab. China.
22. **FELIS JERDONII**, Blyth, P. Z. S. 1863, p. 185 (not described).
Hab. India.
23. **FELIS JAVANENSIS**, Horsfield, Zool. Java, t. ?
F. diardii, Griffith.
F. minuta, var., Temm.
F. undata, var., Fischer.
Hab. Java.
24. **FELIS NEPALENSIS**, Vigors & Horsfield, Zool. Journ. iv. p. 382.
Hab. India.
 Perhaps a hybrid or domesticated.
25. **FELIS MANICULATA**, Rüppell.
F. rüppelli, Schinz.
Hab. Tunis ; Tangiers ; Sennaar ; Cordofan.
 Var. Pale whitish.—*Felis pulchella*, Gray, Mag. N. H. 1837.
 Skull $3\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches wide. Face short, broad ; orbits large, rather oblong, nearly complete behind.
26. **FELIS CATUS**, Linn.
Chat sauvage, Buffon, H. N. vi. t. 1 ; Blasius, W. E. p. 163. f. 102, 103 (skull) ; Blainv. Ostéogr. t. 10 (skull).
Hab. Europe.
 Tail very thick.
 Skull : length $3\frac{3}{4}$, width $2\frac{3}{4}$ inches. Orbit nearly complete, 1 inch in diameter.
27. **FELIS DOMESTICA**, Brisson ; Blasius, Fauna, W. E. p. 167. f. 104, 105 (skull).
F. syriaca, Aldrov.
Hab. Syria ?, and has been introduced as a domestic animal in most countries.
 The normal colour seems to be that of the Tabby Cat, grey with black dorsal streaks and subconcentric bands on sides and thighs ; sometimes all black from melanism, or grey, blue, yellow, or white, or these colours more or less mixed. When black, white, and yellow, it is called Tortoise-shell or Spanish Cat. The fur varies greatly in length ; it is very short, close, and almost erect from the skin in the Rabbit Cats ; it is very long, silky, and fluffy in the Angora (or

Angola) Cat. The tail is usually long. It is very short or almost entirely wanting in the Isle of Man Cats, or the Japan Cats of Kämpfer. The ears are generally erect; but they are sometimes pendulous in the Chinese Cats.

Mr. Hodgson thinks the Domestic Cat (*Felis domestica*) is derived from *F. nepalensis* (Journ. Asiat. Soc. Bengal, i. p. 341). Pennant (Hist. Quad. i. p. 293) says the Indian Wild Cat breeds with the Domestic English one. The Domestic Cats in India breed with *F. chaus* and *F. rubiginosa*, Elliot, with *F. ornata*, Scott, and with *F. viverrina*, Kelaart, in Ceylon. They breed with *F. caffra*, Layard, at the Cape (see Blyth, P. Z. S. 1863, p. 184).

Skull not observed.

28. **FELIS MANUL**, Pallas.

F. nigripectus, Hodgson.

Hab. Tibet.

Pupil linear, erect.—*Hodgson.*

29. **FELIS MEGALOTIS**, Müller.

Hab. Timor. Not seen by me.

11. **CHAUS**.

Tail shorter than the body, reaching to the hocks. Ears pencilled at the tip. Pupil oblong, erect. Skull: orbits very large, incomplete behind; nasal bones narrow, close on the maxilla; front upper false grinder distinct; upper tubercular grinder small, transverse; the lobe on the inner side of the upper flesh-tooth moderate.

Forehead of skull convex; face short.

1. **CHAUS LIBYCUS**.

Felis libyca, Olivier.

F. chaus, Güldenst.

F. catolynx, Pallas.

F. affinis, Gray.

F. dongolensis, Hemp.

F. jacquemontii, I. Geoff. Voy. Jacquemont, t. 3. f. 1, 2 (skull).

F. katas, Pearson.

F. rüppellii, Brandt.

F. marginata, Loche, Rev. Zool. 1858.

Lyncus erythrotis, Hodgson.

Chaus jacquemontii, Gerrard.

? *F. caligata*, Bruce; I. Geoff. Voy. Jacquemont, t. 3. f. 2 (skull).

Hab. Africa and Asia.

2. **CHAUS ORNATUS**.

Felis ornata, Gray, Illust. Ind. Zool. t. .

? *F. huttonii*, Blyth, MS.

Hab. India (*Capt. Boys*).

B.M.

Legs long and slender. Skull, adult, imperfect behind. Animal very different from *Felis torquata*, F. Cuvier. The skull sent from the Salt-range by Mr. Oldham and marked *F. huttonii*, Blyth. Length 3 inches 10 lines, width 2 inches 7 lines. Orbita moderate, incomplete behind, 1 inch in diameter; crown convex, shelving on the sides; face rather short, broad; nasal very long, slender.

The orbita are much larger than in a skull of *F. himalayana*, of a larger size.

Tribe II. Lynxes—LYNCINA.

Head short, subglobular. Legs elongate, the hinder ones longest. Tail short, or very short. Ears pencilled at the tip. Pupils of eyes oblong. The face of the skull short; the lateral processes of the intermaxillæ and the frontal bones elongate, nearly reaching each other, and separating the nasals from the maxillæ. The orbita incomplete, large; the lobes on the inner side of the upper flesh-tooth moderate-sized.

12. LYNCUS.

Tail very short. Limbs elongate.

* *Pads of feet overgrown with hair. Animal large.* Lynx.

1. LYNCUS BOREALIS.

Felis lynx, Blainv. Ostéog. Felis, t. 3 (skull); Blasius, Faun. W. E. p. 173. f. 106 (skull).

Hab. Northern Europe and Asia.

2. LYNCUS LUPULINUS.

Felis lupulina, Thunb.

Hab. Northern Europe; Sweden.

3. LYNCUS CANADENSIS.

Felis canadensis, Geoffr.

Hab. North America.

** *Soles of feet nakedish. Animal small.* Cervaria.

4. LYNCUS PARDINUS.

Felis pardina, Temm.

Hab. Southern Europe and Turkey.

5. LYNCUS ISABELLINUS.

Felis isabellina, Blyth.

F. lynx, Hodgson.

Hab. Tibet.

Pupil linear, erect.—*Hodgson.*

6. LYNCUS FASCIATUS.

Felis fasciata, Harlan.

Hab. North America, western part.

7. LYNCUS RUFUS.

Felis rufa, Güldenst. Voy. de la Venus, t. 9. f. 2-4 (skull).
Hab. North America.

8. LYNCUS MACULATUS.

Felis maculata, Vigors & Horsfield; Baird, Mam. N. A. t. 75
 (skull of adult and young).
Hab. North America: Mexico; California.

13. CARACAL.

Tail cylindrical, reaching to the hocks. Limbs more equal. Pads of feet bald. Pupil oblong. The skull is that of the Lynx; but the processes of the frontals and intermaxillæ are not quite so much produced, and they do not entirely separate the nasals from the maxillæ. The front upper false grinder is absent. The orbits are rather large, and incomplete behind. The lobe on the inner side of the upper flesh-tooth small.

CARACAL MELANOTIS.

Felis caracal, Schreb.; Blainv. Ostéogr. Felis, t. 10; Van der Hoeven, Zool. t. 19. f. 2 (skull).

Hab. Southern Asia and Africa; Persia and Arabia.

Section 2. Abnormal or Dog-like Cats.—*The flesh-tooth of the upper jaw compressed, without any lobe, and only with a very slightly marked keel on the front part of the inner side. The legs elongate, slender.*

Tribe III. Hunting-Leopards—GUEPARDINA.

Head short, subglobular; face very short. Neck slightly maned. Legs elongate, slender, subequal. Tail elongate. Ears rounded. Pupil round? Skull: face very short, convex; the processes of the frontals and intermaxillæ very short, not separating the nasals from the maxillæ; the flesh-tooth of the upper jaw compressed, without any lobe, but with only a very slightly marked keel on the front part of the inner side; the front upper false grinder distinct, small; orbits incomplete, moderate.

14. GUEPARDA, Gray.

Cynælurus, Wagner.

GUEPARDA GUTTATA.

Felis guttata, Herm.; Blainv. Ostéogr. Felis, t. 4 (skeleton), t. 9
 (skull).

F. jubata, Schreb.

F. venatica, A. Smith.

F. fearonis, A. Smith.

Cynælurus sœmmeringii, Rüppell.

Hab. Africa and Asia: Persia.

4. List of Birds collected on the Blewfields River, Mosquito Coast, by Mr. Henry Wickham. By P. L. SCLATER, F.R.S., and OSBERT SALVIN, M.A., F.Z.S.

Mr. Henry Wickham, who has lately left England to collect objects of natural history in the little explored territory of Mosquitia, has kindly requested his correspondents in this country to submit his bird-skins to our determination. We have had great pleasure in undertaking this task, the more so as we have as yet seen no collections from this part of Central America.

The nearest point of the ornithology of which we have as yet any published account is the vicinity of Greytown, Nicaragua, where Mr. H. E. Holland obtained the small series described by Mr. Lawrence in the 'Annals of the Lyceum of New York' in 1865*.

Mr. Wickham's present collection embraces thirty-nine species. We have thought it advisable to give a complete list of these (although the greater part are well-known Central American species, and none are new to science) in order to furnish further data for limiting the geographical range of the species. The district is one of considerable interest, as it is somewhere here that the remarkable change must take place for the fauna of Guatemala to pass into that of Costa Rica. We must await further additions before we draw any conclusions from Mr. Wickham's series; but we may point out as of interest the occurrence in it of several southern forms, such as *Cotyle uropygialis*, *Dendroornis lacrymosa*, *Copurus leuconotus*, *Myiozetetes granadensis*, *Myiarchus nigricapillus*, *Prionorhynchus platyrhynchos*, and *Porzana albicularis*, not hitherto recorded so far north.

Mr. Wickham's present collection contains the following species, all collected during his voyage up the Blewfields River:—

Fam. TURDIDÆ.

- + 1. *GALEOSCOPTES CAROLINENSIS* (Linn.).

Fam. HIRUNDINIDÆ.

- 2. *COTYLE UROPYGIALIS*, Lawrence.

Agreeing with specimens from Panama and Ecuador.

Fam. TANAGRIDÆ.

3. *PYRANGA ÆSTIVA* (Gm.).

4. *RAMPHOCŒLUS PASSERINII*, Bp.

5. *RAMPHOCŒLUS SANGUINOLOENTUS* (Less.).

Fam. FRINGILLIDÆ.

6. *SPERMOPHILA CORVINA*, ScL.

* Ann. Lyc. N. H. N. Y. viii. p. 179.

Fam. ICTERIDÆ.

7. OSTINOPS MONTEZUMÆ (Less.).
8. ICTERUS BALTIMORENSIS (L.).
9. ICTERUS PROSTHEMELAS (Strickl.).
10. ICTERUS MESOMELAS (Wagl.).
11. CASSIDIX ORYZIVORA (Gm.).

Fam. DENDROCOLAPTIIDÆ.

- + 12. DENDRORNIS LACRYMOSA, Lawr.; Sclater & Salv. P. Z. S. 1864, p. 355.

Fam. TYRANNIDÆ.

- 13. COPURUS LEUCONOTUS, Lafr.

- 14. MYIOZETETES GRANADENSIS, Lawrence, Ibis, 1862. p. 11.

The *Myiozetetæ*, allied to *M. cayennensis*, may be divided as follows:—

- a. Species with a clearly defined white superciliary stripe.
 - a'. Species with the primaries externally narrowly bordered with rufous, and with the basal half of the inner webs of both primaries and secondaries broadly margined with pale rufous. 1. *M. guianensis*.
 - b'. Species without rufous edgings to primaries, embracing four local forms, which require further examination. 2. *M. texensis*. +
3. *M. columbianus*.
4. *M. cayennensis*. +
5. *M. similis*.
- b. Species without white superciliary stripe 6. *M. granadensis*.

The synonymy of these *Myiozetetæ* is correctly given in Sclater's 'American Catalogue' (p. 219). Mr. Wickham's skins of *M. granadensis* agree with examples from Panama in Sclater's collection.

- + 15. MYIARCHUS NIGRICAPILLUS, Cab.

- + 16. TYRANNUS SATRAPA (Cab. et Heine).

Fam. COTINGIDÆ.

- + 17. LIP AUGUS UNIRUFUS, Scl. & Salv.

- 18. LIP AUGUS HOLERYTHRUS, Scl. & Salv.

Fam. MOMOTIDÆ.

- + 19. PRIONORHYNCHUS PLATYRHYNCHUS, Leadb.

Fam. ALCEDINIDÆ.

- + 20. CERYLE AMAZONIA (Lath.).

21. CERYLE CABANISI, Tsch.

+ 22. CERYLE TORQUATA (L.).

Fam. CUCULIDÆ.

23. CROTOPHAGA SULCIROSTRIS, Sw.

24. PIAYA MEHLERI (Bp.).

Fam. RAMPHASTIDÆ.

+ 25. RAMPHASTOS PISCIVORUS, L.

Fam. PICIDÆ.

+ 26. CENTURUS PUCHERANI (Malh.).

Fam. PSITTACIDÆ.

+ 27. CONURUS ASTEC, Souancé.

Fam. ACCIPITRES.

+ 28. URUBITINGA ZONURA, Shaw.

+ 29. URUBITINGA ANTHRACINA, Nitzsch.

+ 30. ACCIPITER FUSCUS.

Fam. STRIGIDÆ.

+ 31. SYRNIUM PERSPICILLATUM, Lath.

Fam. COLUMBIDÆ.

+ 32. COLUMBA NIGRIROSTRIS, Scl.

Fam. ARDEIDÆ.

33. ARDEA VIRESSENS, L.

34. ARDEA CANDIDISSIMA, Gm.

35. ARDEA CÆRULEA, L.

+ 36. TIGRISOMA CABANISI, Heine, J. f. O. 1859, p. 407.

Fam. SCOLOPACIDÆ.

37. GALLINAGO WILSONI, Temm.

Fam. RALLIDÆ.

+ 38. ARAMIDES CAYENNENSIS (Gm.).

+ 39. PORZANA ALBIGULARIS, Lawr.

5. On the Fishes of the Neilgherry Hills and Rivers around their Bases. By Surgeon FRANCIS DAY, F.Z.S., F.L.S.

During the period Sir William Denison, K.C.B., F.Z.S., was Governor of Madras, the absence from the waters of the Neilgherry Hills of all but an insignificant species of fish, *Paradanio neilgherriensis*, sp. nov., attracted attention. It was universally considered desirable that fish should be introduced into the Ootacamund Lake, which is $1\frac{1}{2}$ mile in length and 7600 feet above the level of the sea, as well as into the Pykara River, which is only about 1500 feet lower down. The presence of the finny tribes, it was surmised, would be very acceptable in this magnificent sanitarium, both as affording sport for anglers and food for convalescents and the general public.

To carry out this design, I was instructed early in 1866 to convey Trout-ova in ice overland from England to Madras. This experiment having failed from various causes, more especially the high temperature of the water on the hills, some substitute appeared necessary; and as on examination I found the fauna to be almost entirely tropical, I suggested and obtained leave to remain four months longer for the purpose of attempting the introduction of fishes from the plains. Unfortunately about one month before the allotted time had expired, when the best mode of carriage had been discovered, after the species unadapted for transit had been ascertained, and others successfully introduced, my services were required for temporary regimental duty at Kurnool, and there was no one available to complete the experiment.

It appears advisable to record what has been accomplished, or at some future date naturalists visiting these hills may be at a loss to explain the presence of Eels, *Ophiocephalidæ*, and other fishes of the plains at the summit of such an elevated plateau, and erroneous deductions as to their geographical distribution might be the consequence.

An account of this experiment, or the obstacles which had to be surmounted, upon endeavours at first unsuccessful but finally overcome, would be too long for recording here. So I will merely observe that most of the Siluroids died of cold whilst being carried up the ghawts, as the water in the earthern chatties in which they were being conveyed became cooled by evaporation or the direct action of the cold cutting winds which at night time sweep those mountainous roads; the *Cyprinidæ* and *Ophiocephalidæ* when large knocked themselves about so much during their transit that they either perished whilst "en route," or a few days after reaching their destination; that finally a stock-pond had to be instituted halfway, where the fish could rest before being carried into Ootacamund, whilst only the young of the various species were taken, and that several varieties appear to have been successfully introduced. It is to be regretted that the experiment was not completed, to do which two dozen more of each of the four following species ought to

be placed in the Ootacamund Lake and the Pykara River :—the *Ophiocephalus marulius*, *O. striatus*, *Labeobarbus tor*, and *Puntius carnaticus*, all of which breed in the Bowany River, at the foot of the Neilgherries, on the Coimbatore side. The period to obtain the young fish is during the months of September and October.

Whilst employed as stated I took the opportunity of investigating and collecting all the indigenous varieties on the plateau, slopes, and rivers flowing around the bases of these hills, except upon their western side. During the course of my researches I obtained thirty-six species, many of which appear to be new.

The almost complete absence of Acanthopterygians was very remarkable ; for, with the exception of the Eel-like *Mastacembelidae* and the *Ophiocephalidae*, whose title to rank as such might almost be open to dispute, none were captured ; even the *Gobiidae*, so universally distributed throughout India, seemed to be absent. On the other hand, some species hitherto only recorded from Northern Bengal and the Deccan obtained a place in my collection.

The fishes mentioned in this paper may be divided into :—those of the upper plateau of the hills, from 5000 to 7000 feet elevation, where only one species, *Paradanio neilgherriensis*, sp. nov., exists ; secondly, those on the lower slopes, from 2000 to 4000 feet above the level of the sea. From the rapids on the slopes of the Neilgherries one small Roach (*Nemacheilus guentheri*, sp. nov.), a little Carp (*Puntius grayi*, sp. nov.), and what is commonly and erroneously called “a Trout” (*Barilius rugosus*, sp. nov.), were taken. Besides these species in the Seegoor River, which is not rapid, but nearly 3000 feet above the sea, and takes a long winding course into the rivers of the plains, the *Ophiocephalus gachua*, Buch. Ham., the *Nemacheilus semiarmatus*, sp. nov., the *Garra gotyla*, Gray, the *G. jerdoni*, sp. nov., the *Puntius carnaticus*, Jerdon, and the *Paradanio aurolineatus*, Day, were found to be indigenous. The Bowany River, flowing along the base of the hills at an elevation of only 1000 feet above the sea, contained most of the foregoing species, as well as twenty-seven others. For stocking the waters of the hills those fish which were found to inhabit the highest levels were preferred.

The following is a list of the species obtained, and specimens of which I still possess :—

OPHIOCEPHALUS MARULIUS, Buch. Ham.

Poo verarl (Tam.). The flower of the Verarls.

B. v. D. 51. P. 16. V. 1/6. A. 35. C. 13. L. 1. 60.
L. tr. $\frac{6-7}{13-14}$.

The coloration of this species, when captured in the Bowany, agreed with Colonel Sykes’s ‘Fishes of the Dukhun,’ pl. 60. f. 3. The young were greenish, with about five stripes passing backwards on the sides, and a yellowish ocellus on the posterior part of the dorsal fin. A few of these were placed in the Ootacamund Lake.

OPHIOCEPHALUS STRIATUS, Bloch.

Curroopoo verarl (Tam.). The Black Verarl.

B.v. D. 42. P. 16. V. 6. A. 24. C. 13. L. 1. 56. L. tr. $\frac{5-6}{10-8}$.

Both this and the last species commenced breeding in June, when the south-west monsoon began. Large specimens are difficult to convey long distances alive, because they knock themselves about, and cause such injuries that, if they reach their destination, they generally die in a few days. Some young ones were placed in the Ootacamund Lake.

OPHIOCEPHALUS GACHUA, Buch. Ham.

Korava (Tam.).

B. v. D. 32. P. 15. V. 6. A. 16. C. 9. L. 1. 41. L. tr. $\frac{4}{7}$.

This fish is exceedingly common in the Bowany, where it is frequently captured up to one foot in length.

The very young has generally a light edging to its dorsal fin, but no red colour is apparent except in the pectoral; an ocellus is invariably present in the posterior portion of the dorsal fin. The adult has its dorsal, caudal, and pectoral fins margined with bright orange, most developed in the males.

At first difficulty was experienced in conveying these fish alive up the ghawts; but finally it was found that when one-fourth (or a little less) of the chatty was first filled with mud and then water added the difficulty vanished.

The following incidents will show how exceedingly tenacious of life these fish are:—At Culhutty, on July 19th, 1866, a Cooly accidentally turned one out of a tin can of water; this took place at 6 P.M., when the temperature of the air was 69°; the occurrence remained undiscovered until 8.45 P.M., or nearly three hours subsequently, when the fish was found on the gravel-path outside the house. It was quite well, had suffered no injury, and some days later was placed in the Ootacamund Lake. A few days subsequently a still more interesting circumstance occurred with one of these fish:—On July 27th, 1866, I was riding from Mettapoliam to Wellington, and on passing the Kullaar Bridge at 4.45 P.M. obtained a young one of this species. Having nothing else in which to place him, I moistened my pocket-handkerchief, within which I rolled him up, being careful to leave the head exposed. An hour subsequently I took him out of my coat-pocket and put him into a small stream of water by the side of the road; he gave three gasps, was then as well as ever, and was again consigned to the pocket. At 6.45 P.M. the dipping was repeated, and at 8.45 P.M., on my arrival at Wellington, he was quite well. The succeeding morning he was put into the Coonoor stock-pond, and on August 2nd removed, along with fourteen others, into the Ootacamund Lake. The vitality must be great in a fish which, as in this instance, bore an ascent of nearly 5000 feet, carried in a wet pocket-handkerchief

only moistened twice by the way, especially as the time consumed was four hours.

Nearly one hundred of this species were placed in the Ootacamund Lake, and eighteen in the Pykara River.

MASTACEMBELUS ARMATUS, Lacép.

Allaree (Tam.).

B. vi. D. 37 | 74. P. 23. A. 3 | 79. C. 15.

Not uncommon, but does not bear transporting well.

Numbers of young of this species were captured in the Bowany during July and August.

WALLAGO ATTU, Bloch.

Wahlah (Tam.).

B. xix. D. 1/4. P. $\frac{1}{14}$. V. 9. A. 92. C. 17.

This fish is very common in the Bowany, where it attains a large size, but does not extend its limits so high as Seegoor. In conveying this species up the ghawts they generally died : some few reached Coonoor alive ; but all succumbed after they had been there a few days.

WALLAGO MALABARICUS, Cuv. & Val.

Chota wahlah (Tam.). The small Wahlah.

B. xv. D. 4. P. $\frac{1}{13}$. V. 9. A. 73. C. 17. Vert. $\frac{11}{39}$.

Length of specimens up to 9 inches.

This species is numerous in the same localities as the last. Both deposit their ova during the south-west monsoon, and by the end of July young fish are common.

HEMIBAGRUS PUNCTATUS, Jerdon.

Psetta kultetee (Tam.).

B. xi. D. $\frac{1}{7}$ | 0. P. 1/7. V. 6. A. 11. C. 17.

Length of specimens up to 11 inches.

Length of head $\frac{2}{9}$, of pectoral $\frac{1}{6}$, of caudal $\frac{2}{9}$, of base of first dorsal $\frac{1}{9}$, of base of adipose dorsal $\frac{1}{10}$, of base of anal $\frac{1}{10}$ of the total length. Height of head $\frac{1}{11}$, of body $\frac{1}{9}$, of first dorsal $\frac{2}{11}$, of anal $\frac{1}{11}$ of the total length.

Eyes transversely oval ; horizontal diameter $\frac{1}{6}$, vertical diameter $\frac{1}{8}$ of the length of the head ; two horizontal diameters apart, $1\frac{1}{2}$ from end of snout.

Gape of mouth wide, being equal transversely to nearly half the length of the head. Jaws of equal length. Summit of head depressed, both it, the opercles, and shoulder-bones being furrowed. Occipital process very narrow, and only extending about one-third of the distance to the basal bone of the first dorsal, which is narrow. A flat lance-shaped groove on the summit of the head, between the

orbita, reaching anteriorly nearly as far as the intermaxillaries, and posteriorly almost to the base of the occipital process. Nasal cirri reach to opposite the posterior margin of the orbit; the maxillary to slightly behind the origin of the ventral fin; the external mandibular pair reach the base of the pectoral fin, whilst the internal are one-third shorter.

Teeth villiform, and in numerous rows in both intermaxillaries and lower jaw; on the vomer and palate they are of the same description, and arranged in an uninterrupted and slightly crescentic band.

Fins. The first dorsal arises opposite to the posterior third of the pectoral, the ventral below the posterior extremity of the first dorsal. The anal commences rather nearer to the origin of the ventral than to the base of the caudal. The adipose dorsal begins opposite the middle of the anal. Dorsal spine weak, with about eight very slight serrations posteriorly in its upper third and terminating in a soft prolongation; its rays longer than the spine. The pectoral spine longer and stronger than the dorsal, flattened, rugose externally, with about eighteen strong serrations internally. Adipose dorsal thin and rounded. Anal slightly rounded. Caudal deeply lunate, the upper lobe the longest.

Lateral line passes from the upper portion of the opercle direct to the centre of the caudal.

Colours. Summit of head and back of a dark greyish olive, becoming yellowish from a little below the lateral line; abdomen nearly white; about ten rather small and rounded black spots along the lateral line; both dorsals dusky, with darker margins; caudal olive; ventral and anal yellowish white; pectoral yellowish, tipped with olive; eyes olive, with a yellowish margin.

Not uncommon in the Bowany, where they are captured up to 18 inches in length, and are considered good eating.

HYPSELOBAGRUS CAVASII, Buch. Ham.

Vella kullee, Tam. The White Bagrus.

B. vi. D. $\frac{1}{7}$ 0. P. 1/6. V. 6. A. 11. C. 16.

Grows to 18 inches in length.

GLYPTOSTERNUM LONAH, Sykes.

Kul kullee, Tam. Stone Kullee.

B. viii. D. 1/6. P. 1/10. V. 7. A. 3/8. C. 15.

Length of specimens to 4 inches.

Not uncommon in the Bowany, where it gets under stones in the fords.

NEMACHEILUS GUENTHERI, nov. sp.

B. iii. D. $\frac{2}{7}$. P. 11. V. 8. A. $\frac{2}{5}$. C. 19.

Length of specimens up to 4 inches.

Length of head $\frac{2}{11}$, of pectoral $\frac{2}{11}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{6}$, of caudal $\frac{2}{13}$ of the total length. Height of head $\frac{1}{9}$, of body $\frac{1}{7}$, of dorsal $\frac{1}{7}$, of anal $\frac{1}{7}$ of the total length.

Eyes not covered by skin; diameter $\frac{2}{7}$ of length of head; 1 diameter apart, $1\frac{1}{2}$ from end of snout.

Body elongated, anteriorly fusiform, in the posterior portion laterally compressed; abdominal profile nearly straight.

Mouth rather below, lower jaw shortest; the cleft of the mouth extending halfway to below the anterior end of the orbit. Lips fleshy. Two pairs of cirri on snout, not united at their bases. One pair of fleshy maxillary cirri. All these cirri short, not reaching so far as the orbit. Nostrils midway between the snout and the orbit, the anterior tubular.

Fins. Dorsal arises slightly anteriorly to the origin of the ventrals, and is situated about the centre of the entire length of the fish. Anal commences midway between the middle of the pectoral and the end of the caudal. Dorsal nearly square. Anal slightly pointed. Caudal with sharp lobes.

Scales over the whole of the body, none on the head.

Lateral line becomes indistinct in the last portion of the body.

Colours. Generally of a deep olive-brown, with three rows of round, oval, or irregularly shaped flesh-coloured spots running along the whole of the body of the fish, the superior row (along the back) and inferior (along the abdomen) being much larger than the middle series; a black bar at the base of the caudal fin; all the fins reddish, stained with orange in their external halves; two rows of fine black dots along the dorsal fin, and one across the anal; two indistinct blackish bands across either lobe of the caudal, which has also a slightly black edge.

This very pretty little Loach I have named after Dr. A. Günther.

NEMACHEILUS SEMIARMATUS, nov. sp.

B. iii. D. $\frac{3}{6}$. P. 12. V. 7. A. $\frac{2}{5}$. C. 18.

Length of specimens up to 4 inches.

Length of head $\frac{2}{11}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{6}$, of pectoral $\frac{2}{11}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{1}{8}$, of body $\frac{2}{11}$, of dorsal fin $\frac{1}{7}$, of anal $\frac{1}{7}$ of the total length.

Eyes. Diameter $\frac{1}{4}$ of length of head, $1\frac{1}{2}$ diameter from end of snout, 1 diameter apart.

Body elongated, fusiform anteriorly, compressed laterally, posterior to the ventral fin. Profile from snout to origin of dorsal fin convex; abdominal profile almost straight.

Lower jaw shortest; lips fleshy; opening of mouth rather inferior, and extending one-third of the distance to the anterior margin of the orbit. Two pairs of cirri on snout; the external extend as far as the orbit, whilst the internal pair are only half that length. The maxillary pair of cirri extend as far as the posterior third of the orbit. Nostrils one-third of the distance from anterior extremity of orbit to the snout; the anterior tubular. A cartilaginous and rudimentary

spine exists opposite the anterior inferior extremity of the orbit ; it is present in both males and females.

Fins. Not scaled at their bases. The dorsal arises slightly anterior to the origin of the ventral, the anterior extremity of its base being nearly the same distance from the snout as its posterior extremity is from the posterior extremity of the caudal fin. Pectoral rather large and pointed. Ventrals subhorizontal, reaching as far as the anus, which is a short distance anterior to the origin of the anal fin ; this last is short. Caudal lobed in its last half.

Scales apparent over the whole of the body, but not very distinct ; none on the head.

Lateral line passes direct from opposite the eye to the centre of the caudal fin.

Colours. Light brown, with numerous irregular-shaped spots and bars proceeding from the back towards the lateral line ; head brownish, with a dark line from the snout through the orbit ; dorsal fin with about three rows of dark spots ; caudal irregularly barred ; a dark line runs down the centre of the back.

Hab. Bowany and Seegoor Rivers, as well as the Billicul Lake. A few were placed in the ponds in the Government Gardens at Ootacamund.

NEMACHEILUS DENISONI, nov. sp.

B. iii. D. 2/7. P. 11. V. 8. A. 2/4. C. 19.

Length of head $\frac{2}{9}$, of pectoral $\frac{2}{9}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{2}{13}$, of body $\frac{2}{13}$ of the total length.

Back broader and more flattened than in the last two species. The two pairs of cirri on the snout, as well as the maxillary pair, are all short.

Dorsal fin commences slightly in advance of the ventral, and is situated in the centre of the total length.

Colours. Of a rich light reddish-brown colour, having twelve yellowish-olive bars passing across the back, and continued vertically down either side of the body to the abdomen ; before the dorsal fin they irregularly coalesce across the back ; summit of head dotted and marbled with black points ; dorsal fin with three rows of fine black dots ; caudal irregularly dotted in bands ; some dull spots on anal and ventral fins ; pectoral with a darkish external edge.

Hab. Bowany River.

I have named this species after Sir William Denison, K.C.B., under whose auspices the Indian fish-experiment was commenced ; and during whose governorship, had he continued in Madras, it would most assuredly have been successfully completed.

Whilst engaged upon this experiment I communicated with Mr. Assistant Apothecary Everard, stationed at Trichoor, my wish to obtain some more specimens of my *Platacanthus agrensis* (P. Z. S. 1865, p. 296), and he was good enough to forward me twelve. Being taken during the breeding-season, their colours were much more vivid than in the specimen which I described. I found two distinct sorts, the markings of both being identical ; but in the one the pectoral

spine was present, in the other it was absent. In dissecting seven of these, four males and three females, the spine was present in the former, absent in the latter. I am the more disposed to consider this a sexual peculiarity, from having obtained a second Loach, in which the same sexual difference exists. In this latter species, which I shall describe at a future date, out of about forty specimens, I only found the adult males thus armed.

In these fresh specimens of the *Platacanthus agrensis* all have about fifteen marks or blotches along the lateral line, with rows of irregular longitudinal pencillings above it, and a superior row of blotches crossing the back. Caudal more emarginate than lobed, with three or four bars upon it, and a jet-black spot at its base having a light ring around it. A number of small black spots on the side beneath the pectoral fin.

GARRA GOTYLA (Gray).

B. iii. D. 2/8. P. 1/3. V. 9. A. 2/5. C. 20. L. l. 33-34.
L. tr. 4/3.

Length of specimens from 2 to $5\frac{4}{10}$ inches.

At least twenty or thirty were captured at each haul of a small drag-net, in a stream at the foot of the Neilgherries. On July 20th one large female was found full of ova; but this was not the rule, the breeding-season being apparently completed. There were many young ones, and the transverse fissure was apparent across the snout, even in the smallest specimens.

Hab. Common in the Bowany and most of the streams around the base of the hills, but rarer in the Seegoor River.

GARRA JERDONI, sp. nov.

B. iii. D. 2/8. P. 15. V. 10. A. 2/5. C. 20. L. l. 36.
L. tr. 5/4. Vert. $\frac{16}{15}$.

Length of specimens from 2 to $4\frac{5}{10}$ inches.

Length of head $\frac{2}{13}$, of pectoral $\frac{2}{13}$, of base of dorsal $\frac{1}{9}$, of base of anal $\frac{1}{5}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{1}{9}$, of body $\frac{2}{9}$, of dorsal $\frac{2}{11}$, of anal $\frac{1}{8}$ of the total length.

Eyes nearer to the posterior than they are to the anterior extremity of the head; diameter $\frac{1}{4}$ of length of head, 2 diameters from end of snout, $2\frac{1}{2}$ diameters apart.

The profile ascends in an almost regular curve from above the snout, which is thick and prominent, to the anterior extremity of the dorsal fin, whence it sinks to the base of the caudal. The abdominal profile is not so convex as that of the back. Sides moderately compressed.

Mouth below. Snout broad, becoming rather pointed anteriorly (not rounded as in the *Garra malabarica*, P. Z. S. 1865, p. 297), and covered with mucus-pores, which remain persistent in the adult. The gape of the mouth equals the length of the base of the anal fin. The two lips are united and moderately thick. Behind the lower lip is a round suctorial disk, the diameter of which is one-

half more than that of the orbit. One short pair of cirri exist on the snout; a second pair at the angles of the maxillæ. Nostrils close to the anterior superior angle of the orbit, the posterior round and patent, the anterior tubular. Interorbital space rather convex from side to side; no furrow exists between it and the snout.

Teeth. Pharyngeal teeth small, curved, sharp, in three rows, 5, 4, 2/2, 4, 5.

Fins. The anterior extremity of the dorsal is the same distance from the snout as its posterior extremity is from the base of the caudal; it is slightly in advance of the ventrals, and higher anteriorly than it is posteriorly. Anal in the posterior fourth of the body. Caudal lobed, with a broad and scaly base.

Lateral line nearly straight, from the centre of the orbit to the centre of the caudal fin.

Colours. Olive-green, gradually fading into dirty olive on the abdomen; a black spot sometimes exists on the scale behind the upper piece of the opercle.

This and the last species rapidly die when removed from streams; however, some were placed alive in the Ootacamund Lake. This species is said to grow to 10 inches in length, and is much esteemed for eating.

Hab. Very common in the Seegoor River; rare in the Bowany.

LABEO KONTIUS (Jerdon).

Currumunnee candee, Tam.

B. iii. D. $\frac{4}{12}$. P. 15. V. 10. A. 3/5. L. l. 38. L. tr. 9/5.

Length of specimen $21\frac{1}{2}$ inches.

Length of head $\frac{1}{7}$, of pectoral a little above $\frac{1}{7}$, of base of dorsal rather above $\frac{2}{11}$, of base of anal $\frac{1}{15}$, of caudal nearly $\frac{2}{9}$ of the total length. Height of head $\frac{2}{17}$, of body $\frac{1}{4}$, of dorsal above $\frac{1}{5}$, of anal $\frac{1}{6}$ of the total length.

Eyes nearly circular; diameter nearly $\frac{1}{5}$ of length of head, 3 diameters apart, $2\frac{1}{2}$ diameters from end of snout.

Profile rather more convex along the abdominal than the dorsal aspect; in the latter it rises considerably to the commencement of the dorsal fin, beyond which it sinks.

Gape of mouth wide, arched, almost triangular, with the apex above. Muzzle blunt and truncated. Cleft of mouth short, not extending quite half the distance to the anterior margin of the orbit. Lower jaw shortest, almost angular. Lips fleshy, continued from the upper to the lower jaws, and covered with mucus-pores. Snout tuberculated, and a fleshy prolongation from it is extended laterally. Upper surface of head smooth. Opercle high and narrow, its width not being quite equal to half its height. Nostrils slightly in advance of anterior superior angle of the orbit. Cheeks fleshy. No cirri were observed in this specimen, neither did Dr. Jerdon perceive any in his; but probably they were present, but minute. The specimen being now stuffed, they cannot be detected.

Fins. Dorsal commences over the ventrals, and nearer to the snout

than it does to the base of the caudal. Anal begins midway between the base of the pectoral and the posterior extremity of the caudal. Dorsal fin highest anteriorly, the last ray divided at its base and prolonged; upper margin of fin concave; the first two undivided rays minute, the second scarcely more than one-third of the length of the third ray, which last is weak. Anal longest anteriorly; first undivided ray very minute, second one-third the length of the third, all very weak. Caudal deeply lunate, lobes extended and pointed.

Scales moderate in size.

Lateral line in single tubes, passing nearly directly from opposite the centre of the orbit to the centre of the caudal fin.

Teeth. Pharyngeal teeth small, placed close together, plough-shaped, and hardly pointed, 5, 4, 2/2, 4, 5.

Colours. Greenish brown along the back, fading to dirty silvery white on the abdomen; fins reddish, the posterior and external margins of each stained darker; a golden gloss over the opercles; eyes golden.

This species is said to grow to a large size.

Hab. Bowany River, from which I only obtained this one specimen.

LABEO (?BANGANA) DUSSUMIERI, Cuv. & Val.

B. iii. D. 3/8. P. 15. V. 9. A. 3/5. L. 1. 36. L. tr. 7/4.
Length of specimens up to 7 inches.

Pharyngeal teeth as in the last species, 5, 4, 1/1, 4, 5.

I have placed this, according to Dr. Bleeker's identification, as a *Labeo*, but, whilst doing so, cannot avoid stating that it seems questionable whether Buchanan Hamilton's genus *Bangana*, which has no lateral lobes to the snout, can be identified with the genus *Labeo*. Both are extensively diffused in India. Some of this species were placed in the Ootacamund Lake.

LABEOBARBUS TOR, Buch. Ham.

Poomeen candee, Tam.

B. iii. D. 3/9. P. 18. V. 9. A. 2/5. C. 18. L. 1. 23-27.
L. tr. 4/2.

Length of specimens from 3 to 7 inches.

Pharyngeal teeth 5, 3, 2/2, 3, 5, crooked and pointed.

This species, which is said to grow to a large size in the higher regions of Bengal, is moderately common in the Bowany, where young ones are easily obtained in August and September. I had intended introducing it into the waters of the hills, to which it would seem well adapted.

PUNTIUS (BARBODES) GRACILIS, Jerdon.

Coatee candee, Tamil.

B. iii. D. 4/9. P. 17. V. 9. A. 2-3/5. C. 19. L. 1. 40.
L. tr. 7/4.

Length of head $\frac{1}{3}$, of pectoral $\frac{1}{6}$, of caudal $\frac{1}{5}$, of base of dorsal $\frac{1}{7}$,

of base of anal $\frac{1}{13}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{2}{7}$, of dorsal fin nearly $\frac{1}{7}$, of ventral $\frac{1}{6}$, of anal nearly $\frac{1}{6}$ of the total length.

Eyes transversely oval, $\frac{2}{7}$ of length of head, $1\frac{1}{4}$ diameter apart, $1\frac{1}{4}$ from end of snout.

Dorsal profile more convex than the abdominal, and ascending in a regular curve from the snout to the commencement of the dorsal fin, whence it gradually sinks.

Snout rather pointed; cleft of mouth extending scarcely half the distance to below the anterior margin of the orbit; lower jaw slightly the shortest. Nasal cirri extend to the anterior third of the orbit; the maxillary cirri to the posterior margin of the orbit. Praeorbital rather elongated, with its apex anterior, and curved rather towards the median line. Nostrils generic.

Fins. Dorsal arises immediately over the ventrals; base slightly scaled. First two undivided rays small; third not quite half so long as the fourth, which is bony, strong, broad, laterally compressed, smooth, and nearly as high as the first soft ray; last ray hardly more than one-third the length of the first. Pectoral pointed, and reaching as far as the base of the ventral. Anal entirely posterior to the dorsal, arising midway between the base of the pectoral and the termination of the caudal; its undivided rays articulated and weak, when three exist the first is very minute. Caudal deeply forked in its posterior two-thirds.

Scales largest in the anterior half of the body.

Lateral line in single tubes; commencing near the upper end of the opercle, it bends gently downwards, and opposite the centre of the pectoral it passes direct to the centre of the caudal.

Pharyngeal teeth crooked, pointed, 4, 3, 2/2, 3, 4.

Colours. Cheeks golden; body generally silvery green superiorly, becoming silvery white below the lateral line, the base of each scale being the darkest. After death a darkish line appears along the centre of every scale.

Hab. Bowany River.

A few of this species were placed in the Ootacamund Lake. It is said to attain to a large size.

PUNTIUS (BARBODES) DUBIUS, sp. nov.

B. iii. D. 4/9. P. 17. V. 9. A. 3/5. L. 1.42. L. tr. 9/6.

Length of head nearly $\frac{1}{5}$, of pectoral $\frac{1}{6}$, of caudal a little above $\frac{1}{4}$, of base of dorsal $\frac{1}{9}$, of base of anal $\frac{1}{16}$ of the total length. Height of head $\frac{2}{15}$, of body nearly $\frac{1}{4}$, of dorsal $\frac{1}{5}$, of ventral $\frac{1}{6}$, of anal $\frac{1}{6}$ of the total length.

Eyes transversely oval; diameter $\frac{2}{7}$ of length of head, $1\frac{1}{3}$ diameter apart, and the same distance from end of snout.

Appearances the same as in the last species, from which it may be only a sexual difference. Its cirri are much shorter, its two pairs being of the same length, and only equal to half the diameter of the orbit. The third dorsal spine extends two-thirds the length of the fourth. Snout more elevated, and scales smaller.

Hab. Bowany River.

PUNTIUS (BARBODES) CARNATICUS.

?*Barbus carnaticus*, Jerdon, Madras Journ. No. 35. p. 311.
Poaree candee, or *Saal candee*, Tam.

B. iii. D. 4/8. P. 15. V. 9. A. $\frac{2-3}{5}$. C. 19. L.l. 32. L. tr. 6/3.

Length of specimens up to $22\frac{1}{2}$ inches.

Length of head $\frac{2}{11}$, of pectoral $\frac{2}{13}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{13}$, of caudal $\frac{1}{6}$ of the total length. Height of head nearly $\frac{1}{7}$, of body rather more than $\frac{1}{4}$, of dorsal $\frac{1}{7}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Transverse diameter $\frac{1}{4}$ of length of head, $2\frac{1}{4}$ transverse diameters apart, $1\frac{1}{4}$ from end of snout.

Dorsal profile rather more convex than that of the abdomen.

Cleft of mouth extending nearly to beneath the anterior margin of the orbit. Nostrils generic. Praorbital irregularly pentagonal, the anterior margin the longest, the anterior superior the shortest. In adults the summit of the head very rugose, and a slight depression extends across the snout just anterior to the nostrils. Nasal pair of cirri thin, reaching as far as anterior margin of the orbit; maxillary thicker, but slightly shorter.

Fins. The dorsal, nearly square, commences midway between snout and base of the caudal, and is situated in the posterior half of the body; first entire dorsal ray minute, the second longer, the third only two-fifths of the length of the fourth, which last is broad, nearly as long as the first soft ray, strong, entire, and has a short soft articulated termination; the last soft ray is divided at its root. Caudal deeply forked, lobes pointed.

Scales very large, nearly quadrangular, and in the adults having very roughened margins; some scales exist over the bases of the dorsal, anal, and caudal fins.

Lateral line first curves gently downwards for five scales, and then proceeds direct to centre of caudal fin.

Teeth. Pharyngeal teeth pointed and slightly crooked at their extremities, 5, 3, 2/2, 3, 5.

Colours. Brownish green along the back, silvery white on the abdomen; cheeks glossed with gold; dorsal fin dark grey; pectorals, ventrals, and anal whitish, with a dash of pink; caudal greyish; eyes golden.

Hab. Bowany and Seegoor Rivers.

This is the only large species of *Puntius* existing as an indigenous species at so high an elevation as 2900 feet; the small *Puntius grayi*, spec. nov., was also found at about the same height above the sea. At Billicul, about 5700 feet elevation, I found it existing; it had been introduced there some years previously; and the first fish I obtained was taken on a night-line, and nearly $4\frac{1}{2}$ lb. weight. In the Bowany it has been taken 25 lb. weight. Their conveyance alive during the hot months is difficult, but during the cold weather exceedingly easy. Upwards of two dozen were placed in the Ootacamund Lake, where, however, more are necessary; and no doubt they would succeed in the Pykara River.

PUNTIUS (BARBODES) GRAYI, sp. nov.

B. iii. D. 3/6. P. 15. V. 8. A. 2/5. C 15. L. l. 20. L. tr. 4/2.

Length of specimens up to $2\frac{1}{2}$ inches.

Length of head $\frac{2}{9}$, of pectoral $\frac{1}{7}$, of base of dorsal $\frac{1}{7}$, of base of anal $\frac{1}{14}$, of caudal $\frac{1}{4}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{3}$, of dorsal $\frac{2}{9}$, of anal $\frac{1}{7}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head, nearly 1 diameter apart, $\frac{3}{4}$ of a diameter from end of snout.

Profile of dorsal aspect considerably more convex than that of the abdomen, there being a very considerable rise from the snout to the anterior extremity of the dorsal fin, whilst from its posterior end there is a rapid fall.

Cleft of mouth extends to under the anterior margin of the orbit. Nasal cirri short; the maxillary pair slender and equal in length to the diameter of the orbit. Praeorbital longer than high, irregularly pentagonal and directed forwards.

Fins. Dorsal commences midway between the snout and the base of the caudal fin; the anal midway between the posterior extremity of the orbit and the end of the caudal, which last fin is deeply emarginate in its posterior two-thirds. Unbranched dorsal rays thin and articulated.

Scales large; some extended over the bases of the dorsal, anal, and caudal fins.

Lateral line in single tubes; it passes nearly direct from the posterior superior margin of the opercle to the centre of the caudal fin.

Pharyngeal teeth in three rows, curved, sharp, 5, 3, 2/2, 3, 5.

Colours. Olive-green superiorly, with a dash of crimson, and becoming of a dirty reddish white on the abdomen. A broad black band commences from under the whole extent of the base of the dorsal fin, and passes downwards to just below the lateral line; a second band begins four scales beyond the posterior extremity of the base of the dorsal, and passes down to one scale below the lateral line; there is also a slight blackish band, often indistinct, at the base of the caudal fin. Dorsal, caudal, and anal pinkish; the posterior extremity of the first black, whilst the anal is also margined with black having an external white edge. In some specimens taken from a high level (about 3000 feet) in a rapid stream the ground-colour was of a brilliant crimson; in a few young specimens the caudal had the outer third of its caudal crimson edged with black.

Hab. The Bowany and Kullaar Rivers, at the foot of the Neilgherries, and other streams on the lower slopes up to 3000 feet elevation.

I have named this pretty little Carp after Dr. J. E. Gray, F.R.S.

PUNTIUS FILAMENTOSUS, Cuv. & Val.

Sawaal candee, Tam. The Red-tailed Carp.

B. iii. D. 3/8. P. 17. V. 9. A. 2/5. C. 15. L. l. 20. L. tr. 5/4.

Common in the Bowany.

This species of *Puntius* is easily conveyed alive from place to place; six specimens were placed alive in the Ootacamund Lake.

PUNTIUS ARLIUS, Jerdon.

B. iii. D. 3/8. P. 15. V. 8. A. 2/5. C. 18. L. l. 23. L. tr. 5/2.

Length of specimens up to 2 inches.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{7}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{13}$, of caudal $\frac{1}{8}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{4}$, of dorsal fin $\frac{1}{5}$, of anal $\frac{1}{7}$ of the total length.

Eyes. Diameter nearly $\frac{1}{2}$ of length of head, $\frac{3}{4}$ of a diameter apart, $\frac{1}{2}$ a diameter from end of snout.

Profile of dorsal and ventral aspects about equally convex, the greatest depth of the body being opposite the commencement of the dorsal fin.

Cleft of mouth extending nearly to under the anterior margin of the orbit. Nostrils generic. Praeorbital pentagonal. No cirri.

Fins. The dorsal commences midway between the snout and the base of the caudal, and opposite the posterior third of the pectoral. Anal arises midway between the centre of the orbit and the extremity of the caudal, which last is deeply emarginate in its posterior three-fourths.

Scales large, and extended over the bases of the dorsal, anal, and caudal fins.

Lateral line in single tubes, first curving downwards to opposite the posterior end of the pectoral, whence it proceeds direct to the centre of the caudal.

Teeth. Pharyngeal teeth in three rows, crooked at their extremities and sharp, 5, 3, 2/2, 3, 5.

Colours. Olive-green on the back, becoming silvery white dashed with green on the abdomen. A black band of about two scales in width passes from under the commencement of the dorsal fin, as low as the lateral line; a second from just below the posterior extremity of the dorsal to the base of the anal fin; and a third across the base of the caudal. Dorsal, caudal, and anal pinkish; the first with a black bar along its summit, whilst the caudal has also a slightly black termination.

Hab. Bowany River.

AMBLYPHARYNGODON JERDONI, Day.

B. iii. D. 3/7. P. 15. V. 9. A. 3/5. C. 19. L. l. 60. L. tr. 10/6.

Length of specimens up to $3\frac{3}{10}$ inches.

Differs slightly from the Malabar species in having a minute first undivided ray in the dorsal fin, and in the latter being rather lower posteriorly.

The colours also are not so bright, being more of a bluish green along the back, whilst the lateral stripe is more of a steel-colour.

Hab. Bowany River.

BARILIUS RUGOSUS, sp. nov.

Aart candee, Tam. River-Carp.

B. iii. D. 3/8. P. 15. V. 10. A. 3/14. C. 18. L. l. 40. L. tr. 8/3.

Length of specimens from $\frac{4}{10}$ of an inch to $4\frac{3}{10}$ inches.

Length of head nearly $\frac{1}{4}$, of pectoral $\frac{1}{6}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{8}$, of caudal a little above $\frac{1}{6}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{4}$, of dorsal fin $\frac{1}{8}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Diameter $\frac{2}{7}$ of length of head, $1\frac{1}{4}$ diameter apart, 1 diameter from end of snout.

Profile more convex on the ventral than on the dorsal aspect.

Cleft of mouth large, directed forwards and slightly upwards, extending posteriorly to beneath the middle of the orbit. The lower jaw is received at its termination into a slight emargination formed by the junction of the intermaxillaries. The anterior surface of the snout, and the sides of the intermaxillaries and of the lower jaw, covered with large glands; some also exist along the inferior surface of the lower jaw. Nostrils at anterior superior angle of the orbit, nearer to it than to the end of the snout, and divided from one another by a membranous valve; the posterior broad and patent, the anterior semitubular.

Fins. Dorsal commences midway between snout and middle of caudal fin, and opposite the anterior third of the ventral, extending posteriorly to above the third anal ray. Caudal moderately emarginate, lower lobe slightly the longest. Anterior extremities of dorsal and anal fins the highest; the former with a slightly convex, the latter with a convex and concave margin.

Scales moderately large, with from two to three raised lines on each. The base of the dorsal scaleless, of the anal slightly scaled. Two long free scales at the base of the ventral. Base of caudal scaled.

Lateral line in single tubes on each scale; it passes downwards nearly to the abdominal profile, along which it runs parallel.

Teeth. Pharyngeal teeth in three rows, curved, slightly hooked, and pointed at their extremities, 5, 4, 2/2, 4, 5.

Colours. Head purplish silvery, generally of a shade of grey glossed with purple, becoming silvery white along the abdomen. About fifteen vertical greyish silvery bands pass from the grey of the back to nearly as low as the lateral line; in the old males they are more in the form of large oval spots. Fins greyish, the anterior extremity of the dorsal and anal tipped with white. In a very few young the body was marked with black bands in the form of the letter W.

The old males differ so much from the young and the females as at first to appear like different species; in the latter the scales are quite smooth, and but few glands around the jaws. Some of the males, on the contrary, when full-grown, have from one to three rough spots on each scale in the posterior half of the body, the lateral line is indistinctly apparent, the caudal fin is comparatively short, and its lower lobe considerably the longest.

This species differs from the *Barilius bakeri*, being of a more slender shape, whilst the jaws are surrounded by large glands, and, instead of a few distinct oval or round spots along the lateral line, it has fifteen distinct stripes.

Fishes of this genus are invariably called Trout by Europeans.

Hab. The Bowany and Seegoor Rivers, and the rapid streams along the lower slopes of the Neilgherries.

BARILIUS (PACHYSTOMUS) COCOA, Buch. Ham.

B. iii. D. 2/7. P. 13. V. 9. A. 2/7. C. 18. L.l. 42. L. tr. 9/3.

Length of specimens to 5 inches.

The existence of a short pair of nasal, and a second pair of maxillary cirri about equally long was very apparent. Having captured an identical fish at Kurnool, I have but little doubt that it is Buchanan Hamilton's fish, with which it exactly agrees.

Hab. Bowany River, where, however, it is not common.

PARADANIO AUROLINEATUS, Day.

Poarah cunjoo candee, Tam.

B. iii. D. $\frac{3}{11-12}$. P. 14. V. 7. A. $\frac{3}{15-16}$. C. 19. L.l. 35. L. tr. 7/2.

Length of specimens to $4\frac{5}{10}$ inches.

The coloration differs slightly from the Malabar species, in that here there are some irregular vertical yellow lines on the fore part of the body, and the blue between the yellow lines and the opercular spot is less distinct. The lower half of the dorsal fin is also darker.

Hab. Billicul, where it was imported and breeds; also the Bowany and Seegoor Rivers. Some were placed in the Ootacamund Lake. It grows to about 6 inches in length.

PARADANIO NEILGHERRIENSIS, sp. nov.

Cowlie, Tam.

B. iii. D. $\frac{2}{9-10}$. P. 15. V. 10. A. 2/10. C. 20. L.l. 35. L. tr. 9/2. Vert. $\frac{12}{20}$.

Length of specimens up to $3\frac{1}{2}$ inches.

Length of head $\frac{2}{9}$, of pectoral $\frac{1}{6}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{8}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{2}{13}$, of body $\frac{1}{4}$, of dorsal $\frac{1}{8}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head, $1\frac{1}{4}$ diameter apart, $\frac{2}{3}$ of a diameter from end of snout.

Profile more convex on the ventral than it is on the dorsal aspect. Body compressed.

Cleft of mouth extending to under the anterior margin of the orbit, with the lower jaw directed rather upwards, and having a slight knob at its termination, so that when the mouth is closed it forms the anterior end of the fish. Nostrils at anterior superior angle of the orbit, nearer to it than to the end of the snout, and divided from each other by a membranous valve.

Fins. The dorsal commences midway between the snout and the middle of the caudal fin, and opposite the posterior third of the ventral, extending to above the fourth anal ray. Caudal emarginate in its posterior fourth. Anterior ends of dorsal and anal fins the highest.

Scales of medium size; none over the bases of dorsal or anal fins, but a few over the caudal.

Lateral line commencing from the upper posterior margin of the

opercle, bends directly downwards to oppose the posterior extremity of the pectoral fin, it then follows the curve of the abdomen to its termination; it consists of single tubes.

Teeth. Pharyngeal teeth crooked and pointed, 5, 4, 2/2, 4, 5.

Colours. Back greenish, sides silvery, with a purplish tinge along the abdomen, and a badly marked broad steel-blue stripe extending from behind the eye to the caudal fin; it is bounded superiorly and inferiorly by a narrow bright yellow band. Fins yellowish, with fine black dots, the external portions of dorsal and anal the highest. The colours vary in different places.

Hab. Ootacamund Lake, Pykara, Avalanche, and Kaity streams. This is the only indigenous fish of the hills.

With short dorsal fin, and an elongated ray in ventral fin.

PARADANIO ELEGANS, spec. nov.

B. iii. D. 1/3. P. 11. V. 8. A. 2/23. C. 19. L. 1. 52. L. tr. 8/2.

Length of specimens up to $3\frac{1}{2}$ inches.

Length of head $\frac{1}{6}$, of pectoral $\frac{1}{4}$, of base of dorsal $\frac{1}{18}$, of base of anal $\frac{1}{4}$, of caudal nearly $\frac{1}{4}$ of the total length. Height of head $\frac{1}{9}$, of body $\frac{2}{7}$, of dorsal $\frac{1}{8}$, of anal $\frac{2}{13}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head, $\frac{3}{4}$ of a diameter from end of snout, $1\frac{1}{4}$ apart.

Profile of dorsal aspect rises slightly to the base of the dorsal fin; along the abdominal surface there is a regular curve from the symphysis of the lower jaw to the end of the anal fin. Body strongly compressed.

Cleft of mouth deep, oblique, and reaching to nearly under the anterior margin of the orbit. Snout short. Upper jaw slightly compressed; lower jaw the longest; both covered by thin lips. Nostrils generic.

Fins. Dorsal commences over the middle of the anal. Ventral with an elongated ray extending backwards as far as the middle of the anal, which last fin is highest anteriorly. Caudal lobed, the inferior lobe both largest and longest.

Scales with two or three diverging striae. Base of dorsal not scaled, of anal scaled.

Lateral line in single tubes; it first curves round the base of the pectoral fin, and just beyond the ventral attains within two scales of the abdominal profile, which it follows as far as the posterior extremity of the anal, and then curves upwards to the centre of the caudal.

Teeth. Pharyngeal teeth crooked at their extremity and pointed, 5, 4, 1/1, 4, 5.

Colours. Greenish, with a silvery band extending from opposite the upper margin of the opercle to the upper portion of the caudal fin. Abdomen silvery. Several irregular yellow bars pass downwards from the back to the abdomen. Cheeks silvery. Fins diaphanous. Eyes golden.

Hab. Bowany River.

RASBORA NEILGHERRIENSIS, spec. nov.

Ovaree candee, Tam.

B. iii. D. 2/7. P. 13. V. 8. A. 2/5. C. 18. L. 1. 34. L. tr. 6/3.

Length of specimens to $5\frac{1}{2}$ inches.

Length of head $\frac{2}{11}$, of pectoral $\frac{1}{8}$, of base of dorsal $\frac{1}{12}$, of base of anal $\frac{1}{8}$, of caudal $\frac{2}{11}$ of the total length. Height of head $\frac{1}{9}$, of body $\frac{1}{5}$, of dorsal $\frac{1}{8}$, of anal $\frac{1}{9}$ of the total length.

Eyes. Diameter $\frac{1}{5}$ of length of head, $1\frac{1}{2}$ diameter apart, 1 diameter from end of snout.

Profile more convex on the ventral than on the dorsal aspect, which last is almost straight.

Cleft of mouth extending to beneath the anterior margin of the orbit; it is directed upwards, and there is a slight knob below the anterior extremity of the lower jaw. Nostrils at anterior superior angle of the orbit, nearer to it than to the end of the snout; the posterior broad and patent, divided by a valve from the anterior, which has elevated margins. Präorbital irregularly pentagonal, its anterior margin the longest, its anterior superior very short.

Fins. Dorsal commences midway between the snout and centre of the caudal fin, and over the middle of the ventral, extending backwards to opposite its posterior extremity. Caudal broad, slightly lobed in its posterior fourth, in adults the lowest lobe being the longest. Anterior extremities of dorsal and anal the highest.

Scales moderately large; none on the base of either the dorsal or anal, some on the caudal.

Lateral line consists of single tubes; it makes a very gentle curve downwards, from the posterior superior angle of opercle to above the ventral fin, whence it runs parallel with the abdominal profile.

Teeth. Pharyngeal teeth crooked, pointed, 5, 3, 2/2, 3, 5.

Colours. Back dull greenish brown, fading to white glossed with purple on the abdomen. Opercles silvery. A darkish silvery line runs along the opercles and side of the body, having a broad silvery band below it. Fins yellowish grey; base of caudal dark grey. Eyes bluish green.

This species is said to grow to eight inches in length, and takes either a fly or a worm. In the Billicul Lake (to which place it was imported) it breeds very readily.

Hab. Bowany and Seegoor Rivers, also the Billicul Lake.

RASBORA WOOLAREE, spec. nov.

Woolaree candee, Tam.

B. iii. D. 2/7. P. 13. V. 8. A. 2/5. C. 18. L. 1. 30. L. tr. 5/2.

Length of specimens up to 3 inches.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{6}$, of base of dorsal $\frac{1}{10}$, of base of anal $\frac{1}{5}$, of caudal $\frac{1}{4}$ of the total length. Height of head $\frac{2}{15}$, of body $\frac{1}{4}$, of dorsal $\frac{1}{6}$, of anal $\frac{2}{15}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head, $1\frac{1}{6}$ diameter apart, $\frac{3}{4}$ of a diameter from end of snout.

Profile more convex on the ventral than on the dorsal aspect, which last is nearly straight.

Cleft of mouth extending to under the anterior margin of the orbit; upper jaw broad; the lower jaw with a well-marked knob at its anterior extremity, and which is received into a rather deep emargination in the centre of the upper jaw, where, when the mouth is closed, it forms part of the upper profile. Upper surface of head nearly flat. Nostrils generic. Praeorbital irregularly pentagonal, pointing downwards and backwards, its posterior margin the longest, its posterior inferior margin the shortest.

Fins. Dorsal commences midway between the snout and the centre of the caudal fin, and over the middle of the ventral, extending backwards to over its posterior extremity. Caudal broad and deeply lunate in its posterior half. First divided rays of dorsal and anal the highest.

Scales moderately large, some on base of both anal and caudal fins.

Lateral line consists of single tubes; it makes a rather concave curve downwards from the posterior superior angle of the opercle to opposite the end of the pectoral fin, whence it passes parallel with the abdomen to the lower third of the caudal fin.

Teeth. Pharyngeal teeth sharp, curved, 5, 3, 2/2, 3, 5.

Colours. Olive-green superiorly, becoming lighter on the abdomen, with a purplish gloss. A leaden-blue stripe passes from the eye to the centre of the caudal fin; it has a dull yellow edging above. Fins orange.

Said never to exceed four inches in length. It is common in the Bowany River.

This species of *Rasbora* differs materially from the *R. neilgherriensis* in its comparatively longer head, its larger eye, its mouth, its praeorbital, its lateral line, and the shape of the caudal fin.

Fishes of this genus are avoided as food by the natives of some portions of the Madras Presidency whilst cholera is present, as they are considered to predispose the eater to attacks of this scourge.

Genus ESOMUS.

I have in this place introduced a fish of this genus, of which I have been favoured with many specimens captured by Mr. Assistant Apothecary Everard at Trichoor, near Cochin. It is exceedingly interesting, because Valenciennes's specimen was obtained from a hot spring in Ceylon, and Dr. McClelland's from a hot spring in Bengal. Although not captured near the Neilgherries, I shall describe it in this place with reference to the next species.

ESOMUS MALABARICUS, sp. nov.

B. iii. D. 2/7. P. 12. V. 9. A. 2/5. C. 19. L. l. 32. L. tr. 7.

Length of specimens up to 3 inches.

Length of head $\frac{2}{7}$, of pectoral $\frac{2}{7}$, of base of dorsal $\frac{1}{2}$, of base of anal $\frac{1}{2}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{1}{8}$, of body $\frac{1}{4}$, of dorsal $\frac{1}{6}$, of anal $\frac{1}{6}$ of the total length.

Eyes. Diameter $\frac{2}{7}$ of length of head, $1\frac{1}{2}$ diameter apart, 1 diameter from end of snout.

Profile from snout to anterior margin of dorsal fin almost straight, then sinking along its base it again becomes straight. Abdominal profile more convex. Body compressed.

Cleft of mouth short, oblique, not extending halfway to the orbit; the anterior surface of the lower jaw, when the mouth is closed, forms part of the upper profile. Snout rather depressed. Lower lip rather fleshy, not covering the tip of the lower jaw. The superior pair of cirri reach as far as the middle of the orbit; the inferior pair extend from the angle of the mouth to beyond the base of the ventral fin. Praeorbital triangular, apex below.

Fins. Dorsal short, placed opposite the anal, and commencing midway between the anterior margin of the orbit and posterior extremity of the caudal fin. Pectoral large, falcated, reaching to the commencement of the ventral, which is short. Caudal deeply lunated.

Teeth. Pharyngeal teeth slightly crooked and pointed, 5/5, in a single row.

Scales of moderate size.

Lateral line absent.

Colours. Greyish silvery above, becoming silvery white below the middle of the body, along which runs a silvery stripe, which has a narrow yellow edge superiorly. In one specimen the silver stripe was edged superiorly by a broad black band.

Hab. Trichoor in Malabar.

Subgenus NURIA.

Differs from *Esomus* in the presence of a lateral line strongly curved.

ESOMUS (NURIA) MADERASPATENSIS, sp. nov.

B. iii. D. 2/7. P. 12. V. 9. A. 3/5. L. l. 32. L. tr. 5/2.

Length of specimens up to 3 inches.

Length of head $\frac{2}{11}$, of pectoral $\frac{1}{5}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{4}$, of dorsal $\frac{1}{7}$, of anal $\frac{1}{7}$ of the total length.

Eyes. Diameter $\frac{2}{7}$ of length of head, 1 diameter apart, $\frac{3}{4}$ of a diameter from end of snout.

Cleft of mouth short, oblique, not extending above one-third of the distance to below the orbit, and gape three times as wide as the cleft is deep. Two pairs of cirri, as in the last species.

Fins. Dorsal short, its anterior half in advance of the origin of the anal. Pectoral does not extend so far as the ventral; neither does the latter reach the anal. Caudal deeply lunated.

Teeth. Pharyngeal teeth in one row, straight and sharp, 5/5.

Colours. Silvery white, with a silvery line extending along the centre of either side. Fins diaphanous.

Hab. Bowany River. It is also exceedingly common at Madras.

CHELA ARGENTEA, sp. nov.

Wellachee candee, Tam. The White Carp.

B. iii. D. 3/7. P. 15. V. 8. A. 3/14. C. 19. L. l. 40–45.
L. tr. 7/2.

Length of specimens to $5\frac{2}{8}$ inches.

Length of head nearly $\frac{1}{5}$, of pectoral a little above $\frac{1}{5}$, of base of dorsal $\frac{1}{13}$, of base of anal above $\frac{1}{7}$, of caudal a little more than $\frac{1}{5}$ of the total length. Height of head $\frac{1}{10}$, of body above $\frac{1}{5}$, of dorsal fin nearly $\frac{1}{9}$, of anal nearly $\frac{1}{9}$ of the total length.

Eyes. Orbita circular, their upper margin close to the profile. Diameter not quite $\frac{1}{3}$ of length of head, 1 diameter apart posteriorly, $\frac{3}{4}$ anteriorly, and the same distance from the end of the snout.

Profile rises to over the centre of the pectoral fin, whence it proceeds direct to the base of the caudal. Its abdominal profile is more convex than its dorsal. Abdomen sharp, cutting anteriorly; body and head compressed laterally.

Cleft of mouth extending to beneath the anterior third of the orbit; the lower jaw is directed obliquely upwards, so that its anterior extremity is nearly level with the dorsal profile. The lower jaw has a knob at its symphysis, which is received into an emargination formed by the intermaxillary bones. Nostrils generic. Praeorbital nearly oval, its superior and inferior margins being twice the length of its anterior and posterior ones.

Fins. Dorsal situated in the posterior third of the distance between the snout and the base of the caudal fin, and over the commencement of the anal. Pectoral commencing under the posterior extremity of the opercle, extends to rather beyond the base of the ventral, which does not quite reach so far as the anal. Dorsal and anal both highest anteriorly, with their external margins slightly concave, their first undivided rays minute. Pectoral and ventral pointed, the outer ray of the first strong and undivided. Caudal deeply lobed.

Scales moderately large, and with six or eight well-marked lines radiating from their bases towards their circumferences. A few scales exist along the anterior portion of the base of the anal and caudal fins.

Lateral line consisting of a single tube in each scale; commencing on a level with the upper margin of the opercle, it bends downwards for about twelve scales, when it reaches above the base of the ventral fin, from here it follows the curve of the abdomen to opposite the lower third of the base of the caudal, when it suddenly ascends to attain its centre.

Teeth. Pharyngeal teeth curved, pointed at their extremities, and in three rows, 5, 3, 2/2, 3, 5.

Colours. Brilliant silvery, with a brownish-green back, divided from the abdomen by a broad green band, which extends from behind the upper part of the orbit to the centre of the caudal fin. Fins yellowish; external portions of dorsal and caudal stained with dark, due to numerous minute black spots. Outer margin of anal also darkish.

Grows to about 8 inches in length, and is very numerous in the Bowany.

Hab. The Bowany River.

NOTOPTERUS PALLASII, Cuv. & Val.

Ambutan wahlah, Tam. The Barber's Wahlah.

B. vi. D. 9. P. 17. A. 108. V. 4. C. 13. L. I. 225.

Length of specimens from $4\frac{1}{2}$ to 10 inches.

Twenty-eight serrations along the anterior margin of the chest and abdomen.

Its native name is derived from the form of the body being similar to the knives which barbers employ for shaving.

BELONE CANCILA, Buch. Ham.

Coco meen, Tam. "Long-nosed Fish."

B. x. D. 2/15. P. 11. A. 2/15. C. 15.

Very common in the Bowany River. It is reputed to be very destructive to young fish.

MURÆNA MACULATA, Buch. Ham.

Vellangoo, Tam.

Common in the Bowany. Upwards of a dozen and a half were placed in the Ootacamund Lake.

6. Description of a New Australian Bird pertaining to the genus *Malurus*. By JOHN GOULD, F.R.S.

MALURUS CALLAINUS. Turquoisine Malurus.

Male in full nuptial dress:—

Entire crown of the head, mantle, and upper tail-coverts light turquoise-blue ; ear-coverts similar in colour, but of a conspicuously lighter hue ; throat rich cobalt-blue ; entire abdomen and under tail-coverts rich verditer-blue ; the turquoise-coloured feathers of the crown are separated from those of the mantle by a band of jet-black, while the mantle is again separated from the upper tail-coverts by a conspicuous patch of the same colour ; a lunate band of deep black also separates the cobalt-blue of the throat from the verditer-blue of the under surface ; tail-feathers dull green, each slightly tipped with greyish white ; wings brown, each feather tinged with greyish-green on its outer web ; under surface of the shoulder buff ; bill and legs brownish black.

Total length $4\frac{1}{2}$ inches, bill $\frac{1}{2}$, wing $\frac{7}{8}$, tail $2\frac{3}{8}$, tarsi $\frac{7}{8}$.

Hab. South Australia.

Remark.—This very beautiful bird is closely allied to *Malurus melanotus* and *M. splendens* ; but on comparison the distinctive characters of each become very apparent.

For this new species and many other fine objects I am indebted to Mr. S. White, of Adelaide, South Australia, who procured them in the interior of that country.

7. Descriptions of New Species of Shells collected by Geoffrey Nevill, Esq., at Mauritius. By HENRY ADAMS, F.L.S.

(Plate XIX.)

VOLVARIA (VOLVARINA) PUSILLA, H. Ad. (Pl. XIX. fig. 1.)

V. testa fusiformi, pallida; spira elevata, apice obtusiuscula; anfr. 5, convexiusculis, ultimo antice attenuato, postice paulum ascendentem; columella quadruplicata; apertura angusta; labro incrassato, intus dentato.

Long. 5, diam. $2\frac{1}{2}$ mill.

Hab. Port Louis Harbour, Mauritius.

This small species of the genus *Volvaria* has much the appearance of *V. neglecta*, Sow.; but the outer lip is strongly denticulated, while that of *V. neglecta* is smooth.

MACROCHLAMYS MINIMA, H. Ad. (Pl. XIX. fig. 2.)

M. testa subperforata, deppressa, discoidea, tenui, vix striatula, pellucida, nitida; spira planiuscula, sutura profunda; anfr. 4, convexis, ultimo non descendente, basi convexo; apertura vix obliqua, lunari; perist. simplici, acuto, margine columellari superne reflexiusculo.

Diam. $1\frac{1}{3}$, alt. $\frac{1}{2}$ mill.

Hab. Near Port Louis, Mauritius.

Although this species is so minute, it appears to be adult, and is therefore deserving of record.

MACROCHLAMYS PERLUCIDA, H. Ad. (Pl. XIX. fig. 3.)

M. testa anguste umbilicata, deppressa, tenui, laevigata, pellucida, nitida; spira brevissime conoidea, sutura marginata; anfr. $5\frac{1}{2}$, convexiusculis, arcte convolutis, ultimo vix descendente, peripheria rotundato, basi medio impresso; apertura obliqua, lunari; perist. simplici, recto, margine columellari superne reflexiusculo.

Diam. 6, alt. 4 mill.

Hab. Peter Botte, Grand Bassin, Trou-aux-Cerfs, Mauritius.

"The animal of this species presents a very pretty appearance, the mantle being of a bright-yellow colour spotted with black, and the foot bright yellow, while the tentacles are entirely black."—*G. Nevill.*

STYLODONTA (EREPTA) RUFOCINCTA, H. Ad. (Pl. XIX. fig. 4.)

S. testa vix perforata, conoideo-lenticulari, solidula, superne confertim arcuato-striata, pallide rufa, fascia rufa supra carinam alteraque suturali ornata; spira parum elevata, apice obtusa,

sutura leviter impressa; anfr. 6, planiusculis, lente accrescentibus, ultimo antice breviter descendente, peripheria angulato, basi modice convexo, sublævigate, leviter concentrice striato, albido; apertura obliqua, rotundato-lunari; perist. simplici, marginibus callo crasso junctis, columellari declivi, incrassato, supra perforationem reflexo.

Diam. maj. 13, min. 12, alt. $7\frac{1}{2}$ mill.

Hab. On sandhills near the sea-shore, Coromandel, Mauritius.

STYLODONTA (EREPTA) NEVILLI, H. Ad. (Pl. XIX. fig. 5.)

S. testa subperforata, depresso-conica, oblique costulis undulatis granulosis remotiusculis munita, pallide fulva; spira breviter conoidea, apice obtusa, sutura impressa; anfr. 8, convexis, lente accrescentibus, ultimo non descendente, ad peripheriam subangulato, subtus convexo; apertura obliqua, lunato-rotundato; perist. acuto, intus labiato, marginibus callo tenui junctis, columellari incrassato, reflexiusculo.

Diam. maj. 12, min. 10, alt. 7 mill.

Hab. The Pouce Mountain, Mauritius.

This species has characters in common with both *S. suffulta*, Bens., and *S. setiliris*, Bens., but is larger and less globose than the former, and is without the prominent columellar tooth of the latter; while from the latter it also differs in being larger, less umbilicated, and in the absence of the undulate lines of hairs. I have much pleasure in naming it after Mr. Geoffrey Nevill, a very enterprising young naturalist, to whom I am indebted for the opportunity of describing this and the other species included in this paper.

PUPA (PAGODELLA) VENTRICOSA, H. Ad. (Pl. XIX. fig. 6.)

P. testa profunde rimata, ovata, tenuiuscula, oblique striatula, pallide fusca; spira convexo-conica, sutura impressa; anfr. 5, convexiusculis, ultimo ventricoso, basi rotundato; apertura semiovali, plica parietali compressa, intrante, et dente prope insertionem marginis dextri munita; perist. simplici, vix expansiusculo, marginibus callo junctis, dextro subsinuato, columellari superne dilatato.

Long. $2\frac{1}{2}$, diam. $1\frac{3}{4}$ mill.

Hab. The Moka Ravines, Mauritius.

This singular little species I cannot satisfactorily refer to any of the present subgenera of the genus *Pupa*, and I therefore propose a new subgenus for it under the name of *Pagodella*, which may be characterized as follows:—

Subgenus PAGODELLA, H. Ad.

Testa rimata, ovata, opaca; anfr. convexi; apertura semiovalis, plicis parietalibus 2; perist. tenue, rectum, vix expansiusculum, marginibus callo junctis.

GIBBUS (GIBBULINA) NEVILLI, H. Ad. (Pl. XIX. fig. 7.)

G. testa rimata, cylindracea, solidiuscula, oblique sinuato-costata,

albida; spira cylindrica, apice obtusa, sutura mediocri; anfr. 9, planiusculis, ultimo non ascende, basi angulato; apertura parum obliqua, rhombeo-ovali, dente parietali compresso, intrante, et plica columellari obsoleta munita; perist. breviter expanso, margine dextro intus labiato, columellari patente.

Long. 24, diam. 6 mill.; ap. $6\frac{1}{2}$ mill. longa, 4 lata.

Hab. The Pouce Mountain, Mauritius.

"The foot of the animal in this species is orange; the mantle is also orange, slightly mottled with black anteriorly, more densely so posteriorly; and the tentacles are black."—*G. Nevill.*

I have named this species in honour of Mr. William Nevill, the father of Mr. Geoffrey Nevill, a gentleman well known as a mineralogist.

GIBBUS (GONIDOMUS) NEWTONI, H. Ad. (Pl. XIX. fig. 8.)

G. testa profunde arcuato-rimata, elongato-ovata, oblique costata, pallido-lutea; spira convexo-conica, sutura impressa; anfr. 8, convexiusculis, ultimo antice ascende, basi compresso; apertura verticali, truncato-oblonga; perist. breviter expanso, marginibus callo junctis, dextro intus incrassato, columellari patente.

Long. 24, diam. 11 mill.; ap. 7 mill. longa, 6 lata.

Hab. Trou-aux-Cerfs, Mauritius.

"This species was first found by Mr. Caldwell at Trou-au-Cerf, and I have since found it alive at the same place. The animal has the foot of a greyish flesh-colour, the mantle light brownish grey closely veined with longitudinal dark brown lines, and the tentacles of a dull purple."—*G. Nevill.*

ENNEA (GULELLA) MODESTA, H. Ad. (Pl. XIX. fig. 9.)

E. testa profunde perforata, ovato-oblonga, tenuiuscula, conferte et minute costulata, nitida, pellucida, corneo-hyalina; spira ventrosa, sursum tumida, apice convexo-conica, sutura impressa; anfr. 11, convexis, ultimo ascende, basi rotundato; apertura verticali, ovali, plica compressa oblique descendente prope insertionem marginis dextri munita; perist. expanso, subsoluto, margine dextro sinuato, intus tuberculifero.

Long. 5, diam. supra medium $2\frac{1}{2}$ mill.; ap. $1\frac{1}{2}$ mill. longa, 1 mill. lata.

Hab. Mauritius.

This species has hitherto been confounded with *E. clavulata*, Lam., but appears to be distinct. Among many specimens that came under the notice of Mr. G. Nevill there was not one of an intermediate form.

CYCLOSTOMUS (TROPIDOPHORA) MAURITIANUS, H. Ad. (Pl. XIX. fig. 10.)

C. testa anguste umbilicata, ovato-conica, tenuiuscula, pallide fulva, strigis fulvis ornata; spira conica, apice acutiuscula; anfr. 5, convexis, bicarinatis, inter carinas undique costis irre-

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gularibus subdistantibus munitis; apertura vix obliqua, subcirculari; perist. simplici, marginibus approximatis, callo tenui junctis, margine dextro recto, columellari mediocriter expanso.

Diam. maj. 14, min. 12, alt. 17 mill.

Hab. The Pouce Mountain, Mauritius.

CYCLOSTOMUS SCABER, H. Ad. (Pl. XIX. fig. 11.)

C. testa profunde umbilicata, globoso-turbinata, tenuiuscula, spiraliter costulis subdistantibus et longitudinaliter striis elevatis decussata, basi costulis spiralibus propioribus, in umbilico remotioribus, pallide carnea, fascia rufa angusta infra peripheriam ornata; spira turbinata, apice obtusiuscula; anfr. 5, convexis, ultimo rotundato; apertura verticali, circulari; perist. simplici, recto, continuo, superne subangulato, breviter adnato.

Diam. maj. 12, min. 10, alt. 11 mill.

Hab. The Pouce Mountain, Mauritius.

OMPHALOTROPIS COSTELLATA, H. Ad. (Pl. XIX. fig. 12.)

O. testa umbilicata, ovato-conica, tenuiuscula, spiraliter costulis filiformibus subdistantibus, circa umbilicum remotioribus, superne fere obsoletis munita, pallide carnea, versus apicem rubida, strigis fulgoratis rufis picta; spira conica, apice acutiuscula, sutura profunda; anfr. 7, convexiusculis, ultimo rotundato, in umbilico liris æqualibus munito; apertura subverticali, ovali; perist. recto, acuto, marginibus callo tenui junctis, columellari subincrastato, expansiusculo.

Long. 10, diam. 7 mill.; ap. 6 mill. longa.

Hab. The Pouce Mountain, Mauritius.

OMPHALOTROPIS PICTURATA, H. Ad. (Pl. XIX. fig. 13.)

O. testa perforata, ovato-conica, oblique confertim striatula, corneo-rufa, maculis et strigis albis notata; spira conica, apice acuminata, sutura submarginata et crenulata; anfr. 6, convexiusculis, ultimo rotundato; apertura subverticali, oblongo-ovata; perist. simplici, margine dextro recto, columellari vix expansiusculo.

Long. 6, diam. 3 mill.; ap. 2 mill. longa.

Hab. The Pouce Mountain, Mauritius.

"The animal in this species has the tentacles yellow, tipped with dark brown; the foot almost white; the mantle a kind of grey (varying), with its sides dark brown, and the same colour between the tentacles."—G. Nevill.

CASSIDULA PARVA, H. Ad. (Pl. XIX. fig. 14.)

C. testa subperforata, ovato-conica, solidula, spiraliter confertim costulata (prope suturam costulis majoribus), longitudinaliter minute striata, sordide alba; spira conica, apice mucronata; anfr. 6, convexiusculis, ultimo basi attenuato, antice crista obtusa munito; apertura subobliqua, ovali; plica parietali 1, compressa, subtransversa, nodulo supero obsoleto; plica colu-

mellari paulo minore, illi parallela; perist. simplici, margine dextro vix expansiusculo, intus medio unidentato, columellari calloso, dilatato.

Long. 4, diam. $2\frac{1}{2}$ mill.; ap. 2 mill. longa.

Hab. Port Louis Harbour, Mauritius.

PLECOTREMA EXIGUA, H. Ad. (Pl. XIX. fig. 15.)

P. *testa profunde rimata, ovato-conica, solida, spiraliter valde sulcata, longitudinaliter striata, pallide fulva; spira conoidea, apice mucronata; anfr. 8, planiusculis, infra suturam sulco profundo et lato exaratis, ultimo basi attenuato, pone aperturam valde cristato; apertura subobliqua, angusta; plicis parietalibus 2, superiore tuberculiformi, altera bipartita; plica columellari compressa, subhorizontali; perist. simplici, marginibus callo crasso junctis, dextro intus incrassato, tridentato, dente superiore minuto, columellari dilatato, patente.*

Long. 6, diam. $3\frac{1}{2}$ mill.; ap. 2 mill. longa.

Hab. Trou d'Eaux Douces, Mauritius.

8. Descriptions of New Species of Shells.

By HENRY ADAMS, F.L.S.

(Plate XIX.)

NANINA (?ROTULA) CONULUS, H. Ad. (Pl. XIX. figs. 16, 16a.)

N. *testa imperforata, trochiformi, tenui, oblique striata, superne liris spiralibus obsoletissimis signata, rubello-cornea, ad carinam et ad suturas pallidiore; spira conoidea, apice obtusiuscula, sutura distincta; anfr. 6, convexiusculis, ultimo non descendente, carinato, basi convexo; apertura subobliqua, tetragono-lunari; perist. recto, acuto, marginibus convergentibus, columellari verticali, superne breviter reflexo.*

Diam. maj. 11, min. 10, alt. 12 mill.

Hab. Newera Ellia, Ceylon (Coll. F. Layard).

This species, which is closely allied to *N. concavospira*, Pfr., was obtained by Mr. Frederick Layard from Newera Ellia, Ceylon, at an elevation of 6500 feet above the level of the sea. I have referred it with doubt to the subgenus *Rotula*, the animal of the typical species, *N. detecta*, not being known. In the figure given of the animal, in this case, the truncature of the foot is distinctly shown; while the animals of certain Indian species, considered by Mr. W. T. Blanford to belong to the same subgenus, are without such truncature, the mucus-pore being above the flattened posterior extremity.

BULIMULUS (ENA) PUSILLUS, H. Ad. (Pl. XIX. fig. 17.)

B. *testa sinistrorsa, rimato-perforata, cylindrico-turrita, tenui, inæqualiter striata, vix nitidula, olivaceo-fusca; spira elongata, sursum parum attenuata, apice obtusiuscula, sutura distincta;*

anfr. 7, convexiusculis, ultimo $\frac{1}{3}$ longitudinis vix æquante, basi rotundato; apertura verticali, semiovali; perist. recto, margine columellari subverticali, superne dilatato, patente.

Long. 5, diam. 2 mill.

Hab. Matelle, Ceylon (*Coll. F. Layard*).

This small species was collected by Mr. Frederick Layard at Matelle, Ceylon, and is peculiar from being, at least so far as I know, the only sinistral land-shell that has yet been met with in the island.

APICALIA SCITULA, H. Ad. (Pl. XIX. fig. 18.)

A. testa subulata, solidiuscula, subpellucida, politissima, alba, fascia suturali subdiaphana ornata; spira attenuata, sutura indistincta; anfr. 12, apicalibus 3 stiliinis, deinde planiusculis, ultimo rotundato; apertura subovali; labio incrassato, tenui, calloso; labro valde sinuato, vix incrassato.

Long. 10, diam. $3\frac{1}{2}$ mill.; ap. 3 mill. longa.

Hab. Borneo (*Coll. H. Adams*).

COLINA PYGMÆA, H. Ad. (Pl. XIX. fig. 19.)

C. testa pupiformi, tenuiuscula, flava, strigis fulvis nonnullis ornata; spira medio inflata, sursum convexo-turrita, apice obtusiuscula; anfr. 7, convexiusculis, longitudinaliter nodosoplicatis et transverse leviter striatis; plicis longitudinalibus in anfractu ultimo fere obsoletis, striis transversis, ad suturas moniliformibus, et fusco lineatis; anfractu ultimo $\frac{2}{5}$ longitudinis æquante, contracto, et in medio subangulato; apertura semi-ovali, canali brevi recurvo; columella obliqua, arcuata, oblique striata, vix callosa; labro valde expanso, extrorsum incrassato.

Long. 10, diam. 3 mill.

Hab. Borneo (*Coll. H. Adams*).

This species is another interesting addition to the small genus *Colina*. The species I lately described as *C. gracilis* I find has been since described by Mr. G. B. Sowerby under the name of *C. coarctata*.

Genus PARMELLA, H. Ad.

Testa haliotidea, tenuissima, epidermide cornea, extra testam producta; spira plana, vertice laterali; anfr. paucis, ultimo maximo; apertura ampla.

This peculiar form is probably closely allied to *Parmacella*; but the shell of the latter is shown in Cuvier's figure of the typical species (*P. olivieri*) to have a posterior, terminal and rather prominent apex. It is also somewhat similar to the South American genus *Peltella*, Beck (*Gæotis*, Shutt.), but differs in being more depressed, and in the horny polished epidermis with which it is furnished extending widely beyond the posterior part of the margin.

PARMELLA PLANATA, H. Ad. (Pl. XIX. fig. 20.)

P. testa depressissima, haliotidiformi, tenuissima, epidermide

luteo-fulva cornea politissima induta, extra marginem postice late expansa, strigis incrementi subuplicata; spira minutissima, plana, sutura distincta, vertice laterali, ad $\frac{1}{4}$ diametri maximi posito; anfr. 3, rapide accrescentibus, ultimo maximo, horizontaliter compresso, peripheria rotundato; apertura subhorizontali, ovato-lunari, spira intus conspicua.

Diam. maj. 15, min. 10 mill., epidermide exclusa.

Hab. Fiji Islands (*Coll. H. Adams*).

BULIMUS (MESEMBRINUS) GEALEI, H. Ad. (Pl. XIX. fig. 21.)

B. testa subperforata, oblongo-ovata, tenui, oblique striata, striis spiralibus rugosis decussata, nitida, straminea, fasciis fuscis interruptis plerumque ornata; spira conica, acutiuscula, sutura submarginata; anfr. 6, planiusculis, ultimo spiram subæquante, basi rotundato; apertura parum obliqua, ovali-oblonga; perist. simplici, recto, margine columellari superne appresso-reflexo, perforationem fere claudente, basali arcuato.

Long. 29, diam. 14 mill.

Hab. Mexico. Collected by Mr. Boucard.

9. Descriptions of New Species of Shells from Japan.

By ARTHUR ADAMS, F.L.S. &c.

(Plate XIX.)

1. AGADINA GOULDI, A. Ad. (Pl. XIX. fig. 22.)

A. testa vix umbilicata, helicoidea, subinflata, tenui, pellucida; anfr. 3 $\frac{1}{2}$, rapide accrescentibus; apertura obliqua, cucullata.

Diam. 1 $\frac{1}{2}$ mill.

Hab. Kino-Osima, in shell-sand.

This species is much smaller than *A. cucullata* of Gould, which he states is a quarter of an inch in diameter.

2. AGADINA STIMPSONI, A. Ad. (Pl. XIX. fig. 23.)

A. testa profunde umbilicata, planorboidea, deppressa, tenui, albida; anfr. 3 $\frac{1}{2}$, lente accrescentibus; apertura obliqua, campanulata.

Operculum tenuissimum, corneum, extus concavum, multispirale.

Diam. 1 mill.

Hab. Kino-Osima, in shell-sand.

This is much more depressed and planorbular than the former, and the umbilicus is deeper and more open.

MANGELIA SPLENDIDA, A. Ad. (Pl. XIX. fig. 24.)

M. testa elongato-fusiformi, solidula, subpellucida, nitida, longitudinaliter plicata plicis obtusis inæqualibus, spiraliter lineata lineis elevatis subdistantibus, postice prominentibus et validioribus munita; albida, maculis fasciisque interruptis ferrugineis ornata; spira turrita, apice submamilato, sutura im-

pressa; anfr. 11, convexiusculis; apertura subovali, $\frac{1}{3}$ totius longitudinis; columella rotundata, callo tenui induta; labro acuto, sinuato, extus valde varicoso, intus lœvigate; canali lato, brevi.

Long. 24, diam. 9 mill.

Hab. Gotto Islands, Japan.

The largest and most beautiful species of the genus.

Genus IOLÆA, A. Ad.

Testa tenuis, turbinato-turrita, umbilicata, seu rimata; anfractibus sculptis, convexis, transversim liratis; apertura ovata; plica parietali obsoleta aut celata.

I established this little group under the name of *Iole* in the 'Annals' for 1860, founding my diagnosis on a single specimen. Since then, however, I have succeeded in obtaining both *I. scitula* and another species, *I. amabilis*, in greater abundance; and I find that on breaking some examples the parietal plica exists, but is entirely concealed. In *I. amabilis* it is conspicuous externally. The description and natural position of the genus, however, I still consider correct. I have altered the termination of the word *Iole*, as there is a genus of birds under that name. The group differs from *Oscilla* in being thin and turbinated, with the axis more or less perforated, and with the parietal fold either obsolete or entirely concealed.

1. IOLÆA SCITULA, A. Ad. Annals, 1860.

Hab. Mino-Sima; Seto-Uchi; Akasi; Mososeki; Gotto.

2. IOLÆA SCULPTILIS, A. Ad.

Menestho sculptilis, A. Ad. Annals, 1861.

Hab. Mino-Sima; Yobuko.

In the young shells the axis is rimately umbilicated.

3. IOLÆA AMABILIS, A. Ad.

I. testa turbinato-turrita, rimata, alba, tenui, subdiaphana; anfractibus 6, convexis, transversim liratis, liris acutis, angustis, elevatis, distantibus, interstitiis longitudinaliter valde striatis, suturis canaliculatis; apertura acuminato-ovata, antice producta et effusa; labio libero, arcuato; plica parietali postica, parva, inconspicua.

Long. 3, diam. $1\frac{1}{2}$ mill.

Hab. O-Sima; Tanabe; Gotto, 48 fathoms.

A thin, semipellucid, exquisitely sculptured species, with channelled sutures.

Genus OSCILLA, A. Ad.

Testa solida, ovata seu pyramidato-turrita, imperforata; anfractibus transversim valde liratis; apertura ovata aut subquadrata; plica parietali valida, transversa, mediana.

1. OSCILLA LIRATA, A. Ad.

Odostomia (Evalea) lirata, A. Ad. Annals, 1860.
Hab. Sado; O-Sima; Seto-Uchi; Tsu-Sima.

2. OSCILLA SULCATA, A. Ad.

Odostomia (Evalea) sulcata, A. Ad. Annals, 1860.
Hab. Tsu-Sima; Mososeki.

3. OSCILLA CINGULATA, A. Ad.

Monoptygma cingulata, A. Ad. Annals, 1861.
Hab. Takano-Sima.

4. OSCILLA ANNULATA, A. Ad.

Obeliscus annulatus, A. Ad.; Sow. Thes. Mon. Obeliscus, pl. 171.
f. 26.
Hab. Mososeki; Yobuko.

5. OSCILLA CIRCINATA, A. Ad.

O. testa elongato-ovata, rimata, tenuiuscula, alba, semiopaca;
anfractibus normalibus 5, planis, cingulis transversis angustis elevatis regularibus ornatis, interstitiis longitudinaliter concinne striatis; apertura oblonga; plica parietali valida,
acuta, mediana, transversa; labro margine crenulato, intus sulcato.

Hab. O-Sima; Takano-Sima.

A very pretty semipellucid species, delicate in texture and neatly sculptured.

Genus AMAURELLA, A. Ad.

Testa parva, ovata, imperforata, alba, nitida, apice submammillato;
apertura acuminato-ovata; labio arcuato, simplici, subincrassato.

This little group of Japanese Mollusca will include a remarkable shell I described as *Macrocheilus japonicus*, but which appears to have greater affinities with *Amaura*. I now add diagnoses to two other shells, which seem to belong to the same type of form.

1. AMAURELLA GLABRATA, A. Ad.

A. testa ovata, imperforata, solidiuscula, alba, semiopaca, lœvi,
nitida; anfractibus 3, planiusculis, ultimo elongato, ampio;
apertura oblonga, antice producta, subacuminata; labio simplici, arcuato, subincrassato.

Hab. Takano-Sima.

2. AMAURELLA SEMISTRIGATA, A. Ad.

A. testa ovata, imperforata, solidula, semiopaca, alba, nitida,

vertice submamillato; anfractibus 4½, planiusculis, longitudinaliter oblique strigillatis, anfractu ultimo magno, superne glabro, inferne transversim striato, striis subdistantibus, conspicuis; apertura acuminato-orata; labio arcuato, incrassato, antice subplanato.

Hab. Kino-O-Sima.

Genus **PUTILLA**, A. Ad.

Testa turbinato-conoidalis, rimata, solida; apertura subquadrato-orbiculari; labio rectiusculo, incrassato, antice subeffuso, vix dilatato.

Founded on a little, solid, robust, subpellucid shell, which will neither be affiliated to *Eulima* nor any other recognized form.

PUTILLA LUCIDA, A. Ad. (Pl. XIX. fig. 25.)

P. testa candida, lœvi, glabra, sublucida, rimato-umbilicata, solida; anfractibus quatuor, convexis; apertura ut supra.

Hab. Gotto Islands: 54 fathoms.

FOSSARINA PICTA, A. Ad. (Pl. XIX. fig. 26.)

F. testa turbinata, deppressa, late umbilicata; spira parva; anfractibus 4, convexis, spiraliter liratis, liris simplicibus, æqualibus; lutescente, maculis irregularibus atro-purpureis variegata; anfractu ultimo magno, ad peripheriam rotundato; apertura orbiculata, patula; labio arcuato, acuto; labro postice dilatato, ascendente.

Diam. 3, alt. 2½ mill.

Hab. Tanabe; Kino-O-Sima: on the shore.

A species very similar in form to the type, *F. patula*, Ad. & Ang., from Port Jackson; but the liræ are equal and simple, the aperture is nearly circular, and the outline of the shell is more orbicular. It is marked with irregular purple-black radiating blotches, and the umbilical region is generally pale yellow.

AMATHINA NOBILIS, A. Ad. (Pl. XIX. fig. 27.)

A. testa capuliformi, solida, candida; apice mediano, dextrorsum inclinato, involuto, acuto; extus valde bicarinata; apertura subcirculari, ampla, margine posteriore dilatato.

Diam. maj. 25, min. 22, alt. 17 mill.

Hab. Cape Notoro, Island of Saghalien.

I found this very remarkable shell cast up on the shore after a gale, in company with *Pilidium commodum*, Middendorff, *Velutina coriacea*, Pallas, and many other fine molluscous exuviae. There are now three species of this group—*A. tricarinata*, Chem., *A. bicarinata*, Pease, and *A. nobilis*.

MACROCHISMA SINENSIS, A. Ad. (Pl. XIX. fig. 28.)

Animal very large and elongated, bearing the shell in a sloping

direction, obliquely upwards, on the fore part of the body. The tentacles are filiform and very long; and the eyes, large, black, and conspicuous, are on slight swellings at their outer bases. The front edge of the mantle is extended, and gives the appearance of a large veil over the head. The mantle is not developed, nor does it cover the shell as in some members of the *Fissurellidæ*, and neither the mantle-margin nor anal tube is fringed. The edge of the mantle is furnished with short papillæ, four on each side and two behind, which are recurved over the edge of the shell. The anal tube is elongate and cylindrical, and is directed backwards and a little upwards through the foramen in the shell. The foot, large and fleshy, is produced behind, and tapers to a point; it is ovate in outline, and the sides are simple and not furnished with cirri or papillæ, as is the case with some other genera of the family.

In progression the form of the foot varies considerably, sometimes being greatly dilated at the sides, and at others extended in front and contracted and pointed behind.

Hab. Tabu-Sima, Japan: dredged from 25 fathoms of water.

There are about a dozen species of this group already described, but the animal has not hitherto been figured. The tentacles are red; the eyes black, with a light areola; the body is light brown, lineated with darker brown.

Genus Cœlopoma, A. Ad.

Operculum elatum, conicum, concavum, corneum, lamina spirali cornea instructum. Testa subdiscoidea, late umbilicata; peristomate simplici, superne subangulato.

Cœlopoma JAPONICUM, A. Ad. (Pl. XIX. figs, 29, 29 a.)

C. testa turbinato-depressa, striata, castanea; spira vix elata, sutura profunda; anfractibus $4\frac{1}{2}$, convexis, cylindraceis, ultimo antice subdilatato, descendente; umbilico lato, profundo; apertura perobliqua, vix circulari, peristomate recto, superne subangulato.

Diam. maj. 14, min. 11, alt. $6\frac{1}{2}$ mill.

Hab. Tsu-Sima. On dead leaves among stones in shady woods and rocky places.

In this form of *Cyclophoridæ* the peritreme is similar to that of *Myxostoma* or *Cyclotus*, being nearly simple and continuous, and without the peculiar notch of *Pterocyclos*. The operculum, on the other hand, is very similar in form to that of *Pterocyclos*, being elevated, conical, and hollow; but whereas in *Pterocyclos* the spiral lamina is calcareous, and stands out horizontally from the margin of the whorls, in *Cœlopoma* it is horny and closely imbricate.

While the animal is on the move, the operculum, which is carried close to the body, is received into the cavity of the wide umbilicus, and the foot tapers into a point beyond. This is the same mollusk I described in the 'Annals' for 1861 as a species of *Pterocyclos*.

The following is a list of the species of *Cyclophoridae* found by me in Japan, with two exceptions :—

CYCLOTUS CAMPANULATUS, Martens.

Hab. Yokohama (*Martens*).

CYCLOTUS FORTUNEI, Pfr.

Hab. Tsu-Sima.

CŒLOPOMA JAPONICUM, A. Ad.

Hab. Tsu-Sima.

CYCLOPHORUS HERKLOTSI, Martens.

Hab. Tsu-Sima.

CYCLOPHORUS HALOPHILA, Bens., ? = *musiva*, Gould.

Hab. O-Sima.

JAPONIA BARBATA, Gould.

Hab. Tago.

JAPONIA CITHARELLA, Gould.

Hab. Sado.

ALYCÆUS JAPONICUS, Martens.

Hab. Tsu-Sima.

ALYCÆUS SPIRACELLUM, Ad. & Rve.

Hab. Tsu-Sima.

PUPINOPSIS RUFA, Pfr.

Hab. Japan (*Cuming*).

PUPINOPSIS MINDORENSIS, Ad. & Rve. = *japonica*, Mart.

Hab. Tsu-Sima.

DIPLOMMATINA EXIGUA, A. Ad.

Hab. Tsu-Sima.

TEREBRATULA DAVIDSONI, A. Ad. (Pl. XIX. fig. 30.)

T. testa ovato-globosa, lœvi, albida, laminis incrementi distinctis, irregularibus, ad basin validioribus; margine ventrali circulari; rostro producto, recurvato; foramine parvo, perfecto; deltidio parvo, concavo; apophysi simplici, $\frac{1}{3}$ longitudinis testæ superante.

Long. 18, lat. 14, alt. 11 mill.

Hab. Satanomosaki, Japan : 55 fathoms.

This is the fourth recent species of *Terebratula* (as restricted) known. It most resembles *T. uva*, from the Gulf of Tehuantepec, but differs from it in its more solid structure and more globose form, and in the foramen being smaller and entire.

DESCRIPTION OF PLATE XIX.

- Fig. 1. *Volvaria (Volvarina) pusilla*, p. 303.
 2. *Macrochlamys minima*, p. 303.
 3. — *perlucida*, p. 303.
 4. *Stylocerata (Erepta) rufocincta*, p. 303.
 5. — (*Erepta*) *nevilli*, p. 304.
 6. *Pupa (Pagodella) ventricosa*, p. 304.
 7. *Gibbus (Gibbulina) nevilli*, p. 304.
 8. — (*Gonidomus*) *newtoni*, p. 305.
 9. *Ennea (Gulella) modesta*, p. 305.
 10. *Cyclostomus (Tropidophora) mauritianus*, p. 305.
 11. — *scaber*, 306.
 12. *Omphalotropis costellata*, p. 306.
 13. — *picturata*, p. 306.
 14. *Cassidula parva*, p. 306.

- Fig. 15. *Plecotrema exigua*, p. 307.
 16, 16a. *Nanina (?Rotula) conulus*, p. 307.
 17. *Bulimulus (Ena) pusillus*, p. 307.
 18. *Apicalia scitula*, p. 308.
 19. *Colina pygmaea*, p. 308.
 20. *Parmella planata*, p. 308.
 21. *Bulimus (Mesembrinus) gealei*, p. 309.
 22. *Agadina gouldi*, p. 309.
 23. — *stimpsoni*, p. 309.
 24. *Mangelia splendida*, p. 309.
 25. *Putilla lucida*, p. 312.
 26. *Fossarina picta*, p. 312.
 27. *Amathina nobilis*, p. 312.
 28. *Macrochisma sinensis*, p. 312.
 29, 29a. *Cælopoma japonicum*, p. 313.
 30. *Terebratula davidsoni*, p. 314.

March 28, 1867.

George Busk, Esq., F.R.S., V.P., in the Chair.

The Secretary called attention to two fine specimens of *Boidæ* lately added to the Society's collection of living Reptiles, namely:—

1. A specimen of the Carpet-Snake of Australia (*Morelia variegata*, Gray), received from Queensland, purchased of a dealer.
2. A specimen of the Peruvian Boa (*Boa eques*, Eyd. et Soul.), from Guayaquil, presented to the Society by Prof. William Nation, of Lima, Peru, C.M.Z.S.

Mr. Sclater also called attention to the specimen of *Larus fuscescens*, Licht. (*Clupeilarus fuscescens*, Bp. Consp. ii. p. 221), living in the Society's Gardens, having been purchased, when in immature plumage, in 1859, out of a vessel coming from Mogador, and pointed out how very distinct, when seen alive and in full plumage, this bird was from its near allies *Larus fuscus* and *Larus argentatus*. The three species might be diagnosed as follows:—

L. argentatus. Major; pedibus pallide carneis: chlamyde cinerea.

L. fuscescens. Medius: pedibus læte flavis: chlamyde nigricanticeinerea.

L. fuscus. Minor: pedibus pallide flavis: chlamyde nigricante.

In his recently published 'Musée des Pays-Bas' (*Lari*, p. 15),



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