PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

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LIST OF PLATES.

* Err. *maseus* on Plate.

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January 14, 1869.

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

Mr. Sclater exhibited a skin of a *Spizaëtus*, which had been forwarded to him by Mr. Charles Rivington of Hong Kong, and which Mr. Rivington had had two years in captivity. The specimen appeared to be identical with that figured in Temminck and Schlegel's 'Fauna Japonica' as *Spizaëtus orientalis*, but was considered by Mr. J. H. Gurney, to whom Mr. Sclater had shown it, to be merely one of the numerous stages of plumage of *Spizaëtus nipalensis*.

An extract was read from a letter addressed to the Secretary by M. Alphonse Milne-Edwards, C.M.Z.S., relating to some interesting discoveries made by M. Grandidier, C.M.Z.S., in Madagascar:—"In digging in a little marsh in Amboulitsate (Ranou-bé) M. Grandidier had found a great number of bones belonging to a species of *Hippopotamus* much smaller than *H. amphibius*. He had found also bones of *Æpyornis* and of new species of Crocodiles and Tortoises."

Mr. Sclater exhibited specimens in spirits of a female and young Potto (*Perodicticus potto*), which Mr. Frederick M. Skues had obtained living on the west coast of Africa, and had endeavoured to bring home for the Society's Menagerie. Mr. Sclater read the fol-

lowing extract from a letter addressed to him by Mr. Skues relating to this animal:—

"The large Potto (the mother) was offered to me for sale, at Cape Coast, by a native, about the commencement of this year; but I declined it. On the 31st March he brought it again to me, with a young one which it had given birth to on the 8th February; and I bought them, and they remained in my rooms till the end of April, when I went to Accra. All the time at Cape-Coast Castle they kept in excellent condition, but I could not succeed in taming either of them. They used to sleep all day, the mother usually perched on the top of a door, with the young one hanging in front of her belly, clasping her with both fore and hind extremities. As soon as it was dusk they came down, and wandered about the room all night. For some time the mother carried the young one about at night hanging to her belly, but afterwards it used to travel about by itself. I fed them on pine-apples and bananas, with water; milk and bread they would not eat. Though there were insects about the room, as is the case always in tropical climates, I never detected them eating them; but one day I found the large Potto busily munching at a tray of beetles I had drying, and before I detected her she had eaten a good many. At Accra I was unable to afford them the same liberty as at Cape-Coast Castle, and, moreover, being constantly ill with fever, was unable to pay them as much attention as formerly. On the 9th July the young one died, aged 21¼ weeks, with all the symptoms of intermittent fever, of which it had experienced several previous attacks. The mother I took on board the steamer on the 7th August in tolerable condition; but being an invalid I was unable to look properly after her, and she died on the 20th, a little before we reached Teneriffe. The natives call the Potto "*Aposoro*," and seem much afraid of it."

A note was read from Mr. Charles Fraser, M.A., F.G.S., Christchurch, Canterbury, New Zealand, dated Sept. 5, 1868, relating to a female Seal (*Stenorhynchus* ——?) caught in the harbour of Lyttelton, Canterbury, New Zealand, in the month of August 1868. The worn state of the teeth indicated that it was an aged animal. Incisors $\frac{4}{4}$, canines $\frac{1-1}{1-1}$, molars $\frac{5-5}{5-5}$, in all 32. The total length was 11 feet 8 inches, and the girth at the thickest part of the body 6 feet. The nails were very small on the fore paws, and very small, but still present, on the hinder extremities. The whole body was covered with thin, sparse, longish hairs lying close to the skin. In colour the animal was grey above, with black flakes, and a brownish tinge all over the central part. On the sides the black spots were replaced by white flakes or spots; while the underpart of the body was light grey. The fore paws were white, with light grey flakes; the hinder extremities black, with light grey flakes. There was no tail, nor rudiment of one; the vertebral column terminated in a round compressed manner under the skin, which extended about 3 inches beyond it, so as to form the curve uniting the hinder extremities.

A communication was read from Mr. George Clark, of Mahéburg, Mauritius, Corr. Memb., on the Squill of Mauritius (*Squilla stylifera*). After a detailed account of the external characters of this group, Mr. Clark proceeded to observe as follows:—

"The Squills are mostly nocturnal animals, living in holes; hence it is not surprising that they are little known. It is evident at a glance that the position of their branchial apparatus renders it impossible for them to carry their eggs as Lobsters and Shrimps do; such an arrangement would stop their breathing. Cuvier states that he never saw one bearing eggs; and it was with no small satisfaction that, while making researches on the history and habits of these creatures, I learnt from Dr. Power he had seen this; and a few days after I had the satisfaction of witnessing it myself. The roe of the Squill is very curious, and occupies the whole length of the body. The eggs when first extruded form a compact mass, which the female holds between the three pairs of jaw-feet. As this mass expands it forms a loose kind of tissue, somewhat similar to a fleece of wool. Little by little, as the eggs enlarge, the texture of the mass becomes looser, until the larvæ are hatched and swim off to shift for themselves. In the first period of incubation, if I may so call it, the female will hold her eggs even when caught; but the further advanced they are the more readily does she drop them, possibly on account of their cohering less firmly. I believe the female must fast while carrying her eggs; for I have found the stomachs of those taken at that period quite empty, but generally full at other times. When first hatched the larvæ are of a delicate yellowish green, and are very active. As they grow they assume a mottled grey, and the swimmerets and legs become pea-green. The green gradually increases in brightness; but it is not till they have reached a length of three inches that the colours of the adult appear. The male is then of a beautiful bluish green, with the jaw-feet, the swimmerets, and the branchiæ, as well as the antennæ and the fimbriæ which border the different organs, of a cherry-red. The female is clouded with brown and grey, presenting much the appearance of tortoiseshell, and the red about her is much less vivid than in the male. The young Squills inhabit holes in the sand, near low-water mark. The old ones are never found here, but reside in the patches of coral which are scattered over the shallows. Both old and young have invariably two entrances to their holes; and the adults always stop these with a plug of fine seaweed. They do not swim swiftly; and in places where the water is not deep enough for them to swim their principal organs of progression are their large jaw-feet, which they thrust forward as a man would do striving to get along on the points of his elbows. I believe these limbs also serve them to make their holes, as they are often considerably worn on the joints. The motions of the Squill are very different from those of a Shrimp or a Lobster, being much more like those of a caterpillar; hence the little Creoles call the young ones 'Chenilles de mer.' The extensor muscles seem to act much more powerfully than the flexors; and it is by the former that the vigorous motion is produced which inflicts

such terrible wounds with the tail. I have seen one literally split the end of a person's finger, and another wound the hand through a thick leather glove. I believe the Squills to be, as Cuvier supposed, carnivorous. I have carefully examined the stomachs of some, and have always found them to contain the remains of small crustaceans, but no vegetable matter. Their flesh is excellent; but the great strength of their integument renders it difficult to detach it. The most extraordinary circumstance in the distribution of the branches of the heart is that it has no apparent connexion with the antennæ or the eyes.

"This beautiful creature would be a great ornament to an aquarium; but, unfortunately, I have never been able to keep an adult specimen alive more than a few hours after it was caught, though using every precaution—placing it in a vessel as soon as it was taken from the sea, and renewing the water at short intervals. When young I have preserved them for days, and might, perhaps, have preserved them indefinitely had I persevered in the attempt. I have known them exist in full vitality for twelve or fifteen hours without water."

Mr. George Dawson Rowley, F.Z.S., exhibited, and read the following remarks upon, a specimen of a rare Asiatic Thrush (*Turdus atrogularis*, Temminck) recently killed in this country, this being its first recorded appearance in the British islands:—

"The specimen of *Turdus atrogularis* was shot near Lewes, Sussex, on December 23rd, 1868. It is a young male, as shown by its plumage; dissection also confirmed the fact. I saw the bird in the flesh, and took particular care to ascertain its history, because it belongs to the fauna of Central Asia, and is only an accidental visitor to Europe. To find such a species on the south coast of England appears to me a matter of considerable interest. It is now in the collection of T. J. Monk, Esq., of Mountfield House, near Lewes, who purchased it for a trifle of a working-man."

The following papers were read:—

1. On the Value of the Characters of the Base of the Cranium in the Classification of the Order Carnivora, and on the Systematic Position of *Bassaris* and other disputed Forms. By WILLIAM HENRY FLOWER, F.R.S., F.Z.S., &c., Conservator of the Museum of the Royal College of Surgeons.

The Order Carnivora has always been an attractive one to zoologists; and consequently nearly all the important structural modifications which occur among its members are so well known that it is surprising that there is not yet a more universal accord of opinion upon their arrangement and mutual affinities.

Too exclusive attention has been paid to the characters of the teeth in defining the family divisions of the order. The difficulty in the taxonomic use of these organs arises from the fact that the teeth of all the members of such a limited and well-defined group as the terrestrial or fissipedal Carnivora are formed on the same general type, but with infinite modifications of this type. And as these modifications are mainly adaptive and not essentially indicative of affinity, they reappear in various degrees and combinations in many of the great natural divisions of the order. Thus, as will be shown further on, teeth alone afford us no satisfactory means of diagnosis between the very distinct groups of the *Procyonidæ* and the *Viverridæ*. The teeth of *Proteles*, though demonstrating undeniably its right to a place in the order, are so rudimentary or generalized that they afford no help whatever to determine its special position. Again the teeth of *Gulo* are so similar to those of *Hyæna*, that if this character alone were used, these two otherwise widely differentiated forms would be placed in the closest proximity. *Enhydris*, among the Mustelidæ, and *Cynogale*, among the Viverridæ, might also be cited as examples of strangely modified dentition, with comparatively little corresponding change in other parts.

Rather more than twenty years ago the late Mr. H. N. Turner*, in a paper read before this Society, pointed out the importance of certain structural peculiarities of the base of the cranium in the classification of the Mammalia, and especially demonstrated the constancy of these characters in the various members of the natural divisions of the order Carnivora†. Very few subsequent zoological writers, however, have followed out the indications suggested in that communication; and Mr. Turner's views as to the position of certain disputed forms, and the general relationship of the groups one to another, have not by any means met with universal acceptance.

It seems desirable therefore to test whether the characters chiefly relied upon by Mr. Turner really have the value which he attributed to them. In endeavouring to do this I shall find it necessary to give a more detailed description than the limits of his paper allowed, to supply a larger number of illustrative examples, and, while fully recognizing the great merit of his observations, may find myself occasionally obliged to differ from the conclusions which he deduced from them.

It may be objected at the outset that such an investigation cannot be worth the pains bestowed upon it, as any classification founded solely or even mainly on one limited portion of the organization must necessarily be an artificial one. But if it can be proved that the modifications of any one part are always correlated with important variations in several other and quite unconnected portions of the organization, it is obvious that its study will become of great practical

* This original and accurate observer fell a victim to his zeal for his favourite science, having died in 1851 from the effects of a dissection-wound.

† "Observations relating to some of the Foramina in the Base of the Skull in Mammalia, and on the Classification of the Order Carnivora," by H. N. Turner, jun. (P. Z. S. 1848, p. 63).

utility to the zoologist; and this will be more especially the case when the part in question is one so imperishable, so easy of examination, and affording indications so clear and capable of ready definition and description, as the base of the skull.

In order not to extend this communication to too great length, or over too great a variety of subjects, I propose to limit my observations on the present occasion mainly to the terrestrial or fissipedal Carnivora, and only to those genera now existing. My reason for this last restriction is, that it is only in these that we have the opportunity of thoroughly working out all the important points of structural modification throughout the system, and thus definitely assigning their position; and from these only can we hope to establish any correlation between the structure of the hard and imperishable parts and the viscera. When such a correlation has been established, then the examination of the fragmentary remains of the extinct forms can be made with much greater advantage, and the work of tracing the stages by which the present condition of the order has come into being can be approached with more probability of a satisfactory result.

The region to which attention will now be especially directed is the posterior part of the base of the cranium, the most conspicuous feature in which, in all Carnivora, is the auditory bulla; and it is mainly the characters of this bulla, and the structures immediately surrounding it, which will be described in the principal genera of the order.

Following Mr. Turner's example, I will first take one of the extreme forms of existing terrestrial Carnivores, the Bear.

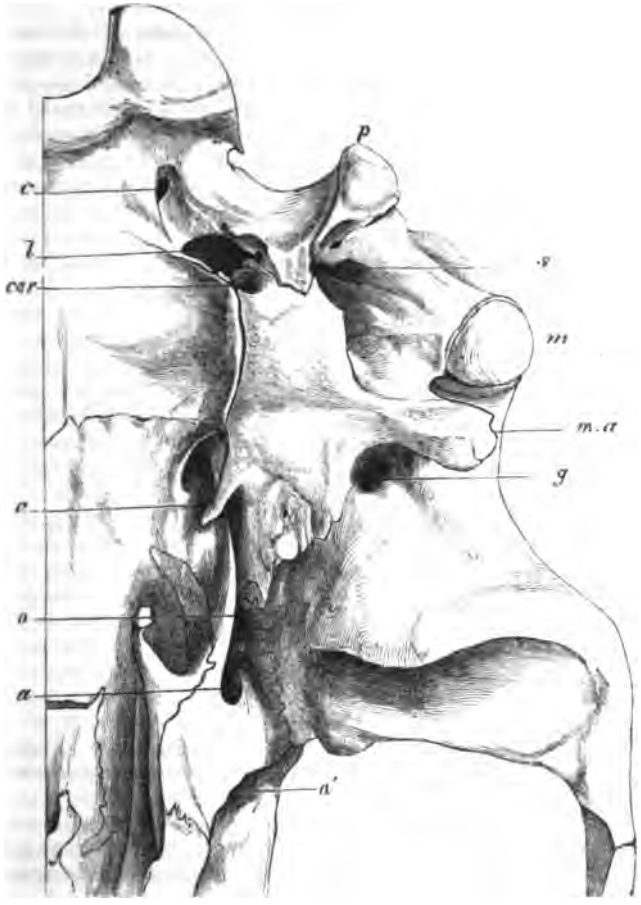
Figures 1 and 2 (pp. 7 & 8) are taken from the skull of a not quite adult *Ursus ferox* in the Museum of the Royal College of Surgeons (No. 4016).

The auditory bulla is comparatively little inflated. It consists of a single bone, readily detached from the cranium in skulls of young animals. Its form is more or less triangular, being broad and nearly straight at the inner edge, and prolonged outwards into the much produced floor of the external auditory meatus (*m.a*). Its greatest prominence is along the inner border; from this it gradually slopes away towards the meatus. Near the hinder part of the inner edge is a considerable circular foramen (*car*), which pierces the bone obliquely, leading to a canal which runs forwards in an arched direction, in its inner wall. This is the carotid canal. In old Bears the entrance is partly concealed by the prominent lip of the basioccipital, which abuts against the inner edge of the bulla; and by the growth of this and of the paroccipital process it becomes almost included in the deep fossa leading to the foramen lacerum posticum (*l*). Anteriorly the carotid canal of the bulla ends close to the inner side of the groove for the eustachian tube; and the artery quitting it takes a sudden turn upwards and backwards and enters the cranium through the foramen lacerum medium.

When a section is made through the auditory bulla (see fig. 2, p. 8) it is seen to be a simple thin-walled bony capsule, imperfect above, where it fits on to the petrosal and squamosal bones, and prolonged

externally into the much thickened spout-like floor of the meatus externus. At the inner extremity of this floor is a freely projecting oval lip (*t*), which gives attachment to the membrana tympani, and

Fig. 1.



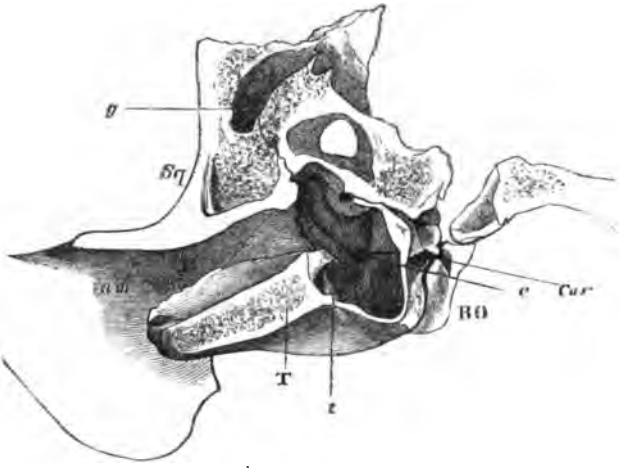
Part of the base of the skull of the Grizzly Bear (*Ursus ferox*).

c. The condyloid foramen. *l*. The foramen lacerum posticum. *car*. The carotid canal. *e*. The eustachian canal. *o*. The foramen ovale. *a*, the posterior, and *a'* the anterior, opening of the alisphenoid canal. *p*. The paroccipital process. *m*. The mastoid process. *s*. The stylo-mastoid foramen. *m. a*. The external auditory meatus. *g*. The glenoid foramen*.

* This and all the figures, except figs. 9, 10, and 14, are taken from specimens in the Museum of the Royal College of Surgeons. All are of the natural size, except fig. 4, which is enlarged.

which is the original and first ossified ring-like portion of the tympanic bone. In the front of the floor of the bulla is the groove for the eustachian canal (*e*); between this and the anterior part of the tympanic ring, a low and thin ridge of bone with a concave free margin rises from the floor of the cavity. This is the only indication of any septum or division of the cavity of the bulla. Whether the whole of this bone is developed from the original tympanic, or whether the bullate inner portion is (as will be shown to be the case in some other Carnivora) ossified from a distinct cartilage of its own, I am not at present able to determine. In the youngest Bears' skulls that I have examined, the ossification of the whole bulla is continuous with that of the tympanic ring and floor of the meatus.

Fig. 2.



Section through the auditory bulla of *Ursus ferox*.

Sq. Squamosal bone. *T*. Tympanic bone. *BO*. Basioccipital. *g*. Glenoid canal. *a.m*. External auditory meatus. *t*. Tympanic ring. *e*. Eustachian canal. *car*. Carotid canal.

Behind the bulla (fig. 1, p. 7) the prominent and tuberous paroccipital process (*p*) projects downwards, outwards and backwards, standing quite off from the bulla, and only connected with it by a low laterally compressed ridge. Between the paroccipital process and the occipital condyle is a smooth concave surface, the front of which is excavated into a deep notch, the posterior boundary of the foramen lacerum posticum (*l*), between which and the condyle is the distinct subcircular foramen condyloideum (*c*), which transmits the hypoglossal nerve.

At the outer side of the bulla, just behind the meatus auditorius externus, the mastoid process (*m*) is distinct and prominent, and widely separated from the paroccipital. At the bottom of a deep

hollow between these processes and the bulla is placed the stylo-mastoid foramen (*s*), through which the facial nerve makes its exit from the cranium*.

Immediately in front of the commencement of the meatal prolongation of the tympanic, at the base of the postglenoid process of the squamosal is a conspicuous opening called foramen glenoideum (*g*), which leads to a venous canal which runs upwards and backwards into the lateral sinus.

Still more forward, immediately to the inner side of the glenoid fossa, is the foramen ovale of the alisphenoid (*o*), transmitting the third branch of the fifth nerve, and bounded and partly covered on the inner side by a strong ridge of bone. Close in front of this is the hinder aperture of the large canal (*a*), bridged over by a lamina of bone from the alisphenoid, to which Mr. Turner has particularly directed attention under the name of "alisphenoid canal." Through this the ectocarotid artery runs for a part of its course. It opens in front by a common aperture with the foramen rotundum (*a'*).

With this the list of the parts to which it is necessary to refer at present concludes. The description just given will apply, with trifling modifications, to all known species of the genus *Ursus*, including the subgenera *Thalassarctos*, *Helarctos*, and *Prochilus*.

Passing to the animals usually considered most nearly allied to the Bears, *Procyon* (fig. 3, p. 10) has the auditory bulla more dilated and prominent, it is true, than in *Ursus*, but with the same general form, *i. e.* rising abruptly on the inner side, most prominent near the middle of the inner edge, sloping off behind and before this point, and flattened at the outer side, where it is continued into the prolonged under lip of the auditory meatus. Moreover it is simple within, undivided by any distinct septum; on looking into the meatus the opposite wall can be distinctly seen, or a probe can be passed to it without meeting with any impediment.

The aperture of the carotid canal (*car*) is large, and rather more advanced and more distinct from the foramen lacerum posticum (*l*) than in the Bears. The paroccipital process (*p*) stands away from the bulla; the mastoid (*m*) is very distinct. The condyloid foramen (*c*) is freely exposed on the surface, and quite distinct from the foramen lacerum posticum. The glenoid foramen (*g*) is large and conspicuous, though somewhat overlapped by the margin of the tympanic bone. The alisphenoid canal is completely wanting; this is the most important distinction from the true Bears.

In *Nasua* the bulla is still more rounded and prominent; indeed its resemblance to that of the Bear is chiefly in its simplicity, and in the prolongation of the auditory meatus. The carotid foramen is advanced to the middle of the bulla. The paroccipital and mastoid processes, and condyloid foramina, are as in *Procyon*. The glenoid foramen is more conspicuous. There is no alisphenoid canal.

Cercoleptes presents a great difference from *Nasua* and *Procyon*

* The modifications of this foramen in situation will not be noticed hereafter, as they depend simply on the amount of inflation of the external portion of the bulla.

in the form of the auditory bulla—it being more like that of *Ursus*, except that it is rather longer from before backwards, and slightly more bullate. The carotid foramen, however, differs widely in its position from that of the Bear, being placed very conspicuously rather in front of the middle of the inner edge of the bulla. The paroccipital and mastoid processes are not much developed, partaking of the general flattening that the base of the cranium seems to have undergone, but they occupy the same relative position as in the

Fig. 3.

Fig. 3*a*.

Fig. 3. Under surface of the skull of the Raccoon (*Procyon lotor*).
3*a*. Under surface of the skull of *Bassaris astuta*.
(The letters as in fig. 1.)

foregoing genera. The first-named is much compressed and turned backwards. The condyloid foramen is conspicuous; but the glenoid foramen, though present, is reduced to a mere slit by the overlapping of the tympanic bone and shortness of the postglenoid process. The alisphenoid canal is absent.

In the singular genus *Ailurus* the auditory bulla is very small and simple, prominent and rounded on the inner side, with a very prolonged bony floor to the external auditory meatus. The carotid canal is large and distinct, rather behind the middle of the inner edge of the bulla. Paroccipital process long and trigonal, standing backwards and outwards, quite unconnected with the bulla, curved inwards at the extremity in old animals. The condyloid foramen is distinct in a flat exposed surface between the paroccipital and condyle. There is a well-developed rounded mastoid process, quite distinct from the paroccipital. The glenoid foramen is large, situated between the inner end of the tympanic meatus and the most prominent part of the large postglenoid process. There is a distinct alisphenoid canal.

To pass to the *Mustelidæ*:—*Lutra* is extremely Ursine in the base of its skull, although all the bones (including the auditory bulla) are remarkably thinned-out and flattened. The meatus is much prolonged. The carotid foramen is placed rather nearer the anterior than the posterior part of the inner edge of the bulla. The glenoid foramen is very distinct. The cavity of the auditory bulla (as is the case with many of the *Mustelidæ*) is divided into several freely intercommunicating cells by thin incomplete bony septa placed transversely across the floor of the bulla, and connected at their outer end with the tympanic ring. The paroccipital process is greatly compressed from before backwards. The mastoids are prominent laterally. The foramen lacerum posticum very large. There is no alisphenoid canal.

Enhydris differs from *Lutra* chiefly in the large size and more posterior position of the carotid foramen, and the very small size of the glenoid foramen.

Meles presents, in the most characteristic manner, the form of auditory bulla assigned by Mr. Turner to this group, "rising suddenly on its inner side, and flattened off towards the meatus." Internally it has two transverse imperfect septa rising from the floor. The meatus is considerably prolonged. The paroccipital and mastoid processes are very well developed and far apart, the former rather compressed and pointed, the latter tuberous. The carotid foramen is placed rather behind the middle of the bulla. The condyloid foramen is small, its hinder border partially overlapped by a slight ridge of bone passing from the paroccipital process to the condyle; but it is quite superficial and distinct from the foramen lacerum posticum. The glenoid foramen is distinct, though not very large. There is no alisphenoid canal.

Taxidea differs from *Meles* in the remarkably inflated condition of the auditory bulla. Essentially, however, its characters are much the same; the bulla is not so dilated at its hinder part as to come into contact with the paroccipital process, though in front it reaches to such an extent as to overlap and obscure the glenoid foramen. It has several partial transverse septa.

In *Mephitis*, on the other hand, this region of the skull is nearly as much expanded and flattened as in the Otters. The bulla forms a very small prominence. The paroccipital process is widely separated

from it; and the mastoid projects directly outwards. The bony meatus is of considerable length. The carotid foramen is large, placed at the middle of the inner border of the bulla. The condyloid foramen is large and quite exposed. The glenoid foramen is represented by a small hole just above the superior anterior angle of the meatus externus.

In *Helictis* the auditory bulla is elongated from before backwards, the hinder part, near the paroccipital process, being more inflated than usual; consequently this process, which is but feebly developed, does not stand so far off from the bulla as is usual in the group. The meatus is moderately produced. The carotid foramen is conspicuous at the middle of the inner border of the bulla. The condyloid foramen is partially concealed and thrown forwards by the ridge extending inwards from the paroccipital process. The glenoid foramen is placed above the auditory meatus. On the whole these parts exhibit a more generalized and less characteristic form than in most other members of the group.

Arctonyx has the base of the skull very flat and expanded laterally. The bulla small, but elevated and rounded near the inner edge. Floor of meatus very long, wide, and flat. Canal of meatus large, directed somewhat downwards and forwards as well as outwards. Carotid foramen large, placed near the hinder part of the bulla. Paroccipital process well developed, quite distinct from the bulla, flattened from before backwards, curving forwards at the extremity. Mastoid very large, flattened and rough behind, rounded and smooth in front, projecting outwards, downwards, and forwards. Glenoid foramen distinct. Postglenoid process rather small. No alisphenoid canal. Great peculiarities in the base of the skull are the remarkable extension of the bony palate backwards, reaching as far as the glenoid fossæ, and the lateral bullate expansion of the palate-bones behind the last molar tooth.

Mydaus presents the same general characters as *Arctonyx*; but, as might be expected in a smaller animal, the bulla is rather more inflated, the paroccipital and mastoid processes less developed, and the meatus less elongated. The palate also does not extend so far backwards, and wants the peculiar lateral dilatation.

In *Gulo* the auditory bulla is like that of the Bear, but rather more dilated. It contains several partial transverse septa. The meatus is much prolonged. The carotid canal is rather behind the middle, and almost completely concealed by the thickened edge of the basi-occipital. The condyloid foramen has a strong ridge behind it, and approaches very near to the foramen lacerum. The paroccipital process is compressed and triangular. The mastoid is very strong, and directed laterally, though turned downwards at the extremity. The glenoid foramen is conspicuous. There is no alisphenoid canal.

All the remaining genera have the auditory bulla rather large, and the floor of the meatus, though forming a distinct prolongation from the bulla, comparatively short.

In *Mellivora* the bulla is very prominent, oval, thick-walled, and rough on the surface. The paroccipital process is stout and trian-

gular, the mastoid process strong and rounded. The carotid foramen conspicuous, near the middle of the inner border of the bulla. The condyloid foramen not bounded posteriorly by a ridge. The glenoid foramen large, close to the anterior edge of the meatus externus.

In *Galera* the bulla is less prominent, the carotid foramen partly concealed by the basioccipital. The glenoid foramen large, and rather more internally placed than in the last.

In *Martes* the bulla is elongated from before backwards. The paroccipital and mastoid processes are small. The carotid foramen is partly concealed by the basioccipital. The condyloid foramen partially overhung posteriorly by the ridge from the paroccipital. The glenoid foramen large, situated at the upper anterior angle of the auditory meatus.

In *Mustela* the dilatation and elongation of the bulla is carried to a great extent. The meatus is directed much forwards, and appears externally to be very short; but this is occasioned (as shown in the transverse section, fig. 4) by its inferior lip being covered up by a thick layer of cancellous tissue, of which the whole parietes of the bulla are to a great extent composed, and which adds much to its external bulk. But for this peculiarity, the general form of the cavity is not unlike that of *Ursus*. In addition to this cancellous structure in the wall, a considerable portion of the interior, especially of the inner and lower parts, is pervaded by numerous fine osseous septa and trabeculæ. The paroccipital and mastoid processes are very feebly developed, especially in the smallest members of the group, where they are flattened and lost on the expanded posterior end of the bulla. The carotid foramen is placed conspicuously at, or rather in front of, the middle of the long straight inner wall of the bulla. The condyloid foramen is quite exposed, and distinct from the foramen lacerum. The glenoid foramen is tolerably large, and situated just in front of the external auditory meatus. As in the preceding genera, there is no alisphenoid canal.

Fig. 4.

Section through the auditory bulla of the Polecat (*Mustela putorius*). Twice the size of nature.

(The letters as in fig. 2.) *Pt.* The petrosal.

In *Rhabdogale* the form of the auditory bulla externally much resembles that of *Mustela*, though rather less inflated; but a section shows that its walls want the peculiar cancellous structure noticed in

that genus. There are only a few partial septal bands across the floor, as in the Badgers. The anterior inferior extremity of the bulla is pointed, and commonly united to the prolonged hamular process of the pterygoid.

The whole of the genera above described are united by Mr. Turner into one family, *Ursidæ*; and that they constitute a natural group, I think no one should doubt, even on grounds independent of their cranial characters. They all agree in having the intestinal canal without a cæcum, all other known Carnivora possessing this appendage. Moreover they all agree together, and differ from all other Carnivora, in the structure of the generative organs of the male, parts of considerable value in determining affinities. They all have a large penis, with a very considerable bone, which is usually more or less curved, somewhat compressed, not grooved, dilated posteriorly, and often bifurcated, or rather bilobed, in front. They are all destitute of Cowper's glands. All have the prostate rudimentary, or consisting only of a thickening of the wall of the urethra and forming no distinct prominence.

Among all the diversity that has been shown to exist in the characters of the base of the cranium, especially in the form of the auditory bulla, the following points of general agreement are to be found:—

1. The cavity of the bulla is simple (as compared with another form to be described presently). That is, although there are frequently trabeculæ or partial septa passing mostly transversely across the lower part, and generally connected with the tympanic ring, there is no distinct and definite septum dividing it into a separate outer and inner character. In all cases, on looking into the external auditory meatus (in the dried skull when the membrana tympani is removed) the opposite wall of the bulla can be seen; or if a probe is passed into the meatus, no obstacle will prevent its touching the inner wall. Whatever the diversity of development of the bulla, it always has its greatest prominence near the middle of the inner border, and slopes away from that point, not only externally, but also forwards and backwards.

2. The inferior lip of the external auditory meatus is always considerably prolonged.

3. The paroccipital process is more or less triangular, and directed backwards, outwards, and downwards, standing quite aloof from the bulla. This relation depends chiefly on the want of development of the posterior portion of the bulla; and is absent, or obscure, in *Mustela* alone.

4. The mastoid process is widely separated from the paroccipital, and generally very prominent.

5. The carotid foramen is always large, and placed usually near the middle, but sometimes more posteriorly, on the inner margin of the bulla. It is generally very conspicuous, but sometimes partially concealed by the projecting lip of the basioccipital.

6. The condyloid foramen is distinct and exposed; and although sometimes partially overlapped posteriorly by a ridge of bone passing

from the paroccipital to the condyle, it is never sunk into a common opening with the foramen lacerum posticum.

7. The glenoid foramen is always present, and generally very conspicuous. In *Enhydris* it is least so.

8. The alisphenoid canal is present in the true Bears and *Ailurus*, absent in all the others. Hence it cannot be used to characterize the entire group, though useful in aiding its subdivision.

The group thus defined is, I think, too extensive, and presents too great variation among its members, in dentition and external characters, to constitute a Family, as proposed by Mr. Turner. I would rather regard it as a primary section of the fissipedal Carnivora, to which the name of ARCTOIDEA might be given.

I perfectly agree with Mr. Turner that it is further divisible into four chief sections, or families, as I should call them—the *Ursidæ*, *Ailuridæ*, *Procyonidæ*, and the *Mustelidæ*. The further consideration of these divisions must be reserved for the present, my purpose now being to establish the group *Arctoidea* upon a perfectly secure basis.

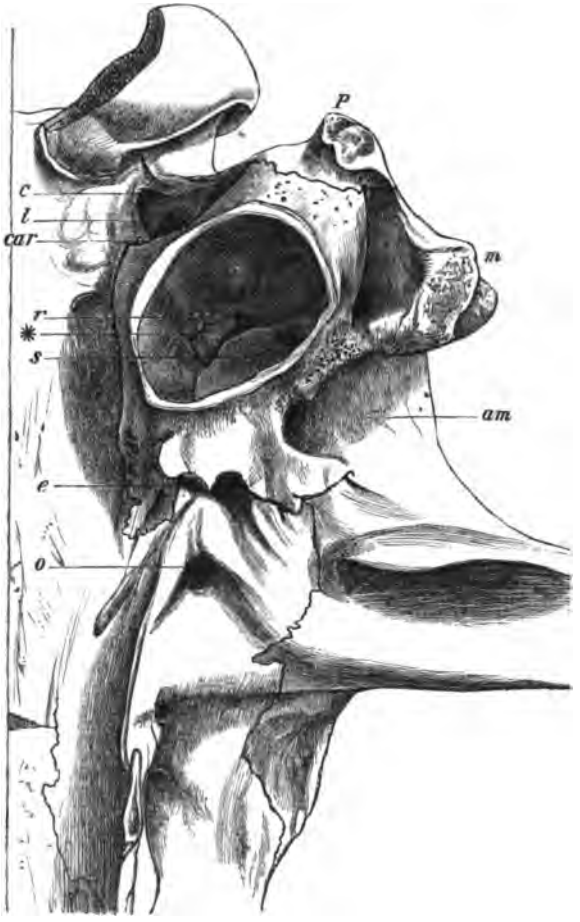
I will now pass to a genus as far removed from the Bear in its general structure as it will be seen to be in the construction of the base of its skull, *Felis*. Figs. 5 and 6 (pp. 16 & 17) are taken from the Tiger (*F. tigris*).

The auditory bulla is very prominent, rounded and smooth on the surface, rather longer from before backwards than transversely, its greatest prominence being rather to the inner side of the centre. The lower lip of the external auditory meatus (*a.m*) is extremely short; the meatus, in fact, looks like a large hole opening directly into the side of the bulla. On looking into this hole, at a very short distance (in fact, just beyond the tympanic ring) a wall of bone is seen, quite impeding the view or the passage of any instrument into the greater part of the bulla. On making a section (fig. 6), it will be seen that this wall is a septum (*s*) which rises from the floor of the bulla, along its outer side, and divides it almost completely into two distinct chambers; one (*o.c*), outer and anterior, is the true tympanic chamber, and contains the tympanic ring, membrane, and ossicula, and has at its anterior extremity the opening of the Eustachian tube (*e*); while the other (*i.c*), internal and posterior, is a simple but much larger cavity, having no aperture except a long but very narrow fissure (*) left between the hinder part of the top of the septum and the promontory of the petrosal, which fissure expands posteriorly, or rather at its outer end, into a triangular space, placed just over the fenestra rotunda or cochlearea (*r*), so that the opening of this fenestra is partly in the outer and partly in the inner chamber of the bulla. This chamber is formed by a simple capsule of very thin but dense bone, deficient only at a small oval space in the roof, where the petrosal projects into and fills up the gap, except such portion of it as is left to form the aperture of communication with the outer chamber.

Not only are these two chambers thus distinct, but they are originally developed in a totally different manner. At birth the only ossification in the whole structure is the incomplete ring of bone sup-

porting the membrana tympani, and developed originally in membrane. Ossification extends from this, so as to complete the outer chamber and the very limited lip of the meatus auditorius externus. The inner chamber is formed from a distinct piece of hyaline cartilage, which at birth is a narrow slip, pointed at each end, lying between the tympanic ring and the basioccipital, applied closely to

Fig. 5.

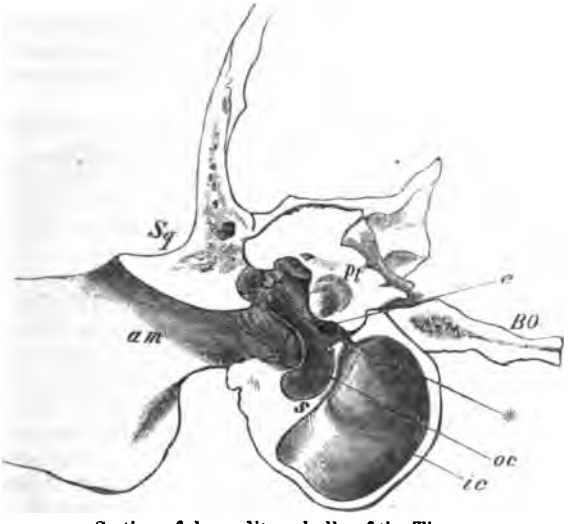


Part of the base of the skull of the Tiger (*Felis tigris*). A portion of the auditory bulla has been removed to show its interior. The cavity of the inner or posterior chamber is exposed.

r. The fenestra rotunda in the petrosal. *s*. The septum between the chambers. * The aperture of communication. The other letters as in the preceding figures.

the surface of the already ossified petrosal, and forming no distinct prominence on the under surface of the skull*. Soon after birth this increases in size, and gradually assumes the bullate form of the wall of the inner chamber. In young animals, even some time after the ossification of the bulla is complete, the distinction between the two parts is clearly seen externally; not only are they marked off by a groove, but the tympanic portion has a more opaque appearance than the other.

Fig. 6.



Section of the auditory bulla of the Tiger.

o c. The outer chamber. *i c.* The inner chamber. *s.* The septum. * The aperture of communication between the chambers. The other letters as in the preceding figures.

The septum is formed by an inversion of the walls of both, applied together and ultimately perfectly fused in *Felis*, although, as will be seen, permanently distinct in some other allied forms†.

No indication of a carotid foramen can be seen anywhere on the

* The cartilage from which the auditory bulla of the *Felidæ* is developed evidently corresponds with that lamella of the "opisthotic" of Man which "gradually wraps itself round the carotid, and so converts the primitive groove for the vessel into a complete tube, at the same time furnishing the inner part of its floor to the tympanum" (Huxley, Elements Comp. Anatomy (1864), p. 155).

† These parts are all described in great detail in Straus-Durckheim's 'Anatomie du Chat' (1845), vol. i. pp. 409 *et seq.* He calls the outer chamber the "caisse du tympan, the inner one the "cavité mastoïdienne," or "seconde chambre de la timbale," regarding it as the "analogue" of the mastoid cells of man. This part, he says, "ne commence que par un seul point d'ossification qui ne paraît même que quinze jours après la naissance; et à six semaines il est entièrement formé, et a articulé avec tous les os voisins." The septum, or "cloison," is "commune aux deux os, formée par deux lames adossées et soudées entre elles."

inner side of the bulla, where it was so conspicuous in most of the Arctoidea, but it is represented by a minute groove (*car*) deep in the recess of the foramen lacerum posticum. In the smaller members of the genus this groove is more superficial, but always very minute, and apparently never converted into an actual foramen except by the contiguous wall of the basioccipital.

The paroccipital process (*p*) is flattened out over the back of the bulla, being applied closely to the whole of its prominent rounded hinder end, and projecting, as a rough tubercle, slightly beyond it. From the inner side of this process a strong sharp ridge runs towards the occipital condyle. This forms the posterior boundary of a deep fossa, at the bottom of which is the foramen lacerum posticum (*l*), and in the hinder part of which, under cover of the aforesaid ridge, the foramen condyloideum (*c*) opens.

The mastoid process (*m*) is a moderately conspicuous rough prominence, not very widely separated from the paroccipital.

There is no distinct glenoid fossa, nor is there an alisphenoid canal.

This description applies equally well to all the true cats (genus *Felis*), including the slightly aberrant Cheetah, but not to any other members of the Order.

I pass next to the *Viverridæ*.

In the African Civet (*Viverra civetta*) (fig. 7, p. 19) the auditory bulla is very prominent, smooth and oval, broader behind than before. The meatus has scarcely any inferior lip, its orifice (*a m*) being close to the tympanic ring. The part of the bulla immediately surrounding the meatus is separated by a distinct groove from the much larger, more inflated, and more transparent inner, or, rather, *posterior* part, as it is in this animal. There is a septum within, disposed exactly as in *Felis*, but very short, owing to the small space it has to fill up, occasioned by the slight dilatation of the outer chamber. It is applied closely to the petrosal above, leaving a mere linear fissure, probably closed in the living animal, expanded at one end into a small triangular space, situated just over the fenestra rotunda.

Instead of a carotid canal, there is a groove (*car*) on the inner side of the bulla, near its anterior end.

The paroccipital (*p*) is triangular, spread very evenly over the hinder part of the bulla, applied to it "like the capsule of the acorn to the seed"*, and projecting slightly beyond it, as a rough pointed process. The ridge running from its inner side bounds the common fossa into which the condyloid foramen (*c*) and the foramen lacerum posticum (*l*) open.

The mastoid process can be scarcely said to exist. An extremely minute aperture near the hinder end of the postglenoid process may represent the glenoid foramen. There is a distinct alisphenoid canal (*a*).

In the Rasse (*Viverra malaccensis*) the bulla is large, as wide in front as behind, much elongated, narrow, and compressed laterally, corresponding, in fact, with the proportions of the entire cranium. Otherwise its structure is essentially the same as that of the Civet.

* Owen, Cat. Osteological Series in Mus. Roy. Coll. Surg. vol. ii. p. 680.

The anterior chamber is rather more developed, and less distinctly marked off externally from the posterior. The orifice of the meatus is very large, and opens directly into the tympanic cavity. The carotid enters by a distinct groove near the middle of the inner wall of the bulla, partially concealed and converted into a canal by the lip of the basioccipital.

The paroccipital process is smoothly expanded over the posterior part of the bulla, but does not project beyond it. The mastoid process is not very distinct. The condyloid foramen is much overhung by the ridge from the paroccipital. The glenoid foramen is very minute.

Fig. 7.

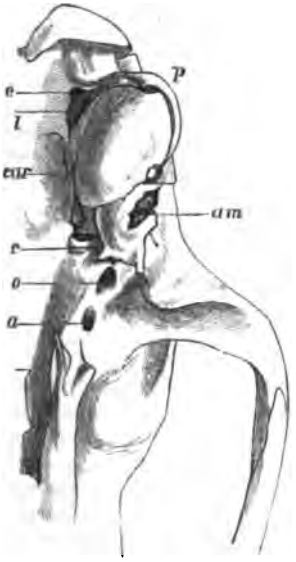


Fig. 8.

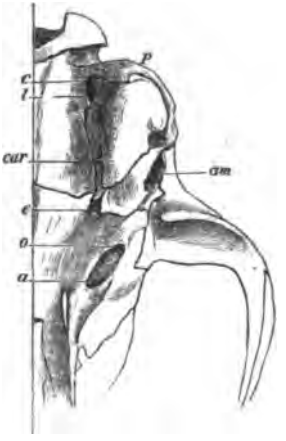


Fig. 7. Civet (*Viverra civetta*).
8. Paradoxure (*Paradoxurus hondar*).
(The letters as in the preceding figures.)

Mr. Turner remarked that in this species the alisphenoid canal is not developed; but I find, on examining a series of seven skulls in the Museum of the Royal College of Surgeons, that in one this canal exists on both sides, and in another on one side only; in the remainder it is absent.

In the true Genettes, which otherwise closely correspond to the Rasse in cranial characters, the alisphenoid canal appears to be always present.

In the Paradoxures (fig. 8) the external form of the bulla is more like that of the Civet than the Genette; but the inner or posterior chamber presents, in some species at least, the peculiarity of being

permanently distinct and moveable, not only from the other cranial bones, but also from the tympanic portion of the bulla. In form it is conical, broad and truncated behind, pointed in front, and rather compressed at the sides, which meet in a ridge. The orifice between the two cavities of the bulla is very minute, and the septum permanently double, receiving a stratum from the wall of each cavity. The carotid canal is distinct, situated near the anterior end of the inner wall of the posterior chamber of the bulla; but it appears to be never completely closed on the inner side, except by the contiguous basioccipital. The paroccipital and mastoid processes are as in the Civet. The condyloid foramen is even more concealed. The glenoid foramen is very minute. The alisphenoid canal is distinct.

In a specimen of *Nandinia binotata* in the College Museum, which otherwise agrees generally with *Paradoxurus*, the posterior chamber is entirely cartilaginous, although the cranium appears to be adult or nearly so, and the tympanic portion of the bulla is completely ossified.

Cynogale, which has a singularly modified dentition, closely resembles the Paradoxures in its cranial characters, even to the permanent want of union of the two portions of the bulla. The anterior chamber is very small and flat; the posterior rather more inflated and conical than in *Paradoxurus*, being more like that of *Viverra*. The carotid canal forms a deep groove, converted into a foramen by the lip of the basioccipital, placed rather in front of the middle of the posterior chamber. The paroccipital process projects beyond the bulla. There is no alisphenoid canal.

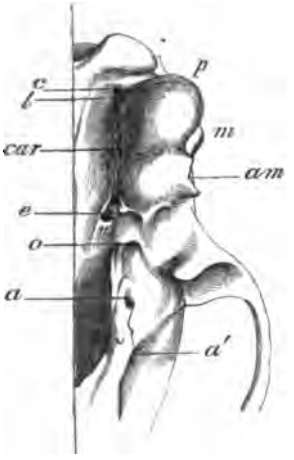
All the Herpestine members of the *Viverridæ* (*Cynopoda*, Gray) present certain common characters of this region by which they can be readily recognized. The bulla (fig. 9, p. 21) is very prominent and somewhat pear-shaped, the larger, rounded end being turned backwards and somewhat outwards; a well-marked transverse constriction separates the chambers, which are now directly anterior and posterior. In front of the constriction the anterior (true tympanic) chamber is somewhat dilated again, much more than in the Civet-like Viverrines. The aperture of communication between the two chambers is rather larger. The carotid canal (*car*) is very distinct, situated quite at the front of the posterior chamber. The paroccipital process (*p*) does not project beyond the bulla, but is spread out and lost (in adult animals) on its posterior surface. The condyloid foramen (*c*) is concealed; the glenoid foramen is very minute or absent. The alisphenoid canal appears to be always present.

The Suricate (*Rhyzæna zenik*) presents the same essential characters in a very modified form, caused by the general lateral expansion of the posterior part of the cranium. Here, and here alone among the *Viverridæ*, there is a prolonged auditory meatus; but it presents the peculiarity of being fissured along the whole extent of the middle of its floor*. The anterior chamber is remarkably prominent, even more than the posterior. Externally these parts have some resemblance to those of the Arctoidea, but show their adherence to the Viverroid type in the two distinct chambers of the bulla, the ex-

* The slightly produced floor of the meatus of *Urva* is also fissured.

panded and applied paroccipital process, the concealed condyloid, and absent glenoid foramen. The carotid foramen is distinct, situated at the anterior extremity of the posterior chamber; and, as in the other Herpestines, the alisphenoid canal is present.

Fig. 9.



Herpestes ichneumon. From a specimen in the British Museum. (The letters as in the preceding figures.)

The *Felidæ* and the *Viverridæ* have thus the auditory bulla and surrounding portions of the cranium formed upon a common plan distinct from that of the Arctoidea, the essential features of which are:—

1. The bulla is greatly dilated, rounded, smooth, thin-walled, and divided by a septum into two distinct portions, communicating only by a narrow aperture—an outer or true tympanic portion, into which the meatus externus and the eustachian tube open, and a simple vesicular inner chamber.

2. The bony meatus is extremely short; or when prolonged (as in *Rhyzæna*), the inferior wall is imperfect.

3. The paroccipital process is closely applied to, and, as it were, spread over the hinder part of the bulla.

4. The mastoid process is never very salient, and often obsolete.

5. The carotid canal is small, sometimes very inconspicuous, and rarely, if ever, a true canal excavated in the substance of the wall of the bulla, but a groove converted into a canal by the basioccipital bone applied to its inner side.

6. A ridge from the paroccipital process to the condyle encloses the condyloid foramen in a common fossa with the opening of the foramen lacerum posticum.

7. The glenoid foramen is extremely minute, or absent.

The animals which possess these characters show their affinity to

each other in other parts of their organization, especially in those which were made use of in defining the Arctoidea. They all have a short simple cæcum. They all have a comparatively small penis, with a more or less conical termination, and of which the bone is small, irregular in shape, or not unfrequently altogether wanting. They all possess Cowper's glands, and a distinct lobed prostate.

The *Felidæ* and *Viverridæ* may therefore be united into another primary group, for which I would propose the name ÆLUROIDEA.

The two families have been chiefly distinguished by the well-known differences in their dentition; but they also show characteristic cranial distinctions. In the *Felidæ* the auditory bulla is more globular, and the inner chamber is placed really to the inner side, as well as somewhat posterior to the tympanic. The carotid canal is represented by a very minute groove placed far back on the inner side of the bulla, often quite concealed in the foramen lacerum posticum. There is no alisphenoid canal.

In the *Viverridæ* the bulla is more elongated, and the inner chamber is placed more posteriorly, usually entirely behind the tympanic. The distinction between the two parts of the bulla is better marked externally. The carotid canal is larger and placed more conspicuously and nearer the anterior part of the bulla. The alisphenoid canal is almost always present.

Cryptoprocta is a member of the Æluroid group, which, as long as it was known only by a single immature individual, was placed among the *Viverridæ*. The recent examination of a complete skeleton of an adult animal has led MM. A. Milne-Edwards and Grandidier to remove it completely from that group, and to ally it closely to the Cats—not indeed in the same family; for they form a tribe containing *Felis* and *Cryptoprocta* alone, each genus constituting a family by itself, the first digitigrade, the second plantigrade. The teeth are certainly more Feline than Viverrine, and so is the general appearance of the upper surface of the skull; but I cannot altogether agree in the remarks that "la conformation de la tête osseuse du *Cryptoprocta* rappelle le type félin, plus que le type viverrien," and "en effet, s'il y avait à chaque mâchoire une prémolaire de moins, son crâne ne différerait en rien de celui des Chats" *.

On examining the base of the cranium of the adult *Cryptoprocta* lately received at the British Museum (fig. 10, p. 23), I find that it possesses all the characters above shown to be common to the *Felidæ* and *Viverridæ*, but that it has a distinct alisphenoid canal (*a a'*), a distinct carotid foramen (*car*) near the front part of the inner side of the bulla, and the bulla itself constructed more on the viverrine than the feline type. The inner chamber is quite behind the other; it is flattened at the sides, ridged and very prominent posteriorly, and low in front. The paroccipital process does not extend beyond the bulla.

As the dentition and the general osteological characters pointed out by the authors just quoted† forbid us to place it among the *Vi-*

* Annales des Sciences Naturelles, 1867.

† The form of the scapula of the specimen at the British Museum appears to me decidedly more viverrine than feline.

Fig. 10.

Cryptoprocta ferox. From a specimen in the British Museum. The foramen between *c* and the occipital condyle is an accidental vacuity, existing only on one side of the skull. (The letters as in the preceding figures.)

verridæ as ordinarily constituted, I think, with them, that it must form a family by itself; but I look upon it as a perfectly annectent form, as nearly allied to the ***Viverridæ*** on the one hand as to the ***Felidæ*** on the other.

The visceral anatomy of ***Cryptoprocta*** is at present almost entirely unknown; but the little information we possess shows that in one respect it departs widely from both the families with which it otherwise appears so nearly connected—that is, in the possession of a large os penis. In the British-Museum skeleton this bone is $2\frac{3}{10}$" long, slender, compressed, slightly curved, not grooved or divided anteriorly, rounded and slightly dilated at each end, but thickest posteriorly.

Passing over for the present the consideration of several somewhat doubtful forms, it will be convenient to examine Mr. Turner's third type of Carnivorous cranium, that of the Dog. In the genus ***Canis*** (figs. 11 & 12, p. 25) the auditory bulla is externally simple, smooth, and evenly rounded. The meatus has a rather prominent under lip, though less so than in the Bears. Interiorly a very incomplete septum (*s*) springs from its anterior wall in exactly the same situation as in the ***Felidæ***, and divides the front part of the chamber into an

outer division, in which is the opening of the eustachian tube (*e*), and an inner one, of which the anterior end is a cul-de-sac, as in *Felis*; but this septum only extends through about one-fourth or one-third of the entire cavity, so that the two chambers communicate most freely. In the hinder part of the inner chamber are a few irregular projecting bony ridges. The bulla is developed as in the Cats, from two parts, an outer true tympanic, and an inner cartilaginous portion. At birth ossification has not commenced in the latter, and appears in the former only as the horseshoe-shaped tympanic ring.

The carotid canal (*car*) is complete, and of tolerable dimensions; but its external opening is not visible on the surface of the bulla, being deep in the foramen lacerum posticum (*l*); the course of the artery is similar to that which it takes in the Bears. The paroccipital process (*p*) is long and prominent; and its anterior surface is applied closely to the back part of the bulla, but to a less extent than in the Cats, as the process is more compressed. The mastoid (*m*) is distinct, but slightly developed. The condyloid foramen (*c*) is conspicuously situated on the ridge passing from the paroccipital to the condyle, and is quite distinct from the foramen lacerum posticum (*l*). The glenoid foramen (*g*) is very large. The alisphenoid canal (*a a'*) is present.

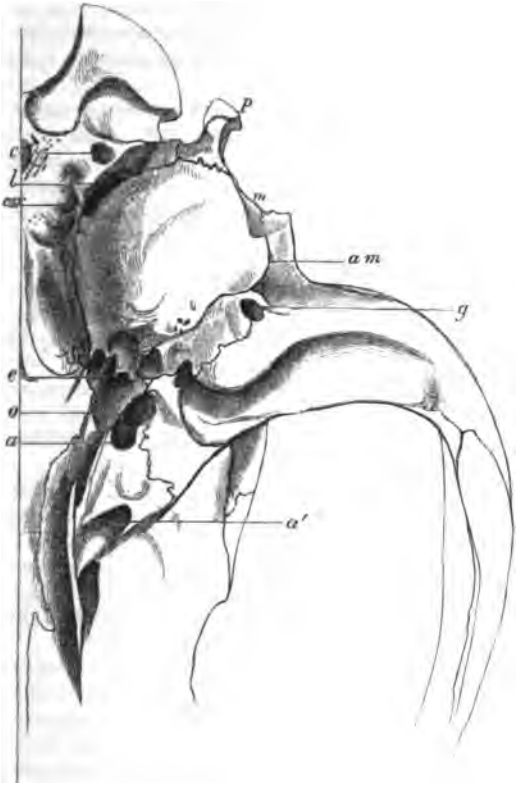
It is clear that, with these cranial characters, which are found distinctly developed (with some modifications to be noticed hereafter) in all the members of the family *Canidæ*, the Dogs cannot be placed in either of the great primary groups as above defined. They are in fact as nearly as possible intermediate between the two. The general form of the bulla and the presence of a septum, though imperfect, incline to the Æluroid type; while the position and development of the carotid canal, of the condyloid foramen, and of the glenoid foramen are Arctoid characters. The form of the paroccipital and mastoid processes, and the length of the meatal lip, are intermediate.

Though I agree with Mr. Turner in making the Dogs a distinct primary group, which might be termed CYNOIDEA, I differ from him in placing them at one end of the series and the Bears at the other. The Dog appears to me to be the most central or generalized form of the whole order as at present existing, at least as far as the structure of the cranium is concerned. The comparative length of the folded cæcum is a special peculiarity*. The reproductive organs belong neither to the Arctoid nor to the Æluroid type, but partake of some of the characters of each. In the absence of Cowper's glands, and

* The length of the cæcum in the Dogs, among other characters, induced De Blainville to place them at the end of the series of which the Bears were at the head, the Cats, with moderate cæcum, intervening. But may not the long cæcum be rather a retention of general mammalian structure, which has been completely or partially deviated from in the Bears on the one hand, and the Cats on the other, both more specialized groups?

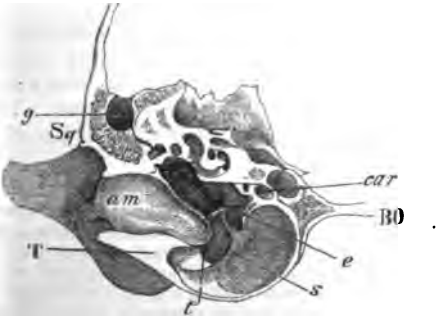
It should be remarked that the Dogs retain more nearly the typical number of teeth than any other Carnivores, and that some of the earliest known forms of the order appear, as far as can be gathered from their fragmentary remains, to belong to the group. Thus the Early Miocene *Amphicyon* had the teeth of a modern Dog, with an additional upper molar, completing the typical mammalian dentition.

Fig. 11.



Wolf (*Canis lupus*).
(The letters as in the preceding figures.)

Fig. 12.



Section of auditory bulla of Dog.
(The letters as in the preceding figures.

the large size of the os penis, they resemble the former, though the os is of a different form, being straight, wide, depressed, and grooved. In the distinctness of the prostate gland they approach the Æluroids. The bulbous dilatation of the penis during erection is a special Cynoid peculiarity.

The above-described cranial characters are very constant in all the known forms of dogs, even the most aberrant*. The principal modifications are in the size of the meatus and amount of inflation of the bulla, which appear to be in direct relation to the development of the external ear, as they reach their maximum in the Fennec. The only deviation presenting any approximation to any other family that I have observed is in *Lycaon*, in which the condyloid foramen is partly concealed by the ridge from the paroccipital as in the Æluroids and the Hyæna, an animal with which it has been supposed to have some affinity. But for this slight peculiarity, it presents no other deviation from the true Cynoid type.

Such being the three principal types of Carnivora as indicated by the modifications of the base of the cranium, I will next consider the position of certain genera about the affinities of which there has been some real or supposed difficulty.

First the Hyænas, which are placed by Mr. Turner without hesitation in his family *Felidæ*, equivalent, it must be remembered, to the group here called Æluroidea, as they present, he says, "the same cranial characters as the cats." But he appears not to have noticed the peculiar septum, which forms such a marked character in the *Felinæ* or *Viverridæ*, and which is completely wanting in the Hyænas†.

The cranial characters of this genus (fig. 13, p. 27) are as follows:—Auditory bulla inflated, smooth, oval, most prominent posteriorly, and rather pointed in front, slightly compressed laterally. Bony meatus short, but its anterior lip slightly produced. Bulla perfectly simple within, without trace of division into compartments. Carotid foramen (*car*) distinct, near the middle of the inner side of the bulla. Paroccipital process (*p*) spread out over the posterior surface of the bulla, and forming a nodular protuberance beyond it, as in the larger *Felidæ*. Mastoid process (*m*) slightly developed. Condyloid foramen (*c*) quite concealed by the ridge from the paroccipital to the condyle. Glenoid foramen very minute or absent. No alisphenoid canal.

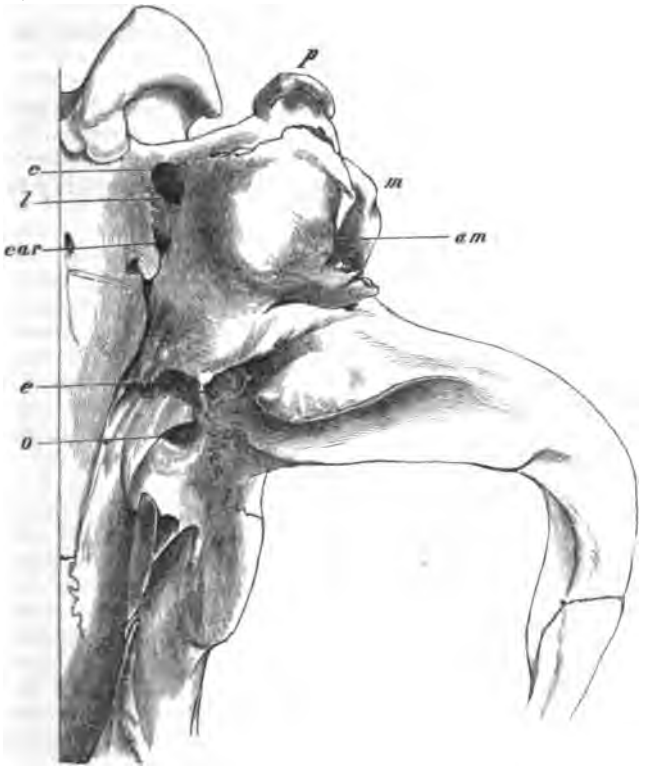
These characters all agree with the Æluroid type, with the exception of the absence of septum to the bulla, and when taken together are perhaps rather more feline than viverrine. The other parts of the system which have previously been made use of in the former

* I should mention that I have not had an opportunity of examining the skull of *Icticyon venaticus*; but Burmeister's figure shows its true cynoid character.

† Mr. Turner says of the *Viverridæ*, "The auditory bulla has very distinctly the appearance of being divided into two portions, of which the posterior is much the larger, and elongated in form: the more anterior division, which encloses the meatus auditorius externus, is much smaller, and partly overlapped by the other."—*Loc. cit.* p. 78. This only refers to the external appearance of the bulla, and is given as diagnostic of the bulla of the *Viverridæ* as opposed to that of the *Felidæ*.

cases lead to similar conclusions. In the presence of a short cæcum, and of Cowper's glands, and a distinct prostate, Hyæna conforms with the Æluroids. The penis is of a form unlike that characteristic of that group, being large and pendulous under the abdomen; but in the entire absence of a bone it agrees with some of the *Viverridæ*, and differs essentially from all the Arctoid and Cynoid Carnivora. The large number of rib-bearing vertebræ (fifteen or sixteen) of the Hyænas is a special peculiarity, as thirteen is the most usual number in the Æluroids.

Fig. 13.



Hyæna (*Hyæna striata*).
(The letters as in the preceding figures.)

The Hyænas must then form either a fourth primary division of the Carnivora, or be added, as rather aberrant members, to the Æluroid section. On the whole I am inclined to the latter arrangement, especially as it will be seen to gain support from the examination of the singular genus next to be spoken of.

Proteles was considered by Cuvier a "*Genette hyénoïde.*" It is

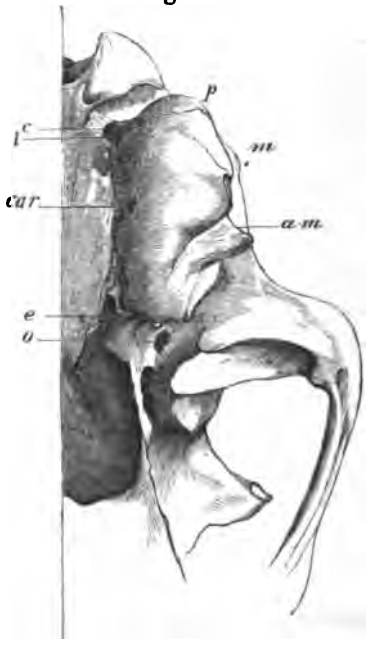
placed by Dr. Gray, in his "Revision of the *Viverridæ*" (P. Z. S. 1864), close to the genus *Viverra*. De Blainville included it in the genus *Canis*, where it is also placed, in the Catalogue of the Osteological Series in the Museum of the College of Surgeons, by Professor Owen. Many other authors have placed it in the *Hyænidæ*, as Dr. Gray in 1868 (P. Z. S. p. 525). The visceral anatomy of this animal appears at present to be quite unknown; and the rudimentary molar teeth afford no indication of its affinities. Both in external appearance and in the general characters of the skeleton it closely resembles the Hyænas*.

The examination of the base of the cranium in this genus is therefore of great interest, as it affords in the present state of our knowledge the only true guide to its position.

Its characters (see fig. 14) are as follows:—

The auditory bulla is very large, pyriform, and everted posteriorly, almost exactly as in the larger forms of *Herpestes*. A septum divides it into two chambers, the meatal or true tympanic chamber being quite in front of the other; externally the two are completely fused.

Fig. 14.



Proteles lalandii. From a specimen in the British Museum. (The letters as in the preceding figures.)

* The Skeleton of *Proteles* in the Leyden Museum has 15 rib-bearing vertebræ: Wagner gives 14.

The anterior lip of the meatus is considerably prolonged and thickened, as in the Hyænas. Its floor is not split as in *Rhyzæna* and *Urva*. The carotid foramen (*car*) is very minute, placed near the middle of the inner side of the bulla. The paroccipital (*p*) and mastoid (*m*) processes are smoothly spread over the posterior dilated end of the bulla, and form no projection beyond it. The condyloid foramen (*c*) is concealed. There is no glenoid foramen; nor is there an alisphenoid canal.

I need scarcely comment upon the value of these characters as affording a satisfactory solution to the guesses that have hitherto been made as to the affinities of *Proteles*. In the first place they are thoroughly Æluroid, but they do not exactly agree with either of the families of that group as hitherto defined. On the whole they approach nearest to the Herpestine section of the *Viverridæ*, but deviate from this, and approximate to the *Hyænidæ*, in two points—the development of the anterior rather than the lower portion of the lip of the meatus, and the absence of the alisphenoid canal. These, in conjunction with the general characters of the skeleton and exterior, appear to be sufficient, as in the case of *Cryptoprocta*, to warrant the formation of a distinct family, intermediate between the *Viverridæ* and the *Hyænidæ*, approaching nearest to the former. If Cuvier had called *Proteles* a Hyænoid Ichneumon, instead of a Hyænoid Genette, exception could scarcely have been taken to the description.

Another genus, whose characters were omitted in their proper place, on account of the great difference of opinion that has existed upon its true position, is *Arctictis*, the Binturong of the East Indies. Ever since its discovery this animal has oscillated between the *Viverridæ* and the *Ursidæ* without any conclusive reasons having been given for either position. F. Cuvier, Mr. Turner, and Dr. Gray assign it a place among the former group, while De Blainville, Wagner, Van der Hoeven, Giebel, Gervais, Carus, and Owen include it in the Ursine or "Subursine" group. Dr. Cantor has published some details of its anatomy, including the statement that it possesses a short cæcum; but no mention is made of the structure of the generative organs*.

The pattern of the teeth when closely examined is clearly that of the Paradoxures—modified, it is true, but forming, as it were, a third term of a series of which a Civet and an ordinary Paradoxure are the first and second terms. Their resemblance to the teeth of *Cercoleptes*, so often insisted on by zoologists, appears to me only superficial or adaptive, and affords an instance of the difficulty of diagnosing the family characters of the Carnivora by teeth alone, which I mentioned at the commencement of this paper.

Fortunately an examination of the base of the cranium (fig. 15, p. 30) gives no uncertain indication of the animal's position. The auditory bulla and all its surrounding parts are decidedly and essentially Viverrine, most resembling in form those of *Paradoxurus*, though the walls of the tympanic and inner chambers of the bulla are completely fused together as in nearly all the other members of the

* Journal of the Asiatic Society, 1846, p. 192.

family. The posterior chamber of the bulla is much inflated, especially the anterior part, which overlaps the very small tympanic portion. The meatus externus (*am*) is very contracted. The carotid canal (*car*) is a deep groove near the middle of the inner wall of the bulla. The paroccipital (*p*) is closely applied to the bulla. The alisphenoid canal (*a*) is distinct. There is not the slightest approximation in any particular to the arctoid type. I feel, therefore, no hesitation in placing the Binturong among the *Viverridæ*, even without waiting for the confirmation which the examination of the structure of the organs of generation will doubtless afford.

Fig. 15.

Binturong (*Arctictis binturong*).
(The letters as in the preceding figures.)

A comparison of *Arctictis* with *Cercoleptes* supplies a good illustration of superficial and adaptive resemblance masking absence of real affinity—closer, that is to say, than ordinal affinity. They belong to two different types of the Carnivora, both modified in the same direction. One is an arboreal, prehensile-tailed, omnivorous, Viverrine Æluroid, the other an arboreal, prehensile-tailed, omnivorous, Procyonine Arctoid. Geographically, each is confined to near the headquarters of the family to which it belongs; and in a functional sense only can they be regarded as representatives of each other in these different regions of the globe.

If the study of the cranial characters of the Binturong has completely removed it from all suspicion of relationship with the Bears,

and established its true position among the *Viverridæ*, the same method of observation has resulted in affording a full compensation to the former group by assigning to it the interesting little American Carnivore the *Bassaris*, frequently placed among the *Viverridæ*.

When this animal was first subjected to scientific examination, the distinctions between the different families of the Carnivora were less understood than at present; and Lichtenstein, who named it*, and Wagler, who gave a description of its external characters†, were content with pointing out that it showed resemblances on the one hand to the Raccoons and Coatis, and on the other hand to the Genettes.

The first and hitherto only published details of its anatomy were given by M. Paul Gervais, in his description of the mammals collected by MM. Eydoux and Souleyet in the voyage of the "Bonite" (1841). He gives a figure of the skeleton, and a brief description of the principal viscera, including the important statement, apparently since overlooked, of the absence of a cæcum to the intestine. He also describes the very large os penis, from which and certain other minor characters he concludes that *Bassaris* is allied to the *Mustelidæ*, although, on the whole, belonging to the *Viverridæ*, and most nearly approaching the "Mangoustes," more especially the genera *Galictis* and *Galidia*.

In his more recent 'Histoire naturelle des Mammifères' (1855), Prof. Gervais places *Bassaris* in the Tribe of "Viverrines," between which and the "Mangustins" it is said to establish a transition.

De Blainville, giving a figure of the same skeleton, places it among the *Mustelidæ*, it being evidently, he says, a "Mustela viverrin, dont en effet le système dentaire est Viverrin et le reste Mustela"‡

Mr. Waterhouse, as early as 1839, indicated its true position in a note to his paper "On the skulls and the dentition of the Carnivora"§, saying, "From an examination of the external characters of *Bassaris astuta*, it appears to me that it belongs to this group," *i. e.* that division of the *Ursidæ* which includes *Procyon*, *Nasua*, &c.

Mr. Blyth in his translation of Cuvier's 'Animal Kingdom' (1840), introduces it provisionally after *Cercoleptes*, saying, in a note, "Strong presumptive evidence that the Basset (*Bassaris astuta*) does not appertain to the Viverrine group, is afforded by the restriction of the geographical range of the latter to the Eastern Hemisphere in every other instance. The presence or absence of a cæcum would decide the question."

Mr. Turner‖, after quoting Mr. Blyth's observation, says, "I am not aware whether this last-mentioned point has ever been ascertained; but, from the characters presented by the cranium, I do not feel the slightest hesitation in referring this animal to the Subursine group." He, however, gives no description of these characters; and his de-

* "Erläuterungen der Nachrichten des Fran. Hernandez von den vierfüssigen Thieren Neuspaniens," Abh. Berlin Akad. 1827, p. 89. The animal was mentioned by Hernandez under the name of Tepe-Maxtlaton or Cacamitztli, meaning, according to Lichtenstein, the "Rush-Cat."

† Isis, 1831, p. 512.

‡ Ostéographie, tom. ii. p. 65.

§ P. Z. S. 1839, p. 137.

‖ *Loc. cit.* p. 81.

cision does not appear to have affected the judgment of any subsequent author. On the contrary, of late years, *Bassaris* seems to have completely subsided into a settled position among the *Viverridæ*, as all the undermentioned systematic authors place it there, with scarcely a qualifying remark, further than that in its American habitat it forms an exception to the remainder of the group:—

Wagner, in Schreber's 'Säugethiere' (1841); Giebel, 'Die Säugethiere' (1859); Van der Hoeven, 'Handbuch der Zoologie' (1856); Baird, 'Mammals of North America' (1859); Gray, "Revision of the *Viverridæ*" (P. Z. S. 1864); Carus, 'Handbuch der Zoologie' (1868).

The external characters of *Bassaris* are too well known to require further description*. They really afford no satisfactory solution of its affinities, simply because in each of the great families of the Carnivora there is considerable variation in such characters. Either *Viverridæ*, *Mustelidæ*, or *Procyonidæ* allow of sufficient latitude in structure of feet, ears, fur, and tail, to admit of this genus being ranged among them. If coloration counts for anything, except in closely affined forms, it may be noted that it approaches *Procyon* as much as any other known Carnivore, certainly more than *Galidia*, with which Gervais compared it in this respect.

In placing *Bassaris* among the *Viverridæ* zoologists have chiefly relied upon the characters of the teeth. The dental formula is precisely identical with the prevalent one in that group, viz. I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{2}{2}$: total 40. The presence of a second upper molar distinguishes it from all the known *Mustelidæ*. But on the other hand the dental formula of *Procyon* and *Nasua* is exactly the same. Indeed it is extremely difficult, if not impossible, to find any substantial character which would exclude these two genera, and at the same time comprehend all the range of modifications among the *Viverridæ*, from the slender sharply cusped teeth of the Genettes and smaller Ichneumons to the massive teeth of the African Civet, the blunt rounded molars of the Paradoxures and Binturong, or the square tubercular hinder teeth of *Cynogale*. In the sole distinctive character that I have been able to find (the presence of a second cusp on the inner lobe of the upper sectorial) *Bassaris* agrees with the *Procyonidæ*.

The *Procyonidæ* as hitherto established, being a very limited group as to numbers, offer less range of dental characters; *Bassaris*, however, if included among them, will hold precisely the same relation to *Procyon* and *Nasua* as the smaller Genettes and Ichneumons do to the Civets and Paradoxures, the teeth, though formed on the same type, having a slenderer form and sharper cusps, being, in fact, merely adapted to more strictly carnivorous habits (see figs. 3 & 3*a*, p. 10). *Cercoleptes* deviates in its dentition from the more typical members of the group far more than *Bassaris*, though in a precisely opposite direction.

Gervais gives the number of vertebræ of his specimen as C. 7,

* A good figure from life is given in Wolf and Sclater's 'Zoological Sketches,' vol. i. pl. 14.

D. 12, L. 6, S. 3, C. 22. Such a formula is perfectly exceptional, as no known Carnivore has so few dorso-lumbar vertebræ as 18. The skeleton in the Museum of the Royal College of Surgeons has C. 7, D. 13, L. 7, S. 3, C. 23 or more, the dorso-lumbar vertebræ being 20, the most usual number in the order. Although the prevailing number of the rib-bearing vertebræ of the Arctoid group is 14 or 15, and of the Æluroid and Cynoid 13, there are so many exceptions that this character cannot have much weight in determining the position of any doubtful form*.

The skull of *Bassaris* (fig. 3*a*, p. 10) in its general form presents a nearer approach to that of *Procyon* than to any other known Carnivore, allowing for the considerable difference of size and consequent alteration in proportion of brain-case to surrounding parts. The general form of the brain-case, and the direction and development of the zygomatic arches, are exceedingly similar. The principal differences are, that in *Bassaris* the muzzle is narrower and more pointed in front, the orbits larger and more sharply defined from the temporal fossæ by the larger postorbital processes, and especially that the bony palate is very much shorter, as it terminates at the level of the hinder border of the last molar tooth, while in the Raccoon it is continued as far as the anterior end of the pterygoid bones, or very nearly to the level of the anterior edge of the glenoid fossa. This distinction is of no more than generic importance, as similar variations in the extension of the palate backwards in the middle line are met with among different, and otherwise closely allied, members of the *Viverridæ* and of the *Mustelidæ*. The form of the lateral margins of the palate bones, of the pterygoids, and of the hinder margin of the palate itself is precisely the same in both *Procyon* and *Bassaris*.

The mandible of *Bassaris* differs from that of *Procyon* only in having the coronoid process less recurved—a very common character in the mandibles of smaller species both of the *Viverridæ* and *Mustelidæ*. In the special part of the skull which affords the most strongly marked distinctive characters between *Procyon* and the *Viverridæ*, *Bassaris* agrees in every point with the former. The auditory bulla is almost a miniature representation of that of *Procyon*; it is quite simple, without any septum, prominent at the middle part, but falling away before and behind, and prolonged externally into a well-developed bony meatus (*a m*). The carotid foramen (*car*) is large, situated rather behind the middle of the inner border of the bulla. The paroccipital (*p*) and mastoid (*m*) processes, though more feebly developed than in *Procyon* (as is usually the case with smaller animals), have the same general characters, the former especially projecting outwards and backwards, quite free from the bulla. The condyloid foramen (*c*) is exposed on a flat surface, quite distinct from the foramen lacerum posticum (*l*). The glenoid

* Among the other *Procyonidæ*, *Cercoleptes* has 15, *Procyon* 14, and *Nasua* 13 pairs of ribs, though in each instance the numbers seem occasionally to vary in the same species, to judge by the discrepancy in the statements of different authors.

foramen (*g*) is large, and occupies precisely the same position as in *Procyon*; and, lastly, there is no alisphenoid canal.

There is therefore nothing questionable in the characters of this region, nothing showing even the slightest indication of an aberrant or transitional form.

Such other parts of the animal's anatomy as are known, fully confirm the cranial evidences as to its position.

Some of the viscera of the specimen which died at the Gardens of the Society in 1854, are fortunately preserved in the Museum of the Royal College of Surgeons; and among others a special preparation has been made of the junction of the ileum with the colon, confirming Gervais's observation of the total absence of cæcum. Unfortunately I have not been able to find the organs of generation, if they are preserved; but this important link of evidence is not entirely wanting. Gervais and De Blainville have described and figured the os penis of the Paris specimen, showing that it conforms to the Arctoid type. The former says, "La verge est soutenue par un os considérable, et qui a 0·050 en longueur. Il offre à sa base une espèce de tête; ensuite il est comprimé dans une partie de sa longueur et courbé légèrement, puis courbé en sens inverse, et déprimé à mesure qu'il approche de son extrémité libre, dont le bout est élargi et très-deprimé."

It will be very interesting, when opportunity offers, to complete the description of these parts, because the presence of a large os penis in *Cryptoprocta* shows that this character cannot be absolutely relied on as distinctive between the two great Æluroid and Arctoid groups. The absence of Cowper's glands, or of a prominent prostate would be more decisive.

Mr. Gulliver, in reference to the size of the blood-corpuscules, says "*Bassaris* has been alternately associated with the Bears and Viverras; as far as regards its corpuscles it agrees best with the Bears"*.

On the whole I think there can be little question that evidence enough has been adduced to prove that *Bassaris* is a member of the Arctoid subdivision of the Carnivora, and among these approaches most nearly to *Procyon* and *Nasua*.

With regard to the group of Seals, which I look upon as essentially belonging to the same ordinal division of the Mammalia as the animals hitherto treated of, the differences of the cranial characters of the three natural families into which they are divisible, *Otariidæ*, *Trichechidæ*, and *Phocidæ*, are so well described by Mr. Turner that I need only refer to his paper for them. But I must add that I cannot agree with him when he says, "I have not seen in the Seals anything which, in my opinion, warrants their approximation to any of the other families, more than another," or in his placing them and the three divisions of the terrestrial Carnivora as primary groups of equal value. The differences between the Seals and the terrestrial Carnivora both in teeth and limbs are much greater than any found between different members of the latter group. They should therefore constitute in my opinion a distinct suborder, the Æluroid, Cynoid, and Arctoid Carnivora being united to form the other suborder.

* P. Z. S. 1862, p. 96. See also P. Z. S. 1841, p. 43.

I think moreover that there is not the slightest question that their cranial characters indicate most strongly their approximation to the Arctoid type, as has often been noticed before on other grounds*. Indeed their skulls seem to be simply a further modification of this type, showing resemblances to the true Bears on the one hand, and the Otters on the other; but I hope to take some other opportunity of examining more fully into these relationships. The presence of a cæcum in this group is a circumstance not easy to be accounted for.

Conclusion.—Mr. Turner was strongly impressed with certain resemblances, which appear to me rather superficial or accidental, between the Ichneumons and the Weasels; and it was in order to bring these groups in juxtaposition, in his synoptical table of the Carnivora, that he commenced with the Bears and ended with the Dogs, placing the *Felidæ* in the central position; in this arrangement I cannot, as I have said before, concur. The Dogs, for reasons given above, should be placed in the central position, while the Æluroids occupy one flank and the Arctoids the other.

Of the former, the *Felidæ* are perhaps the most specialized, and the *Hyænidæ* the least so. The *Viverridæ* are closely connected with the *Felidæ* on the one hand, especially by the intervention of *Cryptoprocta*, and, though less closely, with the *Hyænidæ* on the other, the gap being partially closed by the annectent *Proteles*. The *Viverridæ* show a great tendency to break into two groups, of which *Viverra*, *Paradoxurus*, *Arctictis*, *Cynogale*, and *Genetta* belong to one, and *Herpestes* and its various modifications to the other, *Rhyzæna* being an aberrant member of the last. The distinction between the five families of Æluroidea is founded mainly on the characters of the teeth, too well known to need recapitulation here; but, as shown above, the cranial characters alone would suffice to distinguish them. Africa and Southern Asia are the head quarters of the group, all the families being restricted absolutely or very nearly (two of the *Viverridæ* alone passing into Southern Europe) to these regions, except the *Felidæ*, which are almost cosmopolitan.

The Cynoidea admit of no subdivision into families; and, although there is a considerable tendency to variation in external characters, they are remarkably "true" in cranial conformation. They are perhaps the most universally diffused of any of the groups.

Of the Arctoidea the true Bears are the most specialized or aberrant; they form a very compact group, distinguished by their very characteristic dentition and their completely plantigrade mode of progression. They have a very wide geographical range. On the other hand the *Procyonidæ*, though few in numbers and restricted to the warmer and temperate parts of the American continent, are structurally less closely connected, at least if the singular *Cercoleptes* is truly a member of this group. Except for the increased number of the molar teeth, which is the only definite character by which they can be separated from the *Mustelidæ*, I see no reason for considering the *Procyonidæ* more nearly allied to the *Ursidæ* than are

* De Blainville says "Les Ours, dont les rapports avec les Phoques ont été sentis de tout temps et même par Aristote" (*op. cit.* tome ii. p. 49).

the other families of the group, or of speaking of them as specially "subursine."

Ailurus (an unfortunate name for an animal so essentially Arctoid) appears to me to be an isolated form; but until more is known of its anatomy, a very definite position cannot be assigned to it. Its dentition, though remarkably modified in character, is numerically that of the *Procyonidæ*; but certain cranial peculiarities already pointed out, and its Asiatic habitat, lead me to concur with Mr. Turner in placing it in a distinct family.

The *Mustelidæ* constitute a large, widely diffused, and somewhat disjointed group, but exceedingly difficult to reduce into natural subfamilies. The most aberrant or specialized are the Otters, which, ending with *Enhydris*, run parallel to the Bears towards the Pinnipedia.

In order to exhibit at one glance the general result of this examination, I have arranged the various groups of the Carnivora in a diagrammatic plan (see p. 37), which has obviously a great advantage over a linear series in showing cross relationships, especially as it attempts to indicate, by the distances the groups are placed apart, the amount of affinity between them*.

A tree has long been a favourite image by which to illustrate genealogical descent; and we are generally accustomed to have side-views of such trees presented to us, with the stem, main boughs, and smaller branches growing from them, all in perfect order. But the ancestral records of our existing fauna are so imperfect that it would be hopeless, from our scattered fragments of knowledge of them, to attempt at present to construct such a view of the descent of any zoological group. What we may, however, do with tolerable certainty is to take a careful survey of the top of the tree (to keep up the simile) as far as it has now grown, the only part that is completely exposed to our view, and make out the mode in which the component branches are now arranged. The diagram is intended to indicate the general outline of what may be called the Carnivora tree at its present stage of growth, seen from above; or it may be said to represent a transverse section of all the diverging genetic lines, showing the amount of differentiation of the groups, and the directions they have respectively taken at this particular epoch. Similar sections, taken at different geological periods, would probably present very different appearances. Groups now sharply separated might in other times have been united by intermediate forms; and other highly specialized groups would be seen which have now entirely disappeared.

The value of this plan all depends upon whether that great zoological problem, interpretation of true affinity, has been rightly solved. It is probable that a longer and more minute study of the details of the organization of different members of the order than has yet been given will introduce many modifications in this rough sketch; it is not too presumptuous, however, to hope that ultimately it may be so perfected that every genus and even species will have its appropriate place assigned to it.

* Prof. Milne-Edwards in 1844 (Annales des Sciences Naturelles), and on several subsequent occasions, has made use of similar plans to illustrate his views of classification.

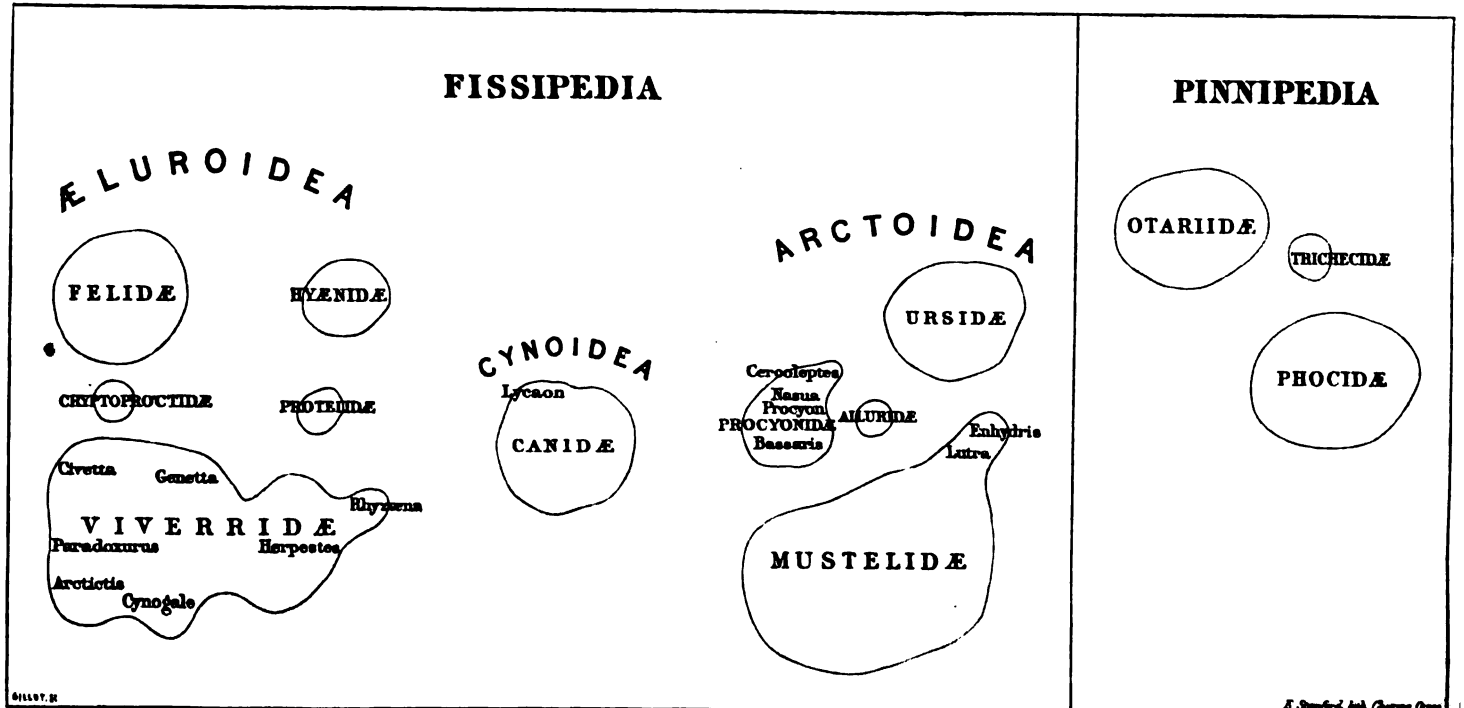


DIAGRAM OF THE RELATIONS OF EXISTING CARNIVORA.

2. On the Characters of a Type of a Proposed new Genus of *Mugilidæ* inhabiting the Fresh Waters of Viti Levu, Feejee Group; with a brief Account of the Native Mode of capturing it. By JOHN DENIS MACDONALD, M.D., F.R.S., Staff-Surgeon, R.N.

(Plate I.)

The fish forming the subject of the present paper is found in abundance in the deeper parts of the Wai Manu, one of the tributaries of the Rewa River, *Na Viti Levu* (Large Feejee). An ordinary specimen would measure eighteen or twenty inches from the tip of the snout to the emargination of the tail, and five inches vertically at its deepest part. The native name, *Ika loa* (black fish), is derived from its colour, the head and upper part of the body being of a rich black, which gradually softens on the sides into a warm brown, growing paler and more silvery towards the white belly. My friend the Rev. Samuel Waterhouse, Wesleyan Missionary, who was with me when the first specimens were obtained, at once recognized the famous "Black Mullet"; but, in the absence of all works of reference, I was obliged to content myself with drawings and notes carefully taken on the spot. The more important characters of *Ika loa* are the following:—

Head thick, convex, and rounded above, but flattened and sucker-like beneath, where the lower jaw is circumscribed by a thin prominent border, angularly produced in front so as to occupy a corresponding median notch in the upper lip. The eye is of moderate size, with a yellowish-brown iris, the snout short and bluntly pointed, and the mouth protrusible to a considerable extent, with the cleft on each side reaching a line drawn perpendicularly through the centre of the orbit. The teeth of the upper jaw are minute, recurved, and disposed in a single series, interrupted, however, in front, where the lip presents the angular grooved space already noticed. Within the dental margin a crescentic palate-like membrane, with a transverse oval thickening in the middle, extends across the roof of the mouth. Behind this valvular membrane, and to the right and left of the mesial line, the vomer bears a small transverse zigzag row of teeth. In the lower jaw the teeth are arranged in a gently curved, villiform cluster on either side, with a wide median interval. A horseshoe-shaped series of delicate transverse sucker-like folds or plicæ corresponds with the contour of the mandible inferiorly, the fore part being very narrow, like an isthmus connecting the lateral portions, which gradually increase in breadth towards their posterior end. A similar structure is present in *Agonostoma plicatile*; but the lateral portions are not united anteriorly as in *Ika loa*. This difference evidently arises, in one case, from the angular projection of the mandible anteriorly, and, in the other, from its roundness at the corresponding part.

Operculum, inter-, and præoperculum scaly; gill-rays six on each

side, the left apparently overlapping the right. Dorsal fins two, distinct, the anterior consisting of four rigid spines, and the posterior of eight soft rays and one rigid in front. Pectoral fins small and scaly to the tip. Abdominal fins with five soft rays, fronted by one spinous. Anal with ten rays, the first alone of which is spinous.

No lateral line visible as in the Mullets generally. Scales large, both the longitudinal and transverse measurements reaching $\frac{8}{10}$ of an inch, with a mucus-groove on the inner surface of each, fulfilling the office restricted to those that form the lateral line in other fishes.

On reviewing Dr. Günther's Synopsis of the characters of the three genera of Mugilidæ, viz. *Mugil*, *Agonostoma*, and *Myxus*, I find that *Ika loa* is not strictly conformable to any of them, but apparently takes up an intermediate place between *Agonostoma* and *Myxus*. Thus the cleft of the mouth extends on the side of the snout to the orbit as in *Agonostoma*, dissociating it from *Myxus*; the teeth of the upper jaw, however, are in a single series, the anterior margin of the lower jaw is sharp, as in *Myxus*, and the upper lip is notched to receive the mesial prolongation of the lower, still further distinguishing it from *Agonostoma*. I therefore conceive that *Ika loa* deserves a place in a new genus, for which I propose the name of *Gonostomyxus*, retaining the native word, *loa loa* (black), for the species. The following diagnosis of the genera of Mugilidæ may be given to illustrate the view here expressed, adopting Dr. Günther's characters:—

I. Cleft of the mouth extending on the sides of the snout, but not to the orbit.
  a. No true teeth in the jaws ..... *Mugil*.
  b. Small teeth in a single series in the upper jaw, and sometimes in the lower and on the palate. Anterior margin of the mandible sharp ..... *Myxus*.

II. Cleft of the mouth extending on the sides of the snout, beyond, to, or nearly to, the orbit.
  a. Small teeth in a single series in the upper jaw, in two lateral crescentic clusters in the lower jaw, and in a short irregular transverse row on either side of the vomer. Anterior margin of the mandible sharp ... *Gonostomyxus*.
  b. Small teeth at least in one of the jaws, and sometimes on the palate. The lower lip with the margin rounded, not sharp ..... *Agonostoma*.

Of course the further discovery of species referable to *Gonostomyxus* may suggest some modification of the characters above given.

I shall now give a brief description of *Ika-loa*-fishing on the Wai Manu.

The Maroons of Jamaica capture the freshwater Mullet with a pronged spear, pursuing it under water; but the Feejeeans take the *Ika loa* very skilfully in a small net, assisted by outlying divers who decoy the fish into the net, cutting off their escape. The men of Soloira, under the Vuni Chief of Vun Mbua, are famous for their knowledge of the habits of the "Black Mullet" and their success in fishing for it.

It will be necessary here to give an idea of the construction of the net. It is very simple, consisting merely of a piece of net once

doubled upon itself so as to make a perfect square, and sewn up so that two contiguous sides are closed, and two open, the closed sides being behind and below, and the open sides above and in front. The two upper free borders are connected with strong rods, moving upon one another at the angle when the net is opened or closed. At the lower and anterior angle a weight, generally consisting of a perforated stone, is appended, and the apparatus is complete. With this net one or two men dive into a deep part of the river, near a bold shore; immediately also some others disappear, and, having remained a considerable time under water, pop their heads up one by one, after which the net is drawn up on a shingly bank with the *Ika loa* floundering within it.

DESCRIPTION OF PLATE I.

Fig. 1. Lateral view of *Gonostomyxus loa loa* (the type specimen is contained in the Haslar Museum). About one-third of the natural size.
2. Inferior aspect of the head, with the mouth open to show the cresentic palatal membrane and the sucker-like plicated band within the border of the lower lip.
3. A scale from the shoulder, magnified about 8 diameters to show its ctenoid character and the mucus-groove on its deep surface.

3. Description of a new Species of Earth-worm (*Megascolex diffringens*) found in North Wales. By W. Baird, M.D., F.R.S., &c.

The genus *Perichæta* was formed by Schmarda to include a number of species of earth-worms differing from the more common genera in having each segment of the body marked in the centre by a narrow, raised rim, which is beset, for the whole circumference of the body, by a row of spines or setæ. He describes, in his 'Neue wirbellose Thiere,' four species, all natives of Ceylon. In 1845 Dr. Templeton characterized a new genus of earth-worms, natives also of Ceylon, which he called *Megascolex*. This genus consisted at that time of only one species, a native of the alpine regions of that island, and is distinguished, like *Perichæta*, by a row of small spines or setæ surrounding each segment. This row, however, according to Dr. Templeton's description (see Ann. & Mag. of Nat. Hist. vol. xv. p. 60) is not completely circular, the setæ being deficient in the mesial line of the back for about the tenth of an inch. Schmarda, who considers the two genera distinct, does not quote Templeton's description accurately; for he seems to think that that naturalist describes the ridges on each ring as occurring *only on the back*; whereas he distinctly says they *surround* the body, only that the rows of bristles are not continued round the whole circumference, but are deficient for a short space on the back.

In describing the genus *Perichæta*, Schmarda says that the species he describes possess no cincture or girdle, whereas in *P. cingulata*

(plate 18. fig. 162) he figures very distinctly a cincture after the thirteenth segment. I thought that perhaps a better distinctive character might consist in the form of the setæ themselves. Templeton describes them (in *Megascolex*) as about 100 in number, and as being in the form of small mamillæ, each surmounted by a minute bristle arched backwards. In *Perichæta* these bristles are bluntly lanceolate in form, slightly curved, and nearly equal in size at each extremity. Upon examining *Megascolex cæruleus*, of which we possess several specimens in the Collection of Annelids in the British Museum, I found that the setæ or spines in it were nearly exactly the same in form, only much smaller; so that in my opinion, these characters fail to constitute a distinct genus. I have now, therefore, little hesitation in referring the species of *Perichæta* described by Schmarda to the genus *Megascolex* of Templeton. The chief difference appears to me to consist of size, the species described by this latter author, *M. cæruleus*, being from 20 to 40 inches in length, and 1 or 1½ inch in breadth, while the species of *Perichæta* described by Schmarda are only about six inches long.

Very lately my attention has been called to a species of Earth-worm found in North Wales, which evidently belongs to the same group as the *Perichæta* of Schmarda. It is about 4 or 5 inches in length, 3 lines in circumference, and is very lively in its movements—when touched by the hand, or laid upon it, twisting itself into a variety of violent contortions which render it very difficult to hold; or, as my correspondents correctly say, the motions are "like those of an eel." After the thirteenth ring there is a short cincture or girdle, which completely conceals from view the segments of the body underneath. Beyond this the worm consists of about ninety-one or ninety-two segments, making in all about 104 or 105 distinct rings. Near the extremities, both superior and inferior, the rings are very distinct; the ridges which run round them are very prominent, and the setæ are considerably, even positively, longer than those in *Megascolex*, notwithstanding the difference in size of the worms; they are of a linear lanceolate form, blunt at the apex and slightly bent, and are about 60 in number in each segment. Towards the middle of the body, these rings become nearly flat, and the setæ are not so distinctly seen, except with the lens. The back of the worm is of a brown colour, and the belly of a very pale yellow, agreeing in this respect with the *Megascolex cæruleus*. The mouth is also like that organ in *Megascolex*; and the anus is terminal, round in shape and central in position.

These worms lived for some time after being sent to me; but they appear to be very *brittle*, many of them breaking off a portion of of their body and then dying.

I have named it *Megascolex* (*Perichæta*) *diffringens*, from this habit of breaking into pieces.

In the beginning of last December, a few of those interesting Worms were sent by Mr. Johnstone, gardener at Plas Machynlleth, in Montgomeryshire, North Wales, to Mr. Draper, at Seaham Hall, near Sunderland. They were brought before the Tyneside Naturalists'

Field Club, in order to ascertain their name and history; and two of these were afterwards sent to me by Mr. Dinning, Secretary to the Club, for identification. They evidently did not belong to any described British species; nor had I ever seen such before, as occurring in this country. Unfortunately the two individuals first sent to me escaped during the night from the box in which they were confined, before I could ascertain or identify the species. A request, however, to Mr. Draper brought me two more alive; and since that time I have had several others sent to me by Mr. Johnstone direct. They

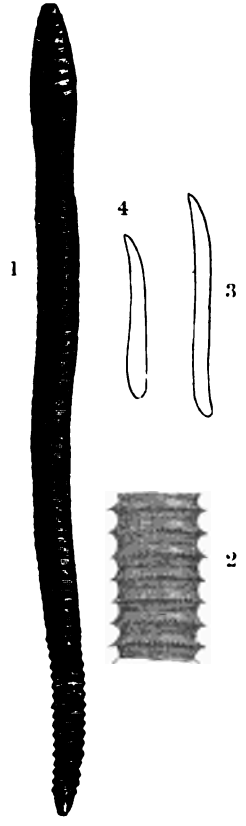


Fig. 1. *Megascolex diffringens*, natural size.
2. Portion of body, magnified.
3. Spinet of *M. diffringens*, magnified.
4. Spinet of *M. cæruleus*, magnified.

are found, he informs me, in a bed of tan and leaves in the plant-stove, mixed up and living with others of the common sort.

Upon reference to the description of Annelids by Schmarda, I

found they would properly belong to his genus *Perichæta*, which, however, upon more mature examination, I believe, as I have stated above, to be synonymous with the genus *Megascolex* of Templeton. The species hitherto described are all natives of Ceylon; but in the National Collection we have a specimen from the Dukhun (Deccan), in India, and two or three from New Zealand, undescribed; and I wrote to Mr. Johnstone to ask if there was anything in the dung-bed which came from that island or from India, through which the Worms could have been introduced into this country. In answer he tells me that "he does not know of any matter, in the bed, from the East Indies." There are, he adds, a few Orchids amongst the plants; and the bed has been partially emptied annually for five years, the same kind of worms being always found there. Mixed with these worms, in the same bed, are numbers of a common British species, some of which Mr. Johnstone kindly sent me, and which upon examination I found to be the *Lumbricus fœtidus* of Dugès.

Perhaps upon attention being called to these Earth-worms of Indian form, they may be found in other parts of the country in similar situations.

4. Description of a new Genus of Heterocerous Lepidoptera, founded upon the *Papilio charmione* of Fabricius. By Arthur G. Butler, F.L.S., F.Z.S., &c.

At page 205 of his 'Entomologia Systematica' Fabricius describes a very remarkable species of Lepidopterous insect under the name of *Papilio* (*Danais*) *charmione*, the characters of the species being probably taken from a figure by Mr. Jones, whose 'Icones' furnished Fabricius with many of his new species. This figure was copied by Donovan in 1827, forming the subject of the 171st plate of his 'Naturalist's Repository,' vol. v.

Fabricius gives the Island of Johanna as the locality from which *charmione* was obtained. But Donovan remarks, "We, however, perceive in our copy of the 'Entomologia Systematica' that this habitat is erased, a correction made by ourselves many years ago upon the authority of Mr. Jones himself."

In his 'Species Général des Lépidoptères' (published 1836) M. Boisduval referred this species to the genus *Terias* (*Pierinæ*), with the following observation:—"Ne l'ayant jamais vue, nous n'affirmons pas qu'elle appartienne au genre *Terias*." But in the margin of the page I find a note in pencil by Mr. E. Doubleday—"Not even a Butterfly."

The supposition that *charmione* was a Rhopalocerous insect seems to have arisen from the fact that it is represented as such by Donovan. Whether the antennæ really are clubbed or not, is a question that can only be decided when we see a perfect example of the species; at present the only point that can be settled is that the species certainly is not a Butterfly; for an old and well-worn specimen in

the national collection testifies to the contrary. This individual was obtained in the year 1841; and on turning to the old Register I find it entered as *Erycina charmione* (ex Mus. Milne), and in pencil a note—"Not a Rhopalocère at all!" No locality is given. It is not impossible that this is actually the type specimen formerly existing in the collection of Mr. Drury; for it seems certain that at least one species formerly in that collection, and pinned in the same manner, now exists in the British Museum*.

Mr. F. Walker has kindly referred me to the genus *Nyctemera*, Hübn., which he considered the nearest approach to the *charmione* type of coloration and general form; and amongst the species of that group I detected one (*N. expandens*, Walker) agreeing with the latter in every structural particular, and differing from the remaining species in its narrow elongated wings and different neuration. These two species will therefore form a new genus allied to *Nyctemera*.

Fig. 1. *Amnemopsyche expandens*, Walker.
2. —— *charmione*, Fabric.

AMNEMOPSYCHE, gen. nov.

Typical species *A. charmione*, Fabr.

Corpus sat gracile, subcylindricum, capite perparvo, thorace brevi, abdomine alas non superante, ano conico; pedes graciles, antici simplices, medii calcari uno tibiali, postici tribus uno subapicali duobusque terminalibus: alæ elongatæ, tenues, anticæ costa vix arcuata, margine externo distincte arcuato, margine interiore subrecto; cella discoidalis perlonga, vena prima discoidali bifurcata, vena superiore disco-cellulari obliqua cum vena secunda discoidali fere continua, vena inferiore disco-cellulari transversa: posticæ subpyriformes, area apicali longiore; cella discoidalis perlonga, venis omnibus distincte separatis, vena superiore disco-cellulari obliqua, inferiore angulari transversa: alæ plerumque nigro alboque coloratæ.

Sp. 1. AMNEMOPSYCHE CHARMIONE.

Papilio charmione, Fabricius, Ent. Syst. p. 205, n. 641 (1793); Donovan, Nat. Rep. v. pl. 171 (1827).

* Namely *Strymon titus*, Fabr. (*Theclinæ*), still bearing the old ticket "*Titus* 130," the number being a reference to the 'Ent. Syst.'

Terias charmione, Boisduval, Spec. Gén. Lép. i. p. 677, n. 40 (1836).
Hab. ——? B.M.
From the collection of Mr. Milne.

Sp. 2. AMNEMOPSYCHE EXPANDENS.

Nyctemera expandens, Walker, Lep. Het. Brit. Mus. ii. p. 398. n. 17 (1854).
Hab. ——? B.M.
Presented by E. Doubleday, Esq.

5. Descriptions of twelve new Species of Land and Marine Shells from Australia and the Solomon Islands. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., F.R.G.S., &c.

(Plate II.)

HALIOTIS (PADOLLUS) BRAZIERI, n. s. (Plate II. fig. 1.)

Shell oblong-ovate, body-whorl nearly flat above, whorls marked with an obscure single central rib; perforations peculiarly tubiferous, standing erect, six open; spire somewhat elevated; sculptured throughout with striæ radiating from the sutures, with a few spiral ridges on the first and second whorls, which lose themselves on the body-whorl and again appear on the outer margin of the lip; beautifully marbled with blotches of red and green interrupted here and there with a few white zigzag markings; base of body-whorl somewhat flattened; interior brilliantly nacreous.

Diam. maj. 1½ inch, min. 1 in., alt. 5 lines.

Hab. Lake Macquarie, New South Wales (*Brazier*).

A beautiful species, remarkable for its *radiate* sculpture and large erect elevated perforations.

TRITON BASSI, n. s. (Plate II. fig. 2.)

Shell ovately fusiform, with five or six rounded varices; spire moderately raised, one-third the length of the shell, apex obtuse; whorls rounded, closely encircled throughout with irregular narrow flattened ridges beaded alternately here and there and especially towards the base with small inconspicuous nodules, the interstices very finely longitudinally crisped, last whorl slightly angled at the upper part, and furnished at the angle with a few rude tubercles; pale purplish brown, the nodules here and there whitish occasionally interrupted on the wider ridges with small chestnut spots; columella white, arcuate, furnished with a small callosity at the upper part, and tooth-ridged below; canal short, recurved; interior of the aperture violet; outer lip thickened, white, closely and strongly denticulated within.

Length 13, diam. 7½ lines.

Hab. Corner Inlet, Bass's Straits (*Brazier*).

A very interesting new species, which I have dedicated to the intrepid voyager who, in an open whale-boat, first explored the straits that bear his name.

TRITON (EPIDROMUS) BRAZIERI, n. s. (Plate II. fig. 3.)

Shell elongately turreted, thick, with about twelve rather prominent rounded varices; spire very slightly twisted; whorls nine, sculptured with regular close-set longitudinal ridges and reticulated with irregular impressed striæ; light brown, paler on the varices, with a broad slightly darker fascia on the middle of each whorl, and a series of small spots at the lower edge of the fascia of the last whorl, the fascia darker where it crosses the varices; columella excavated, smooth, orange-coloured; canal very short, recurved; outer lip orange, denticulated within.

Length 2 in., breadth 7½ lin.

Hab. Lake Macquarie; and Cape Solander, Botany Bay, New South Wales.

Named after its discoverer, Mr. John Brazier, an enthusiastic and intelligent conchologist, who has contributed much to our knowledge of the Australian mollusca.

HELIX (TROCHOMORPHA) DEIOPEIA, n. s. (Plate II. fig. 4.)

Shell deeply umbilicated, depressedly and convexly conical, moderately thin, finely obliquely irregularly striated, upper whorls brown, last whorl black, ornamented with numerous pale diaphanous oblique stripe-like spots; spire convexly depressedly conical, apex obtuse, suture narrowly margined; whorls six, rather convex, the last not descending, keeled, somewhat flattened at the base; umbilicus conical, moderate, partly surrounded by a faint horn-coloured band passing into the interior of the shell; aperture oblique, truncately oval; peristome non-continuous, pale horn-colour, margins converging, the right thin, slightly expanded, the basal a little thickened, sinuous, and somewhat reflexed.

Diam. maj. 8, min. 7, alt. 4½ lines.

Hab. Marau Sound, Guadalcanar, Solomon Islands.

This beautiful species is somewhat intermediate between *H. meleagris*, Pfr., and *H. merziana* Pfr. Five specimens were obtained by my friend Mr. John Brazier, on the trunks of trees, during the visit of H.M.S. "Curaçoa" to Marau Sound.

HELIX (CORASIA) ROSSITERI, n. s. (Plate II. fig. 5.)

Shell imperforate, globosely conical, very thin, obliquely irregularly plicately striated, with the interstices very finely transversely striated, pale straw-colour encircled with numerous narrow white diaphanous bands, the one nearest the sutures the broadest; spire obtusely conoidal, somewhat flattened at the apex; whorls four, convex, the last descending, acutely keeled at the periphery, rounded at the base; columellar margin arcuate, narrowly excavated, sharp within; aperture oblique, rhomboidal; peristome not continuous,

white, with a purplish rose-coloured spot at the periphery, and another at the junction of the right margin with the body-whorl.

Diam. maj. 10, min. 8, alt. 7½ lines.

Hab. Ysabel Island, Solomon group.

This species belongs to the same group as *H. tricolor*, Pfr., and *H. purchasi*, Pfr.; I have named it after Mr. Rossiter, of Sydney, to the kindness of whose friend Mr. John Brazier I am indebted for a specimen of this singularly beautiful shell.

HELIX (GEOTROCHUS) DAMPIERI, n. s. (Plate II. fig. 6.)

Shell imperforate, trochiform, rather solid, obliquely faintly irregularly striated, white, with a narrow pale yellowish-brown band just below the suture, a broader one above the periphery darker below and becoming nearly black as it approaches the margin of the peristome, and a still broader band of the same character at the base; spire conoidal; whorls 4½, slightly convex, the last descending, rounded at the periphery, flatly convex at the base; columella sloping, aperture oblique, truncately oval; peristome expanded and slightly reflexed, the right margin a little sinuous, the columellar margin triangularly dilated and furnished within with a prominent rounded callus terminating abruptly within the aperture.

Diam. maj. 12, min. 10, alt. 9 lines.

Hab. Louisiade archipelago.

HELIX (GEOTROCHUS) DONNA-ISABELLÆ, n. s. (Plate II. fig. 7.)

Shell perforate, somewhat depressedly conical, moderately solid, very finely malleated by two sets of oblique striæ crossing each other at right angles above the periphery, whilst below it the malleations become more irregular and flowing, pale yellowish brown ornamented with a narrow white band below the sutures and one or two dark brown bands on each whorl, the upper one being the narrowest; spire conical, apex rather obtuse; whorls 5½, rather convex, the last not descending, angled at the periphery, a little convex at the base, which has a single broader band of dark brown just below the periphery; aperture diagonal, truncately ovate; peristome white, the upper margin narrow, expanded, the lower margin arcuate and reflexed, almost covering the umbilicus.

Diam. maj. 12, min. 10½, alt. 10 lines.

Hab. Eddystone Island, Solomon Group.

HELIX (TROCHOMORPHA) EUDORA, n. s. (Plate II. fig. 8.)

Shell widely and profoundly umbilicated, depressedly conoidal, moderately solid, obliquely sculptured with sharp close-set somewhat irregular raised striæ, pale chestnut-brown; spire convexly conoidal, apex obtuse; whorls 6½, slightly convex, the last carinated at the periphery, not descending, convex at the base; umbilicus one-fifth the diameter of the shell; aperture oblique, subangular, interior violet;

peristome white, margins converging and united by a slight callus, the right margin thin, the basal arcuate and thickened.

Diam. maj. 11½, min. 10½, alt. 5½ lines.

Hab. New Georgia, on trees.

HELIX (? PLECTOTROPIS) HOWARDI, n. s. (Plate II. fig. 9.)

Shell deeply umbilicated, lenticular, moderately solid, obliquely irregularly striated, and, beneath the lens, very finely granulated, yellowish horn-colour with two indistinct chestnut bands; spire depressed, apex obtuse; whorls 4½, rather convex, the last a little descending, acutely keeled, slightly convex at the base, which is without bands; aperture narrowly ovate; peristome white tinged with brown at the junction of the margins with the body-whorl, margins converging and united by a callus, the right margin slightly expanded, the basal one expanded and reflexed.

Diam. maj. 11, min. 9, alt. 4 lines.

Hab. Arrowie, 450 miles north of Adelaide, South Australia.

MINOLIA PULCHERRIMA, n. s. (Plate II. fig. 10.)

Shell depressedly conical, rather solid, transversely finely ridged with two or three broader ridges forming keels, the interstices crossed everywhere with very fine close-set oblique striæ, pinkish or yellowish white stained on the body-whorl with bright rose, and spotted on the keels with deep purple lake; whorls six, angularly convex, sutures broadly and flatly channelled, last whorl tricarinate, white, and rounded beneath; umbilicus wide, perspective, crenate within; aperture circular, pearly inside; peristome continuous, margins thin, simple.

Diam. maj. 4, min. 3¼, alt. 2½ lines.

Hab. Brisbane Water, New South Wales (*Brazier*).

MINOLIA BELLULA, n. s. (Plate II. fig. 11.)

Shell somewhat globosely conical, rather solid, polished, obscurely obliquely striated, and very finely spirally ridged, pale straw-colour, ornamented with a series of close-set serpentine descending rose-coloured flames on each whorl, ceasing on the last whorl at the periphery; whorls 6½, flatly convex, sutures flatly excavated, channelled, and narrowly margined, last whorl obtusely angled at the periphery, somewhat rounded at the base, which is silvery white; umbilicus deep, profound, and perspective, surrounded by a crenulated keel, from which faint striæ radiate towards the periphery; aperture circular, pearly within; peristome simple, margins not continuous, but strongly converging.

Diam. maj. 5, min. 4, alt. 4 lines.

Hab. Brisbane Water, New South Wales (*Brazier*).

THRACIA SPECIOSA, n. s. (Plate II. fig. 12.)

Shell elongately ovate, thin, white, rather compressed, very inequilateral, beaks posterior, irregularly concentrically striated, beyond the

umbonal ridges closely and strongly granulated; anterior side semiovate; posterior side obliquely truncate; dorsal margin posteriorly sloping, anteriorly slightly convex; umbonal ridge raised, obtusely angulate and slightly curved; ventral margin a little arcuated; hinge with the cartilage-processes small; pallial sinus deep, extending beyond the umbones and nearly to the middle of the shell.

Long. 11½, alt. 6, lat. 3 lines.

Hab. Port Jackson, dredged off the "Sow and Pigs" reef, in four fathoms water (*Brazier*).

6. On a new Species of *Haliotis* from New South Wales. By J. C. Cox, M.D., C.M.Z.S.

HALIOTIS HARGRAVESI, Cox.

Shell orbicularly ovate, spire much raised, rather thin, flatly depressed in the centre between the spire and the perforations, longitudinally strongly ribbed, with nine to ten ribs, which are flat and coarsely lamellose on the surface, intercostal spaces scarcely scabrous, perforations long and tubular, five open; internal surface longitudinally grooved, the depressions corresponding with the raised ribs without; exterior variegated with red and olive-green, within silvery.

Length 1 2/10 inch, breadth 9/10 inch.

Hab. Broken-Bay Heads, north coast of New South Wales.

7. Note on *Ianthella*, a new Genus of Keratose Sponges. By Dr. J. E. GRAY, F.R.S., V.P.Z.S.

Several of the older naturalists, as Rumphius (Amb. Rar. t. 80. f. 1), Seba (Thesaurus, iii. t. 95. f. 2–4), and perhaps Petiver (Gazoph. ii. t. 32. f. 1), figure a horny netted marine sponge, for which Pallas (Zoophytes, 320) adopted the name of *Spongia flabelliformis*, given by Seba to his first figure (t. 95. f. 2). Under this name a good specimen of it is figured by Esper in his 'Zoophytes,' t. 13.

The frond looks much more like the very slender netted axis of a species of Venus's Fan (*Rhipidogorgia*) stripped of its bark than a sponge.

Carefully collected and well-preserved specimens of this sponge are more or less covered with a quantity of dried mucilaginous sarcode, that fills up the spaces between the horny network, and covers the frond with a black polished coat.

It is doubtless a peculiar form of keratose sponges, most likely the type of a separate family.

This genus and the sponges which I described at a preceding Meeting under the name of *Ceratella*, &c., are peculiar in that the skeleton, though formed of a horny substance, is so dense that it does not, as in the generality of horny sponges, become softened and more flexible by being soaked in water; and, unlike the common sponges of commerce, they do not imbibe the water. But I suspect that many of the sponges with a hard, thick, black, horny network will be found to be unchanged by being soaked.

There is no appearance of any pores for inhaling or oscules for emitting the water in the dry specimen.

Being desirous of having it more carefully examined than the state of my eyes allows me to undertake, I sent a fragment of the specimen received from Capt. Sir Everard Home to Mr. M. C. Cooke, of the India-House Museum. He reports to me as follows:—

1. That he has not been able to discover any trace of siliceous or calcareous spicules.

2. It is dissolved away by acid.

3. In *liquor potassæ* it gives a bright violet-colour, like that of *Roccella* and other orchil-lichens.

IANTHELLA.

Sponge frondose, expanded on a plane, flat, fan-like or funnel-shaped; black, when dry more or less covered with dry, black, mucilaginous sarcode, that often fills up the spaces between the horny network, and gives it a black polished appearance. Root expanded; stem very thick, compressed, formed of interlaced filaments, expanded above into a broad flat frond entirely composed of rather thick, compressed, parallel ribs or branches, slightly diverging from the base towards the margin; some of these are once or twice forked in their length. These ribs or branches are united into a network with a square mesh by very short, subcylindrical, thinner, equal-sized, diverging, compressed branchlets.

* *Frond flat, expanded.* Ianthella.

1. IANTHELLA FLABELLIFORMIS. B.M.

Sponge flabellate, expanded, oblong, fan-shaped, with a single thick stem; fibres of the network slender.

Flabellum marinum, Rumphius, Herb. Amb. vi. 208, t. 80. f. 1 (good).

Spongia flabelliformis, Seba, Thes. iii. 183, t. 95. f. 2; Pallas, Zooph. 320; Lamk. Ann. Mus. xx. 380. n. 35; Esper, t. 13.

Var. Network much finer.

Spongia erecta subtilior, Seba, Thes. iii. t. 95. f. 4.

Hab. Australia.

The figure of Petiver (Gaz. ii. t. 32. f. 1) has been referred to this sponge; but it is not a recognizable figure of it.

** *Frond broad, folded together, more or less completely funnel-shaped.* Basta.

2. IANTHELLA BASTA. B.M.

Sponge broad, the sides folded together, leaving an open space below near the root, forming an incomplete funnel, which is more or less distorted and divided; the network slender.

Basta marina, Rumph. Herb. Amb. vi. t. 89. f. 1.

Spongia basta, Pallas, Zoop. 309; Esper, Zooph. t. 25; Lamk. Ann. Mus. xx. 442; Lamx. 11, f. 57.

Spongia flabelliformis, E. W. Gray, B. M. 1804, from spec. in Mus. Sloane, no. 996.

Hab. Indian Ocean, Quail Island; found dead attached to conglomerate ironstone (*Rayner*).

3. IANTHELLA HOMEI. B.M.

Sponge fan-shaped, expanded laterally, the sides bent up, with a thick single stem; fibres of the network thick, strong.

Hab. Australia (*Capt. Sir Everard Home*).

This chiefly differs from *I. basta* in the network appearing to be thicker and stronger. It is only a young, partly developed specimen, and may become more funnel-shaped when it grows older.

8. Notice of two overlooked Species of Antelope. By EDWARD BLYTH.

In or about the year 1840 the Society possessed a fine male specimen of the true *Antilope bubalis* of Pallas, of which individual I still possess a series of sketches or studies from life. The skin of it is now mounted in the British Museum. I have lately seen one exactly like it in the Antwerp Zoological Gardens; and there is an admirable portrait of one of the same kind in the picture-gallery at The Hague, in the same apartment (or rather landing-place in the Museum) in which is exhibited the celebrated life-size portrait of a young bull by Paul Potter. Again, the same species is figured and described by Buffon as *la Bubale* (Hist. Nat. tome xiii. p. 294, t. 37), and its skull, together with that of the Hartbeest (*Boselaphus caama*), showing the considerable difference of size of the two, in the following plate. It is also figured and described by MM. Cuvier and Geoffroy St.-Hilaire. This animal is much smaller than the Hartbeest, and it is of a uniform bright chestnut-colour, without any markings on the feet. It is the particular species figured and described as the *Bubalis* of North Africa in every work that I have seen which treats of the animal.

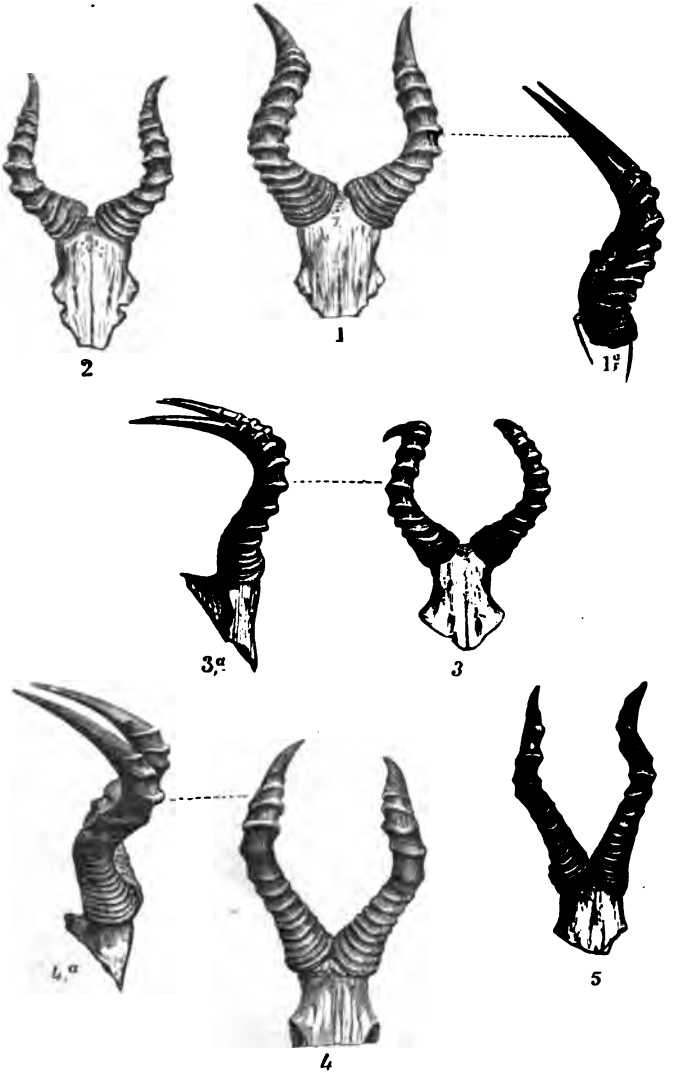
At the same time that the Society possessed the living example before referred to, I saw with Mr. Warwick, of the Surrey Zoological Gardens, the perfect skin of what I at once recognized to be that of a distinct though closely allied species, differing from the true *B.*

bubalis in being fully as large as the Hartbeest, and in having black markings in front of all four feet above the hoofs. In the Museums of Amsterdam and of Leyden there are mounted specimens of this animal, which have hitherto been supposed to exemplify the true *B. bubalis* (which those Museums do not contain), and of which I repeat that I lately saw a living adult at Antwerp of the usual very inferior size. I have also recently seen several frontlets of the larger race, some of which were received (together with frontlets of *Oreas derbianus*) from the west coast of Africa; but the *Boselaphus bubalis*, var. 1, of Dr. Gray (P. Z. S. 1850, p. 139), which I take to refer to the same animal, is stated by him to have been brought by Mr. Louis Fraser from Tunis. I suspect that it is chiefly a western race, though more or less diffused also in the region tenanted by the smaller and more familiarly known *B. bubalis*; while a third and eastern representative of the same form exists in the *Antilope lichtensteini* of Dr. Peters, which I only know from his figures and description of it (Naturwissenschaftliche Reise nach Mossambique, p. 190, tt. 43, 44).

By the kind permission of Mr. H. Ward, taxidermist, of Vere Street, I am enabled to exhibit a pair of frontlets (evidently male and female) of what I shall now designate as *Boselaphus major*, received from the west coast of Africa, and also a frontlet of *B. bubalis* (male) for comparison; and at the same time I exhibit a characteristic skull of the Hartbeest. There is a good pair of frontlets of *B. major* in the collection of Alfred Denison, Esq., which I refer to because that of the male retains the skin of the forehead with its hair on, the latter being of a bright chestnut hue where it is black in the Hartbeest. So far as I can perceive, the horns of the three North-African species are similar in shape, those of *B. major* being only distinguishable by their superior size; and all may be readily told from those of the Hartbeest by the difference at the base when viewed in front, the horns of the latter diverging in the form of the letter V, those of the others in the form of the letter U. The specimen (such as it is) of *B. major* in the national collection is only a skin without horns or hoofs.

Another animal to which I would call the attention of the Meeting is the Kudu, figured by Sir Andrew Smith, in his 'Zoology of South Africa,' under the name *Damalis kudu* (both sexes of it), as distinguished from the ordinary large and familiarly known Kudu, the best figure of which, to my knowledge, is that by Sir W. Cornwallis Harris in his 'Portraits of the Game and Wild Animals of South Africa,' pl. 20. The one is described to measure 4 feet in height at the shoulders, the other 5 feet. The male of the large species is adorned with a copious fringe of long hair down the front of the neck, of which the mature male of the other shows not a trace. There is also a difference in the character of the markings of the body, which is more recognizable to the eye than capable of satisfactory description. The large species is the *Condoma* of Buffon (Hist. Nat. tome xii. p. 301, and t. xxxix.) and of authors in general. Dr. Rüppell, however, informs us that the Abyssinian Kudu is one-third

Fig. A.



Figs. 1, 1a. *Boselaphus major*, ♂. Fig. 2. Ditto, ♀.
3, 3a. —— *bubalis*, ♂.
4, 4a. —— *caama*, ♂. Fig. 5. Ditto, ♀.

smaller than the South-African one, but does not notice the absence of long hair in front of the neck*. There is, however, an Abyssinian specimen of an adult male in the British Museum, which was presented by the Hon. East-India Company; and it agrees in every respect with the animal figured by Sir Andrew Smith. On the other hand, the young Abyssinian Kudu which was lately living in the Society's Gardens was of the large kind, as indicated not only by its size, but by the incipient appearance of the fringe of hair along the

Fig. B.

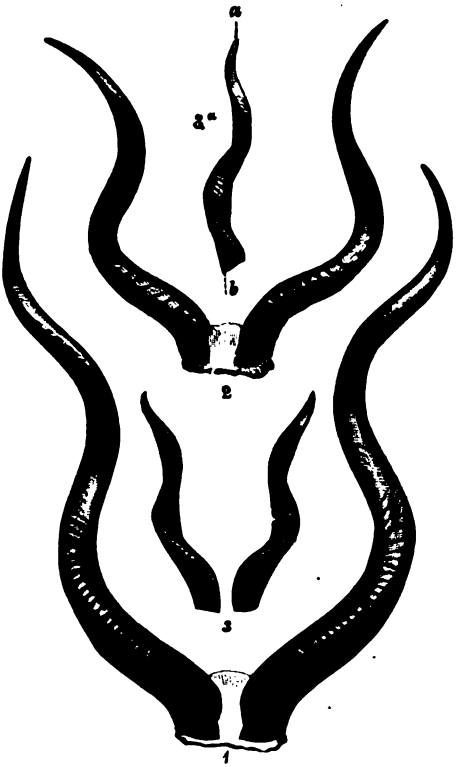


Fig. 1. *Strepsiceros kudu.*
2. Ditto, half-grown.
3. *S. imberbis*, two-thirds grown.
3a. Ditto, showing the straight axial line, *a b*.

* In a presentation copy of the 'Systematische Uebersicht der Vögel Nord-Ost-Africas,' in the library of the Asiatic Society, Calcutta, there is bound up a Synopsis of the Mammalia of the same region, wherein the above statement occurs; but in the 'Neue Wirbelthiere' &c. (p. 20), the large Koodoo is evidently the species referred to, as the fringe of hair in front of the neck is mentioned.

front of its neck. It follows that both species are alike met with in Eastern and in Southern Africa.

By the kindness of Mr. Knight and other gentlemen connected with the Ipswich Museum, I am enabled to exhibit a pair of loose horns of the smaller Kudu, which are about two-thirds grown; that they belong to a different species from the other is at once perceptible upon comparison. Those upon the stuffed specimen in the British Museum had long been full-grown; and their much abraded appearance indicates the individual to have been aged; yet from base to tip they measure only 19½ inches in a straight line, and following the curve 24 inches; greatest width apart (at the tips) 12 inches. They are thus only two-fifths of the size of the horns of the other species, which commonly attain to 4 feet or more in a straight line from base to tip, and 5½ feet round the curvature; from anterior base of horn to nostril (in the stuffed specimen) 7¼ inches, and ears 8 inches. In the smaller of these two species of Kudu the horns are more prominently angulated, and their spirature is considerably more tense than in the other; indeed what constitutes the posterior angle of the horn at base, and appears to the front about the middle of its length, hardly deviates from a straight axial chord (fig. 3ª, *a b*), round which the horn twirls; while in *S. kudu* the spirature is invariably much more apart—and not varying, as it does so remarkably in the horn of the Markhore Goat (*Capra megaceros*). The horns of the smaller Kudu are extremely rare in collections, the reason probably being that, as horns of this kind are chiefly brought as trophies of the chase, the smaller have been neglected on the supposition that they were inferior specimens; and the only pair which I know of in any English museum (besides those upon the head of the stuffed example in the national collection) consists of the two loose horns now exhibited from the museum of Ipswich. Dr. Gray, in his 'List of Specimens of Mammalia in the British Museum' (1850, p. 143), under *Strepticeros kudu*, notices "Var. smaller. Inhabits Abyssinia; Mus. E. I. C.; Mus. Frankfort, adult and young." I consider this small Kudu, of which adults of both sexes are figured and described by Sir Andrew Smith, to be decidedly a well-marked species; and therefore I now propose for it the name of *Strepticeros imberbis*.

January 28, 1869.

J. Gould, Esq., F.R.S., in the Chair.

The following extracts were read from a letter addressed to the Secretary by Prof. J. Reinhardt, F.M.Z.S., dated Universitetets Zoologiske Museum, Copenhagen, January 15th, 1869:—

"Among the different interesting contributions which my excel-

lent friend Dr. Gray has communicated to the 'Proceedings' of the Society for 1868 there are two on which I beg leave to write a few observations, which I should wish you to communicate to the Zoological Society.

"In his 'Synopsis of the Species of Pigs,' Dr. Gray remarks that, according to Marcgrave's statement, *Potamochœrus porcus* was in his time imported by the negroes, and naturalized in Brazil; and then adds that having on all his inquiries received the answer (which, by the way, was perfectly correct) that this Pig is at present kept nowhere in Brazil, he must suppose that it 'has not been found profitable, or was not fitted for the American climate, as the breeding of it has been discontinued' *. As far as I have been able to learn, the *Potamochœrus porcus* has not been domesticated anywhere in its native country, West Africa. If this Pig, accordingly, can be considered identical with the one described by Marcgrave by the name of *Porcus guineensis* (and in that point Dr. Gray is certainly right), and if further it really was the case that the Pig of Marcgrave at his time was domesticated in Brazil, we should here have an instance of an animal having been brought in a wild state from one part of the world to another, and of its having been made a domestic animal there. Now this would certainly be an interesting case, which would deserve considerable attention; but on that account there is also so much reason to examine accurately whether such is really the meaning of Marcgrave's words; and when we do so I think it will appear that a misunderstanding has taken place. For Marcgrave does not state at all in plain terms that his *Porcus guineensis* is kept as a domesticated animal anywhere in Brazil. He begins his description of it in the following way:—'*Porcus guineensis &c. e Guinea Braziliam translatus.*' But in these words he has certainly never thought of saying that his Pig was a domestic animal, but only that in Brazil he had seen such a Pig, brought thither from Africa and being quite tame—that is to say, doing no harm, but being of a placid, inoffensive nature. He might, indeed, have occasion to point out these qualities distinctly, especially as contrasting with the well-known fierce and headstrong character of the European Wild Boars. And that Marcgrave's words really may be justly applied to the said African Pig, we have a further proof in a description of the establishments (formerly Danish) on the Gold Coast†, in which it is especially remarked that the hunting of the Red and Black Boars of this place is without danger, that these Pigs do not show the least inclination to attack their pursuers —nay, that they do not turn upon them when wounded. That Marcgrave should have had an opportunity of seeing such a *Potamochœrus porcus* in Brazil, even though it has never been domesticated there, ought not to surprise us; and more especially it is no more startling than that he also had an opportunity of seeing there, and of sketching, several African Monkeys. It is easily explained when we remember that Prince Maurice of Nassau, in whose

* P. Z. S. 1868, p. 37.

† Mourad, H. C., 'Bidrag til en Skildring af Guinea-Kysten.' Kjöbenhavn.

service he was, caused animals to be fetched from many countries to keep them alive in the park of his country-seat, Freiburg, near Recife (Pernambuco); and that some of these animals had come from Africa is so much more probable, as a lively intercourse, called forth by the slave-trade, took place between the then Dutch North Brazil and the western coast of Africa, where an expedition, sent out by the Prince Maurice in the year 1641, had conquered the possessions of the Portuguese in Angola. I have still to add that if the said Pig had really been a domestic animal generally found in Brazil in Marcgrave's time, it would most probably have also been mentioned by the not much older author Gabriel Soares de Souza, who has left us a very detailed and, for his time, excellent description of the condition and appearance of Brazil at the close of the sixteenth century. But it is not mentioned at all in his work among the domestic animals then kept in that country. As for the rest, Dr. Gray is not the first who has supposed Marcgrave's *Sus porcus* to be not a breed of the common Pig, but a peculiar species, and yet a domestic animal in Brazil. Already in Erxleben we find the same view; and he does not even hesitate to state that it was found there in great numbers even at the time when he wrote ('ubi hodie copiosissimus,' Erxleben, Syst. Regni Anim. p. 184).

"My other observation relates to Dr. Gray's notice about *Pteronura sandbachii*. He concludes the welcome information about this rare Otter with the remark that Natterer's *Lutra solitaria* from South Brazil (Ypanema, in San Paulo) probably forms a second species of the genus *Pteronura*. This supposition, however, is scarcely well founded; for in the short original description given by A. Wagner of this Otter he calls our particular attention to the naked muzzle ('die nackte Nasenkuppe') as one of the most essential characters of this species; whereas the muzzle of *Pteronura*, as we know, is entirely covered with hair. But even though *Lutra solitaria*, Natt., according to all that we know about it, cannot be a *Pteronura*, yet I consider it not improbable that a species of this genus (or, perhaps, rather subgenus) is living in Brazil, to which it may be useful to direct the attention of travelling naturalists, though it is only very insufficient information I can impart about it. I have sometimes in the province of Minas Geraes seen the stretched and tanned skins of a large Otter, and also myself brought home such a one, which, though the point of the tail is wanting, has nevertheless the very considerable length of 6 feet. I do not consider this mutilated and damaged specimen sufficient for definitively deciding the question; but so much may at any rate be stated, that this Otter has a muzzle entirely covered with hair, the very narrow edges of the nostrils only excepted; and on the tail of the skin we see still distinct traces of a lateral ridge (not very prominent, to be sure) which has formed the limit between the upper and the under side, and which it has been impossible to efface completely, though the skin has been stretched and tanned. Thus it is at least very likely that this skin really belongs to a *Pteronura*; and as for the colour and the spots on the throat, it seems even to agree so well

with Dr. Gray's description, especially of Mr. Bartlett's specimen of *Pteronura sandbachii*, that I do not even consider it impossible that my Brazilian Otter may be of that species. At all events, I consider it certain that it is different from the considerably smaller *Lutra brasiliensis*; and I may add that the more experienced hunters of the province Minas Geraes distinguish clearly between two Otters indigenous there: the smaller one they call 'Lontra;' to the larger one they give the name 'Ariranha.' Prof. Burmeister is not accurate when, in his 'Uebersicht der Thiere Brasiliens,' he states that these denominations are used indiscriminately for the same animal, *Lutra brasiliensis*."

Mr. Blyth exhibited and made some remarks upon a pair of horns of one of the new Antelopes (*Strepsiceros imberbis*) described by him at the last Meeting.

A communication was read from Capt. Thomas Hutton, C.M.Z.S., containing notes upon certain Indian Mammals, principally regarding their habits and distribution in India. The species alluded to were the following:—

1. The Indian Bhaloo (*Ursus labiatus* of Jerdon's 'Indian Mammals').

Capt. Hutton gave a full description of the variety of this animal, met with in the north-western provinces, which appeared to present some points of difference, and gave copious notes upon its habits, stating in particular that, although it can climb trees readily enough in search of fruits, it finds difficulty in doing so unless the trunk of the tree is gnarled and rough.

2. The Snow-Bear of the Himalaya (*Ursus isabellinus*).

This species of Bear was stated to be entirely confined to the snowy region of the northern Himalaya and Tibet, where it subsists upon roots, berries gleaned from the neighbouring cultivated spots, fruits both wild and cultivated, and such small animals as it may occasionally surprise. Capt. Hutton was of opinion that this species was essentially distinct from the Syrian Bear (*Ursus syriacus*), to which it had been united by some authors.

3. The Ounce, or Snow-Leopard (*Felis uncia*).

This species was stated to be resident among the snows in the treeless region of the higher Himalaya, occurring occasionally on the Indian slope of the snowy range, where a fine living female, which had come into Capt. Hutton's possession in 1864 when about five months old, had been captured by Mr. Frederick Wilson and brought into Mussooree. In the following year two other cubs were seen about the same place, but were not captured. Capt. Hutton gave a full description of the first-mentioned animal when about six months old; its length at that time was about 2 feet 3½ inches, and

its tail about 2 feet 10 inches. Full particulars about this animal in a state of captivity were also given.

Dr. Murie exhibited two malformed hoofs from a specimen of the feral cattle of the Falkland Islands. The owner, Capt. Henry Payne, stated that he shot the animal himself, and remarked that such an instance had rarely, if ever, been seen by the Falkland-Island residents*. The hoofs were a left fore and a right hind one. The outer half or segment of the fore hoof was considerably lengthened and expanded; the inner half, on the contrary, was narrow, elongated, and very convex on its upper surface. This latter, inner, enormously overgrown portion of the hoof formed a complete semicircle, and crossed above and round to the outside of the outer half. It lay like a section of a quoit over its neighbour. The outer half of the hind hoof was lengthened, but not so much flattened as the corresponding fore one; its point had a tendency to turn upwards. The inner half of the hind hoof curved outwards and over its neighbour, but somewhat differently from the front one. Instead of being quoit-shape, it twisted like a Ram's horn, the plantar surface turning forwards and outwards.

As to the cause of this peculiar growth of the hoof, Mr. Darwin remarks of the Falkland-Island Horses:—"From the softness of the ground their hoofs often grow irregularly to a great length, and this causes lameness" (Voy. of Beagle, p. 192).

A communication was read from Prof. Owen, F.R.S., on *Dinornis*, forming the fourteenth part of his series of memoirs on this subject. The present paper related chiefly to the craniology of the genus, but contained also the description of a fossil cranium from the London clay of Sheppey, in the collection of the Earl of Enniskillen, F.R.S., which Prof. Owen considered to present combinations of Dinornithic and modern Struthious characters, and characterized under the name *Dasornis londinensis*.

This paper will be printed in the Society's 'Transactions.'

The following papers were read:—

1. Descriptions of the Animals of certain Genera of *Auriculidæ*. By Harper Pease, C.M.Z.S.

Genus Plecotrema (H. & A. Ad.).

The animal of the above genus appears to have been unknown to Messrs. H. and A. Adams; and I find no description of it published elsewhere. That of *P. striata* (Phil.) presents the following characters:—Proboscis short, very broad, slightly emarginate in front, produced laterally, neck long, more so than that of *Melampus*. Foot

* See another case recorded by Mr. Sclater, P. Z. S. 1861, p. 44.

entire, short, extending but a short distance beyond the aperture, bluntly rounded behind. Tentacles short, stout, cylindrical, obtuse at their ends; eyes immersed at their posterior inner bases.

Genus Blauneria (Shuttl.).

The animal of *B. gracilis*, Pease, inhabiting the Sandwich Islands, differs so widely from that of *B. pellucida*, as described by Gundlach and Binney*, that I am disposed to regard it as a distinct genus, although the shells can scarcely be distinguished. Mr. Binney appears to have been acquainted with but one species. Four have been described, three of which are in my collection. That inhabiting the Sandwich Islands is the largest, attaining to 8 mill. in length.

The animal of *B. gracilis* is small in proportion to the size of the shell, the head projecting but slightly from the shell, and the foot extending just beyond the aperture. It is pellucid, colourless, excepting a yellowish tinge around the mouth. Tentacles short, stout, approximating at their bases. Head narrow above, and much dilated below; mouth a simple longitudinal slit. Foot small, short, bluntly rounded behind, truncate in front, divided by a transverse groove, the posterior segment being slightly the longer. Eyes conspicuous, black, immersed at the posterior bases of the tentacles.

B. pellucida is reported to have been found at Washington city in gardens. The above species is marine, or at least amphibious. Its station is similar to that of *Pedipes*, which is found in the crevices of stones overflown at high water. I have never found *B. gracilis* on the sides or tops of stones when the tide was out, but around their bases where the water stood in little pools.

Genus Tralia (Gray).

The animals of the two species of this genus inhabiting the Sandwich Islands are those of true *Melampi*; their shells are strictly *Traliæ*, being furnished with three internal elevated ridges on the outer lip, not dentate or plicate near the edge.

Melampus (Tralia) semiplicata, Pease, P. Z. S. 1860, p. 146.

Animal: proboscis rather narrow, emarginate in front, finely wrinkled transversely, blackish on its upperside. Tentacles when extended elongate, cylindrical, somewhat enlarged near the base, obtuse, terminating in a slight round knob, transversely grooved, black at the tips, shading off into cinereous at their bases. Foot divided by a transverse groove at about one-third of its length; anterior segment bluntly rounded in front, concave behind; posterior segment bifid at its termination by a short slit. It moves by advancing the anterior portion of the foot, and then drawing up over it the hinder part. Its motion is regular, similar to that of the *Helices*—gliding along, when on a smooth surface, rather quickly.

* Land and Freshwater Shells of North America (Smiths. Institution), 1865, part 2, p. 20.

The animal of *Melampus parvulus* (Nutt.) agrees with the above in all respects excepting its tentacles, which are shorter and more stout in proportion.

I will take this opportunity of correcting an error in the habitat of *Melampus pusillus* (Gm.). It does not occur at the Sandwich Islands.

The above observations show that Dr. Gray's opinion, that the shells are not always a guide to the generic relations of the animal, is correct.

2. Additional Notes on the Land-Shells of the Seychelles Islands. By Geoffrey Nevill, C.M.Z.S.

The land-shells of the Seychelles are not only remarkably few in number, but are also, generally speaking, local. This probably arises from the nearly complete destruction at some period or another of the original flora; for at Mahé, and at most of the other islands we visited, it was only on the extreme summit of one of the highest passes in the former, and on the top of the mountain at Silhouette, that I could perceive anything like a peculiar or ancient flora. Praslin, it is true, has a vast number of the Coco-de-mer trees and many shrubs, some of which may possibly prove peculiar and of interest to the botanist; but vegetation seems to thrive little better under them than under the ordinary Cocoa-nut or Vacoa Palm. It seemed to me evident that the flora at Mahé must originally have been very different. Large fires have probably been the chief cause of the destruction; and the cutting down the timber, whether for firewood or to plant Cocoa-nuts, must also have had considerable effect, and have enabled the Pine-apple, Cinnamon, Bamboo, &c., and even possibly some of the common Mauritian ferns (*Gleichenia* &c.) to obtain a firm footing. These introduced plants now cover large tracts of country, killing all the more delicate indigenous flowers and ferns. The first mentioned, more especially, is abundant in most of the islands, and grows almost up to the tops of the highest mountains. Where the large timber has been thus destroyed, the water, almost as soon as it falls, forms for itself channels, and, running off from the soil, causes it in a short time to become dry and more or less arid. This is clearly perceptible both at Mauritius and Bourbon. In such situations there are no shells to be found, excepting, indeed, some two or three species, such as *Achatina fulica* &c. By searching, however, where the trees have been recently cut down, one finds quantities of dead shells, evidently killed by want of moisture and by exposure to the tropical sun.

Out of the meagre list of the land-shells I found at the Seychelles, I believe a considerable number to have been introduced. It does not appear difficult to account for this when one considers that such has been the case with a large number of the commonest trees and

plants, amongst the roots &c. of which they could easily have been brought. I have always noticed that the species having the supposed widest ranges are principally found close to the coast, or near some town, where, generally, the chief part of the vegetation has been introduced. In these places one rarely finds a species which can confidently be pronounced to be indigenous, about the only exception that I have met with being *Gibbus mauritianus*, which abounds everywhere in the sugar plantations near Port Louis. The commonest shell in the Mascarene Islands, as well as at Mahé and Praslin, is *Helix similaris*, which I believe has been thus introduced into all of them, either from India or Ceylon. At the great abundance of most of these species one cannot be surprised when one considers the vast numbers now to be found of *Achatina panthera* at Mauritius, and *Achatina fulica* at Calcutta, both of which have been introduced within the memory of many of the present inhabitants of those places. The others, of course, on account of their small size, have not been noticed, and consequently their introduction cannot be so easily traced.

The following are species which I believe, from the localities in which I found them, to have been introduced into the Seychelles:—*Helix similaris, Ennea bicolor, Subulina clavulus, Carychium mauritianum, Acicula mauritiana, Succinea striata,* and *Achatina fulica.*

I should draw a very different deduction from the apparent affinities of the Seychelles *Pulmonata* to that which my friend and companion Mr. E. Newton, in his admirable paper in 'The Ibis' of 1867, arrived at from his careful study of the ornithology of these islands, where he states, "As regards the *Ornis* of the Seychelles, its Malagash tendency is evident." Now the land-shells seem to me to have far more affinity with the Indian fauna than with the Malagash or African. Perhaps it would be more correct to say that the Seychelles fauna forms an intermediate and connecting link between the two, rather approximating to the former than to the latter.

Five genera are common to the Indian region which are not found in the Malagash, viz. *Streptaxis, Cyathopoma, Onchidium, Helicina,* and *Paludomus,* the reverse being the case with only two, *Tropidophora* and *Gibbus.* The only other species known of *Stylodonta,* as restricted, is from the Philippines (*S. cepoides,* Lea). The species of *Discus* and *Conulus* are also common Indian forms.

The only land-shells I can find recorded from the Seychelles which I did not myself meet with, are *Helix militaris,* Pfr., probably a variety of *Stylodonta unidentata,* and *Bulimus ornatus,* Duf., probably the species of which I have seen two specimens in the fine local collection of Mr. Caldwell, of Mauritius; and if the same, it is a very handsome distinct species of the section *Leptomerus,* and must be extremely rare.

1. HELIX (DORCASIA) SIMILARIS, Fér.

From Mahé and Praslin, where it abounds, but always near cultivated land, and never at any considerable height. The shells are

a smaller thinner variety than the ordinary Mascarene ones, very seldom having a brown band on the last whorl.

2. Helix (Conulus), n. sp. ?

From Mahé, Félicité, and Silhouette. Rare; amongst dead leaves, &c., in damp places.

3. Helix (Discus) serratus, H. Ad., n. sp.

From Mahé, Praslin, and Silhouette. Uncommon; on the ground in moist places.

4. Helix (Discus), n. sp.

From Silhouette. Very rare.

5. Helix (Stylodonta) unidentata, Chemn.

From Mahé, Félicité, Silhouette, and Curieuse. On the ground, amongst decaying leaves of the ordinary Cocoa-nut tree, &c. This species is not found at all at Praslin. The variety from the three latter localities, as given above, differs from the Mahé typical form in being thicker, more produced, with a strongly marked brown band round the last whorl, and in often being deformed. This species, even in its youngest stages, can be readily distinguished from *Styl. studeriana*, the spiral striæ on the first few whorls not being cancellated, as is the case with the latter species; it is also far more globose, &c. &c. The animal is a uniform brown, varying in shade; the foot underneath is greenish, and the tentacles a purplish grey.

6. Helix (Stylodonta) studeriana, Fér.

From Praslin *only*. This species is remarkable from its being restricted to one island, like the extraordinary tree the Coco-de-mer, on whose leaves and trunk it lives; unlike the preceding species, I never found any live specimens of it on the ground. There are two varieties, one a rich brown colour, the other a decided yellow. In shape it always appeared to be perfectly constant; and the reflexed outer lip is always white, whilst in *Styl. unidentata* it is violet—although I procured one specimen of the latter in which it also was white.

7. Streptaxis souleyetiana, Petit.

From Mahé, Praslin, and Silhouette. In damp places, on the ground. Animal ash-colour, the posterior part greenish yellow, stained on the neck with mauve (varying in shade), foot (underneath) yellow, tentacles black.

8. Ennea (Elma) nevilli, H. Ad., n. sp.

From Mahé and Silhouette. Extremely rare at the first-mentioned locality, more plentiful at the latter; on the ground, amongst dead leaves &c.

9. SUBULINA MAURITIANA, Pfr.

From Mahé and Silhouette. Amongst the husks of Cocoa-nuts, under stones, &c. This shell, as well as the following, belongs to a most perplexing group; though I have examined a great many specimens, from every place where I have been, I have been unable to come to any satisfactory conclusion concerning them. The present species I take to be the same as one from Mauritius, but which I did not find at Bourbon; it is, if not the same, very closely allied to the common *S. gracilis*, Hutt., of Ceylon and India, although I have never seen the latter at all approaching it in size; the striæ also are a shade stronger, and the last whorl is a little less rounded and more angular in the present species. It is very variable in size, my largest specimen having ten whorls and being 16 mill. long, while usually they have eight whorls and are about 12–14 mill. in length.

10. SUBULINA, n. sp.?

From Mahé, Praslin, Silhouette, and Félicité. In the same localities as the preceding. Certainly distinct from *S. clavulus* and *S. mauritiana*, also from *S. gracilis*, being more nearly allied to *S. clavulina*, P. & M., from which, however, it seems to constantly differ in several respects. This Seychelles species I also found at Bourbon and Mauritius; *S. clavulina*, on the other hand, only at Mauritius.

11. ACHATINA FULICA, Fér.

From Mahé, Praslin, and (I believe) Silhouette. A smaller, thinner variety than the Mauritian type; never very far from cultivated land.

12. ACICULA MAURITIANA, H. Ad., n. sp.

From Mahé. Rare; under stones &c.

13. SUCCINEA ?STRIATA, Kr.

From Mahé, Praslin, Silhouette, and Félicité. Amongst decayed leaves &c., on the ground. This is certainly the same as the Mascarene species.

14. GIBBUS MORELETI, H. Ad., n. sp.

From Silhouette. Extremely scarce; I only found one specimen, at a great height.

15. ENNEA BICOLOR, Hutt.

From Mahé, near Port Victoria, in the cinnamon groves. After a very careful examination of a large number of specimens from Mauritius, Seychelles, Ceylon, and India, I am convinced they are all one and the same species, in which case Pfeiffer's *E. ceylanica* must become a synonym. I have examined the animals both at Mauritius and Ceylon, which are perfectly similar. The shell varies

slightly as regards the convexity of the whorls, the striation, and the spiral angle; these varieties I possess from all the above localities, occurring in all instances with others of the typical form. If *E. ceylanica* is to remain as a good species, I have three or four others possessing equal, or greater, claims to be distinguished.

16. HELICINA ——?.

From Mahé, Praslin, and Silhouette. Amongst decayed leaves &c., on the ground. The shell varies somewhat in colour, sometimes being a bright red, at others an orange-yellow.

17. ONCHIDIUM ——?

From Mahé. Under stones &c., in damp places; common.

18. ONCHIDIUM ——?

From Praslin. On the stems and leaves of the "Coco-de-mer." The differences between this and the preceding species afford a curious parallel to those between *Styl. unidentata* and *Styl. studeriana*. In each instance the Praslin species are far more finely developed than their Mahé representatives: whilst the latter appear to live always on the ground, the former seem to prefer a different habitat. Sometimes one sees the sea-cocoanut-trees covered with shells, not only the two above mentioned, but also *Bulimus fulvicans*, *Cyclostomus pulcher*, and others. On the common cocoa-nut tree I never at any place found any shell except *Bulimus fulvicans*. This species differs from the preceding in being considerably larger, in not possessing the oblong blackish spots, but in being covered with regular, small, roughish pustules, of the same colour as the rest of the animal, which is extremely variable. I found black, brown, and pure-white varieties; the underneath part also, instead of being a pinkish chocolate colour, is darkish yellow (varying in shade, sometimes quite white).

19. CYCLOSTOMUS (TROPIDOPHORA) PULCHER, Gray.

From Mahé, Praslin, and Silhouette. On the Coco-de-mer, shrubs, &c. The shell varies in colour, but not, apparently, in form.

20. CYATHOPOMA BLANFORDI, H. Ad., n. sp.

From Mahé. Extremely rare; amongst decayed leaves &c., on the ground, near a stream, rather high up.

21. CARYCHIUM, n. sp.?

From Praslin, near the Protestant church, at the foot of a common cocoa-nut tree. I unfortunately only found a single specimen, which I hardly like to describe as new, though it differs from *C. mauritianum* in very many respects.

22. MELAMPUS LIVIDUS, Desh.

From Mahé and Praslin.

23. MELAMPUS FASCIATUS, Desh.

From the same islands as the preceding.

24. MELAMPUS CAFFER, Küst.

From Mahé.

25. MELAMPUS BRIDGESII, Carp.

From Mahé. Under damp stones, close to the sea; extremely local, I only found it at one spot.

26. PLECOTREMA, n. sp.?

From Mahé. Under the stones of an old jetty at Port Victoria; rare.

27. NERITINA GAGATES, Récl.

From Praslin. In a very small rapid stream, close to where one crosses to go to Curieuse; very local.

28. MELANIA (MELANOIDES) TUBERCULATA, Müll.

From Mahé, Praslin, and Silhouette.

29. PYRAZUS PALUSTRIS, Linn.

From a creek at Mahé, near Port Victoria.

30. PALUDOMUS AJANENSIS, Morl.

From a rapid stream, rather high up, at Mahé; rarely collected.

31. PALUDOMUS, n. sp.?

From Silhouette. Very rare; in a small stream, very high up.

3. A Monograph of the Siliceo-fibrous Sponges. By J. S. BOWERBANK, LL.D., F.R.S., F.Z.S., &c.—Part I.

(Plates III., IV., V., & VI.)

In my observations on Dr. Gray's "Notes on the Arrangement of Sponges," published in the 'Proceedings' of this Society for 1868 (pp. 124 & 125), I have stated my objection to his arrangement of the siliceo-fibrous sponges, several species of which he has named and described in the volumes of the 'Proceedings.' His descriptions are very brief, and are mainly dependent on the characters of external form and the peculiarities of their surface; but although describing them as sponges, he appears to be still in a state of uncertainty regarding their real nature. In his descriptions of his genera *MacAndrewia* and *Myliusia* (Proc. Zool. Soc. 1859, p. 437), throughout the whole of the paper, he expresses doubts of their spongeous nature, and inclines to the belief, in p. 440, that they, with *Dactylocalyx*, might "all prove to be a peculiar family of

zoophytes rather than sponges." In his "Notes on the Arrangement of Sponges (Proc. Zool. Soc. 1867, p. 492) he arranges them as sponges; but in his description of his genus *MacAndrewia* he commences thus:—"The coral expanded, cyathiform," &c. This confusion of ideas can only be accounted for on the supposition that Dr. Gray has really never taken the trouble to ascertain the structural characters of the specimens that have been so many years in his possession.

Although differing to a considerable extent from the general mass of the *Spongiadæ*, the primary design of sponge-life in the siliceo-fibrous species is in perfect accordance with the great mass of the sponges. The external and internal defensive systems are as those of other sponges, and their minute organs, as in other species, are exceedingly various in form and strikingly demonstrative of their specific characters; in truth they possess in perfection every essential organ of the *Spongiadæ*.

Dr. Gray, in his "Notes on the Arrangement of Sponges" (Proc. Zool. Soc. 1867, p. 505), has formed an order to receive the siliceo-fibrous sponges, which he has designated Coralliospongia, and he thus defines the members of his order:—"Sponge hard, coral-like. Skeleton entirely formed of siliceous spicules, anchylosed together by siliceous matter, forming a netted mass covered with sarcode." Prof. Wyville Thomson, in the 'Ann. & Mag. Nat. Hist.' for February 1868, p. 120, in describing the siliceo-fibrous sponges, under the head of the "siliceous skeleton," says:—"In *Habrodictyon* [*Alcyoncellum speciosum*, Quoy et Gaimard] and *Hyalonema* the skeleton is composed entirely of separate siliceous spicules of various forms, interwoven in fascicles and connected by the thin sarcode layer, or scattered irregularly among the fascicles of spicules. In *Euplectella*, *Aphrocalliste*, *Dactylocalyx*, and *Farrea*, certain kinds of these spicules are more or less completely fused together, forming a continuous anastomosing network."

In my observations on Dr. Gray's "Notes on the Arrangement of Sponges" (Proc. Zool. Soc. 1868, p. 118), I have already pointed out the error the author has fallen into in describing *Dactylocalyx* as "entirely composed of siliceous spicules anchylosed together by siliceous matter into a network;" and I have there stated, and have not since seen reason to alter my conviction, that the description of Dr. Gray is eminently incorrect, as no one, "I believe, ever saw the terminations of spicula united into a network through the morbid action of anchylosis by means of siliceous matter;" and I may add that I have never yet seen a case of the anastomosis of spicula. The normal condition of these organs is never to anastomose, however closely they may be packed together, while that of siliceo-fibrous structure is always to anastomose when they touch each other; and this law is abundantly illustrated in the fibrous structure of the skeleton of *Euplectella aspergillum*, Owen, now so common a specimen in the cabinets of collectors. This error of Dr. Gray, regarding the spicular structure of *Dactylocalyx* and other siliceo-fibrous sponges, seems to have been unhesitatingly adopted by Prof. Wyville Thomson, and without any

effort to test its accuracy, as it appears to me to be impossible that the fibres of *Dactylocalyx pumiceus* should be seen beneath a microscopical power of about one or two hundred linear without the conviction being immediately arrived at that the tissue was purely fibrous; and sections at right angles to their axes at once exhibit their concentric structure, and prove that they are not compound structures formed of "separate siliceous spicules of various forms, interwoven in fascicles." This description, quoted from Prof. W. Thomson's paper (Ann. & Mag. Nat. Hist., Feb. 1868, p. 120), will apply correctly enough to *Hyalonema*, but certainly not to "*Euplectella*, Owen, *Aphrocallistes*, *Dactylocalyx*, and *Farrea*," the latter four genera having purely siliceo-fibrous skeletons, while *Hyalonema* is as purely a spiculo-reticulate structure.

Prof. Wyville Thomson, in his paper in the 'Ann. & Mag. Nat. Hist.' for Feb. 1868, has proposed a new name for the siliceo-fibrous sponges; but a new name, unless it be more significant than the old one, is a detriment rather than an advantage to science. He designates them as vitreous sponges; this is an erroneous idea, inasmuch as the fibres are not inorganic and amorphous in their structure like fibres of glass, but, on the contrary, they are highly organized, consisting of concentric layers of silex and keratode combined, and thus are totally different in their origin and structure from an artificial amorphous structure like glass. The term vitreous naturally supposes an origin and a transparency through the agency of fire; but if we submit the fibres of *Dactylocalyx pumiceus* to the action of that element by making a small portion of the rigid skeleton red-hot two or three times in the flame of a spirit-lamp, it comes forth from the trial as black as charcoal, and perfectly opaque.

If the term vitreous is meant to represent the general character and appearance of these sponges in their natural condition, it is then still more inappropriate, as in the living state their external appearance is that of an ordinary sponge entirely enveloped in a more or less fleshy dermal envelope; if at all applicable, it can only be so when the animal is in a deteriorated and partially decomposed condition; while siliceo-fibrous is correctly expressive of the nature of their structure, and contrasts well with the terms kerato-fibrous and spiculo-fibrous. For these reasons, therefore, I feel under the necessity of rejecting the new designation proposed by the learned Professor.

Prof. Wyville Thomson, in his proposed arrangement of the *Spongiadæ* "Order I. (P. silicea) Vitrea," gives the following as the characters of his proposed new order:—"Sarcode in small quantity, very soft; never containing formed horny matter, either fibrous, membranous, or granular. The skeleton consists entirely of siliceous spicules, either separate (in fascicles or scattered) or anastomosing, and combined into a siliceous network. The sarcode contains small spicula of a different character from the general spicules of the skeletons, and of complicated forms. The spicules, whether of the skeleton, or of the sarcode, may all be referred to the hexradiate stellate type. Ex. *Hyalonema*, *Dactylocalyx*."

Dr. Wyville Thomson's endeavour, by the institution of his proposed new order Vitrea, and his description of its characters, has, instead of elucidating the subject, still further complicated it. All the members of his new order should certainly agree in a series of definite structural characters; but this is not the case. Thus he gives, as examples of his order, *Hyalonema* and *Dactylocalyx*, the sponge of the first having a skeleton composed of spicula cemented together by keratode, as in the great mass of Halichondroid sponges, the mass of the skeleton being eminently elastic and entirely destitute of siliceo-fibrous structure, while in the latter genus the skeleton is perfectly rigid, being composed entirely of inelastic siliceo-fibrous tissue.

But this is not the only error in the descriptions of the characters of his proposed new order Vitrea; thus he states (Ann. & Mag. Nat. Hist. p. 120) of the sarcode:—"It is small in quantity, very soft, probably semifluid, extending in a thin layer over the fascicles of siliceous needles and over the siliceous framework."

Dr. Thomson's description of the sarcode in this tribe of sponges is correctly applicable as regards quantity, if, as appears to have been the case, he has derived his conclusions from an examination of the prepared skeletons of the sponges in the Museum of the Jardin des Plantes and the British Museum; but it is a mistake to imagine that the sarcode is deficient in quantity when in their natural condition. In *Dactylocalyx heteroformis*, *D. M'Andrewia*, *D. Prattii*, and *D. Masoni* which are in the same condition as when taken alive from the sea, there is quite as much of that vital substance in their interstitial cavities as we find in the greater portion of siliceo-reticular sponges, and frequently more in proportion than we find in many of them. It is also an error to conclude that there are no membranous tissues within them. The usual delicate interstitial membranes exist in their cavities to about the same extent as in other sponges.

The author also says, in his character of Vitrea, "never containing formed horny matter, either fibrous, membranous, or granular." Now *Hyalonema* contains an abundance of horny matter, cementing the spicula together in the basal mass of the sponge, and also in the coriaceous envelope of the so-called "glass rope" of the sponge, and *Dactylocalyx* has plenty of membranes in the interstices of the skeleton, and an extensive and elastic dermal membrane enveloping the whole of the sponge.

Prof. Thomson's description of the characters of his proposed new order embraces very many more genera than he could possibly have contemplated when he wrote it. He says, "The skeleton consists entirely of siliceous spicules, either separate (in fascicles or scattered) or anastomosing and combined into a siliceous network." Let us now see what the effect of this very sweeping character will be:—1st, under the head of spicules "separate," it will include the genera *Hymeniacidon* and *Hymeraphia*; 2nd, "spicula in fascicles," it will embrace ten other genera, viz. *Geodia*, *Pachymatisma*, *Ecionemia*, *Dictyocylindrus*, *Polymastia*, *Ciocalypta*, *Tethea*, *Phakellia*, *Microciona*, and *Hymedesmia*; 3rd, "combined into a siliceous net-

work," it will include six other genera, *Halichondria*, *Hyalonema*, *Isodictya*, *Spongilla*, *Diplodemia*, and *Desmacidon*. We have thus no less than eighteen genera, not one of which has a particle of true siliceo-fibrous structure in their skeletons, incorporated with *Dactylocalyx* and the other truly siliceo-fibrous species. Such a character, instead of facilitating the discrimination of species, is calculated to lead us unto a perfect maze of doubt and uncertainty; and all this while he entirely ignores the existence of solid siliceous fibre.

The author's application of negative characters in his description of his order Vitrea is certainly bad: it is positive characters that lead us to correct discrimination of orders, genera, and species; it is what they are that must be our guides, not what they are not. If Prof. Wyville Thomson had a more extensive and intimate knowledge of the species of siliceo-fibrous sponges than he appears to possess, I can readily imagine that he would not have fallen into the errors that I have pointed out.

Dr. Thomson, in his highly imaginative paper "On the Vitreous Sponges," has not only proposed a new and very impracticable order for their reception, but he has also, contrary to all the established canons of nomenclature, proposed to abrogate the established generic names of the working naturalists who have preceded him in writing on the siliceo-fibrous sponges; and, after criticising their differences of opinion very freely, he at once proposes that they shall all be abolished, and his newly concocted name *Habrodictyon* be established in their stead. If the new name were illustrative of new ideas, or of new facts, it might be entitled to consideration; but as we find neither the one nor the other in the learned professor's paper, I do not think he can reasonably expect that it will be adopted.

Before we commence the descriptions of the genera and species of the siliceo-fibrous sponges, it will be as well to ask, what is a siliceo-fibrous sponge? and in what important points of structure does it differ from the general mass of the Spongiadæ? In the extensive order Silicea we find by far the greater number of genera are characterized by the existence of siliceous spicula in their skeletons, and that they are separated from each other by peculiar modes of their arrangement in the structures. In all the genera comprised in the siliceo-reticulate and spiculo-fibrous sponges nature has provided in their structure for their capability of expanding and contracting their skeletons to a certain limited extent; and this power appears to be inherent in all parts of the animal mass. We therefore find the dermal integuments closely adherent to the surface of the animal, expanding and contracting in unison with the general mass. This is not the case with a siliceo-fibrous sponge. The whole mass of the skeleton is formed of a continuous reticulation of solid siliceous fibre, which renders the skeleton perfectly inexpansible; but to compensate for this apparent defect in its economy, these sponges are provided with a peculiar expansile dermal system, the dermal membrane being furnished abundantly with connecting spicula, the distal surfaces of which are closely cemented to the inner surface of

the membrane, while their shafts are freely suspended in the interval existing between the dermal membrane and the surface of the rigid skeleton; so that when the animal is actively inhaling or exhaling, the expansile dermal system expands or contracts in accordance with necessities of its vital actions; but when in a state of inaction or repose, it subsides on to the rigid surface of the skeleton, and the long shafts of its connecting spicula are immersed in its interstices. This singular and beautiful provision of nature prevails in all the known siliceo-fibrous sponges which are in the condition they were when alive in their native element; it also readily accounts for the naked skeleton-like structure of many of the specimens of *Dactylocalyx* and *Iphiteon* which are preserved in the museums of London and Paris. The whole of this beautiful dermal structure is held together in life by the tough and elastic dermal membrane; but as soon as this is removed, either by decomposition or maceration in water, the remainder is the skeleton only of the animal, with probably a few of the retentive and interstitial spicula entangled in the interstices of the skeleton. I have not seen one of these sponges taken from the sea; but in two specimens in my possession, which were dried in the living condition, *Dactylocalyx Prattii* and *Masoni*, their external appearance is that of being enveloped in a thin brown leathery or parchment-like skin, and not the slightest indication of the beautiful rigid siliceo-fibrous skeleton is visible. In *D. Prattii* the expansile dermal membrane in its present condition is contracted into folds and ridges at the margin of the sponge, strongly indicating its lax and expansile nature when in the living state. I immersed one end of my specimen of *D. Masoni* in water for about half an hour; on removing it from the water, the dermal surface presented a smooth and slightly glazed appearance, and the membrane was readily removeable by the point of a penknife from the mass of the skeleton. When thus removed, I submitted it, immersed in water, to a power of 108 linear; I found that the sarcode lining it was so abundant and so much expanded by the water it had imbibed, that I could not see the apices of the numerous connecting spicula imbedded in it, their long shafts only being visible on its inner surface projecting through the stratum of sarcode. A thin slice of the rigid skeleton prepared under the same circumstances presented similar difficulties; the siliceous fibres were completely obscured by the abundance of the sarcode present, which filled all the interstitial cavities, appearing like a firm gelatinous matter of a deep-brown colour; and it was not until the specimens under consideration were dried, the sarcode again contracted into comparatively a thin film, and the specimens mounted in Canada balsam, that any of the siliceous structures of the sponge could be rendered distinctly visible. This abundance of the sarcode and its capability when in the dried state of imbibing water with great avidity are not peculiar to the siliceo-fibrous sponges; a great number of the Halichondroid sponges, under similar circumstances, present precisely the same phenomena.

If we make sections in the dried state of either of the sponges

of which I have been treating at right angles to their surfaces and then mount them in Canada balsam without previously immersing them in water, we frequently find portions of their surfaces in which the expansile dermal membrane has dried without having come into close contact with the rigid skeleton beneath it, and we see the shafts of the connecting spicula pendent from the inner surface of the dermal membrane and freely suspended in the intervening space; and under these circumstances we also frequently see a secondary thin brown dermal membrane closely adhering to the surface of the rigid skeleton. Fig. 6, Plate V., represents such a section from *Dactylocalyx Prattii*.

When the expansile dermal system in *Dactylocalyx Prattii* has been removed, we find the surface of the rigid skeleton closely covered by this continuous enveloping membrane, which in its present condition is closely adherent to the external surface of the rigid skeleton: while this membrane is in its natural state and position, no orifices whatever are observable in it; but when it is removed, we find immediately beneath it, on the surface of the rigid skeleton, a vast number of incurrent orifices of about the average diameter of one-third of a line. They are very evenly dispersed at about three or four times their own diameter from each other. That the enveloping membrane above them should appear imperforate is perfectly natural while the sponge is in a quiescent state; and there is no doubt that when requiring nutriment, imbibing-pores would be opened above each of the incurrent canals of the skeleton, in the same manner as in *Geodia* and numerous other similarly constructed sponges.

From the lengths of the shafts of the connecting spicula, which vary in some species from $\frac{1}{100}$ to $\frac{1}{300}$ inch, we may estimate tolerably closely the range of the contractile and expansile capabilities of the dermal system; and it is exceedingly probable that this space contains the aërating organs of the animal, and is truly the homologue of the large intermarginal cavities that are so numerous in the dermal crust of *Geodia Barrettii* and other closely allied sponges (see Phil. Trans. for 1862, pl. 32. fig. 2, *a a*, p. 788; and 'Monograph of British Spongiadæ,' vol. i. pl. 28. fig. 354, *a a*, p. 171). And this idea is rendered more probable by the existence of the innumerable spherical vesicles on the corresponding membrane of *Iphiteon Ingalli*, which have every appearance of being the basal cells bearing the vibratory cilia during the life of the animal.

The most decisive and valuable specific characters are those derived from the connecting spicula. They vary to a very considerable extent in different species in both size and form; but whatever may be the shape of their apical radii, their mutual connexion is always so ordered that not only is there abundant means for their combined mass to expand at right angles to the surface of the rigid skeleton, but there is always ample room for a great amount of expansion and contraction in a lateral direction; and however complicated or eccentric may be the radii of their apices when seen separately, when *in situ* they always form a compact reticula-

tion, each ray being so adapted to the structure of its neighbour as to render its eccentricity of form, when separate, no longer apparent when in combination (Plate V. fig. 8). The apices of the connecting spicula are exceedingly various in their forms, but they are all modifications of the triradiate one, even in the peltate forms; the triradiate canals passing from the distal termination of the central canal of the shaft at once indicate the connexion with the normal structure, as represented Plate V. figs. 9, 10, 11.

The general mass of the fibro-siliceous skeleton in the genera *Dactylocalyx* and *Iphiteon* varies considerably in the different species. In some it is quite smooth, in others tuberculated or spinous; but it is constant in its characters in each separate species; and besides its generic value, it very frequently affords valuable specific characters. Amidst the tissues of these sponges we find a secondary series of skeleton-fibres which are auxiliary to the primary ones, from which they differ in form and character to a very considerable extent. In the young condition they assume very much the aspect of the rectangulated hexradiate spicula; but they differ from the latter in always being based upon the skeleton-structure. In their progressive development they also unite readily with other fibres of a like description with which they may come in contact, a habit never assumed by true spicula of a similar form; and if in the course of their projection they do not meet with other similar fibres, they occasionally produce a second crop of rectangulating radii, a habit which has never yet been observed to occur in rectangulated hexradiate spicula; and although the latter are frequently intermixed with the auxiliary fibres, the spicula and the fibres are always distinctly separate from each other.

The especial office of the auxiliary fibres is evidently that of affording support to the interstitial membranes: they are rarely found in the compact portions of the rigid skeleton; but wherever there has been a large vacant space in those structures, there we find them projected into the space, anastomosing freely with each other, supporting thin films of interstitial membrane, and ultimately filling up spaces in the skeleton with solid fibrous structure, as represented in the large interstitial spaces (Plate III. fig. 1, *a*, *a*, *a*). Auxiliary fibres are frequently found in the interstitial spaces of keratose sponges; but in this class they always assume the character of the common skeleton-structure of the sponge in which they occur, the only difference being that they are very much more slender than the surrounding skeleton-structures.

The simple rectangulated hexradiate spicula occur, either singly or in fasciculi, in some species of siliceo-fibrous sponges in considerable numbers; in others they are of rare occurrence, or entirely absent. Their office is evidently purely that of affording support and extension to the interstitial membranes. They never anastomose with each other, or unite with any portion of the rigid skeleton. They are generally very slender, and when loosely fasciculated they accord in position. Their radii are frequently incipiently spinous at their apices, apparently for the purpose of affording a secure attachment

to the membranes they are destined to support, and which, in well-preserved specimens, may be seen stretching from point to point of the radii. Fig. 2, Plate III., represents a spiculum of this form × 108 linear.

In some species of siliceo-fibrous sponges there is a paucity or a total absence of the rectangulated auxiliary fibres and of the simple rectangulated hexradiate spicula; in such cases we frequently find their places supplied by numerous long acerate interstitial spicula dispersed in the interstitial spaces of the rigid skeleton, their office appearing to be to increase the surfaces of the nutrimental membranes. In specimens in which the animal matter is well preserved, the membranes are seen stretching from point to point of each spiculum, and from the points of one of these spicula to those of other similar ones in its neighbourhood; and as these spicula occur grouped together frequently in considerable numbers, it may be readily conceived that they perform an important office in thus increasing the amount of the nutrimental surfaces within the animal. The incipient spination of the radii, so prevalent in this form of spiculum, admirably fits them to maintain their hold of the delicate interstitial membranes which are attached to them.

The spinulo-trifurcated hexradiate stellate (Plate III. fig. 4) and other forms of those spicula appear to be peculiar to the siliceo-fibrous sponges. In the well-washed specimens they do not seem to be very numerous; but in cases where the interstitial membranes are in a good state of preservation, they are occasionally found to be so abundant and so closely packed together as to completely cover and obscure the membrane beneath them. Occasionally the hexradiate stellate forms occur with the radii attenuated and acutely terminated (Plate III. fig. 5).

This form of spiculum is abundant in the type specimen of *Dactylocalyx pumiceus*, and is probably either an abortive or an immature development of the spinulate form of spiculum. In my examination of the corresponding forms of spicula in *Iphiteon Ingalli* I found two of this attenuating form of spiculum which, under a power of 108 linear, appeared to have their radii acutely terminated; but on the application of a power of 666 linear I found that their apices exhibited incipient spinulation; and these spicula were the only two that I could find, although I searched for other specimens in a similar condition amidst a crowd of spinulate ones which completely covered a fragment of membrane that I obtained from the sponge while in the possession of my late friend Mr. Ingall.

The situation and peculiarities of the oscula and pores afford important characters in the determination of the species in all sponges. In the cup-shaped siliceo-fibrous sponges the oscula are situated on the surface of the inside of the cup, and the pores on the outer surface. The same law obtains in the cup-shaped kerato-fibrous sponges of commerce and in numerous cup-shaped Halichondraceous species. In coating or amorphously massive sponges the oscula and pores occupy the same surface, and the incurrent and excurrent systems of canals are intermingled. The circulation of the nutrient

and effete fluids of the animal are on the same principle as artery and vein in the higher animals, the excurrent canals having their minute origins near the terminations of the incurrent canals. But this distribution of the two systems does not obtain in all massive sponges. In some species of symmetrically oval or nearly spherical forms we find a modification of the system that obtains in the cup-shaped sponges, the inner portion of the cup being replaced by a large central cloacal tube into which the effete streams from the sponge are poured, and from the mouth of which they are projected, in many cases with a considerable degree of force.

This system is well exemplified in the genus *Grantia*.

Among the siliceo-fibrous sponges, we recognize the same principle in *Iphiteon beatrix* (*Aphrocallistes beatrix*, Gray), which in every other peculiarity of its skeleton is truly an *Iphiteon*. This variation in its habit from the cup-shaped siliceo-fibrous sponges is not sufficient to constitute it a separate genus, as we frequently find in the same species of sponges (as in *Halichondria panicea*) that one individual is massive with simple surface-oscula, while larger specimens, in addition to the surface-oscula, have several large cloacal appendages, receiving the excurrent streams in their cavities and discharging them from a common orifice. Such modifications of the excurrent system prevail to a very considerable extent in many other sponges; but the type of the skeleton-structure, which should always form the basis of generic characters, is never found to vary under any circumstances.

The descrimination of the genera and species of the siliceo-fibrous sponges is by no means a difficult task if we address ourselves to the operation with a sufficient degree of care and attention.

In our determination of genera it is necessary that the skeleton-structures should be examined in sections parallel to the surface of sponge, as well as in those at right angles to it, as the general aspects of these two sections are essentially different. Thus in *Iphiteon callocyathes* a section of the skeleton at right angles to the confluent radial strata presents no appearance of the rotulate arrangements of the fibre that are so characteristic of the genus; and in *Myliusia* the crypt-like form of the skeleton is only distinctly visible in a section at right angles to its surface.

The most efficient and striking specific characters are to be found in the expansile dermal system, in the spicula of the dermal membrane, and in the peculiarities of the structure of the connecting spicula. The characters derivable from the skeleton-fibre are often very effective; but in several of the species they so closely resemble each other as to be relatively of very little value as distinctive characters, while in no two of the known species of siliceo-fibrous sponge have we ever seen the same forms of connecting spicula and spicula of the dermal membrane occurring together. In the discrimination of species we should especially note the peculiarities of this interesting and beautiful dermal organism; and a portion of it should be boiled in nitric acid to obtain the spicula contained in it in a separate state.

When the expansile dermal system is present wholly or in part in specimens under examination, we are enabled to establish specific characters of external form and structural peculiarities of the most satisfactory description; but when that important portion of the organic structure of the sponge is absent, the characters derived from the form and surface of the rigid skeleton are necessarily provisional, and can maintain their places in its description only until a specimen in a natural and perfect state can be procured. When in the denuded state, the form and surface of the sponge should be stated as those of the rigid skeleton, not as that of the sponge.

Genera.

DACTYLOCALYX, Stutchbury.

Skeleton siliceo-fibrous. Fibres solid, cylindrical. Reticulations unsymmetrical.

Type *Dactylocalyx pumiceus*, Stutchbury, P. Z. S. 1841, p. 86.

IPHITEON, Valenciennes.

Skeleton siliceo-fibrous. Fibres solid, cylindrical. Reticulations symmetrical. Areas rotulate, confluent.

Type *Iphiteon panicea*, Museum Jardin des Plantes, Paris, from Porto Rico, 1799.

MYLIUSIA, Gray.

Skeleton siliceo-fibrous. Fibres solid, cylindrical. Rete symmetrical, disposed in a series of crypt-like layers parallel with the external surface, with intervening planes of perforated siliceous tissue.

Type *Myliusia callocyathes*, Gray, from the Island of St. Vincent, P. Z. S. 1859, p. 439, and 1867, p. 506.

KALIAPSIS, Bowerbank.

Skeleton siliceo-fibrous. Basal fibres cylindrical and canaliculated; distal fibres non-canaliculated, compressed. Basal reticulations symmetrical and reversedly arcuate; distal reticulations unsymmetrical and continuously ramifying.

Type *Kaliapsis cidaris*, Bowerbank.

FARREA, Bowerbank.

Skeleton siliceo-fibrous. Fibres canaliculated, canals continuous. Rete symmetrical; interstices rectangulated.

Type *Farrea occa*, Bowerbank.

PURISIPHONIA, Bowerbank.

Skeleton siliceo-fibrous. Fibres canaliculated, canals continuous. Rete unsymmetrical.

Type *Purisiphonia Clarkei*, Bowerbank.

ALCYONCELLUM, Quoy et Gaimard.

Sponge fistulate; fistula single, without a massive base. Skeleton siliceo-fibrous; primary lines radiating from the base in parallel straight or slightly spiral lines; secondary lines at right angles to the primary ones. Oscula congregated, with or without a marginal boundary to their area.

Type *Alcyoncellum speciosum*, Museum Jardin des Plantes, Paris.

DACTYLOCALYX PUMICEUS, Stutchbury.

Sponge cyathiform, slightly pedicelled. Surface even. Oscula and pores unknown. Expansile dermal system—connecting spicula furcated, attenuato-patento-ternate, and dichotomo-patento-ternate. Dermal membrane—tension-spicula small acerate and subequiangular triradiate spicula; retentive and defensive spicula acerate or cylindrical verticillately spinous, whorls of spines numerous and very large; and also attenuato-stellate, very minute, and numerous. Skeleton:—rete irregular; fibre stout, irregularly and abundantly tuberculated, apices of the tubercles minutely papillous. Auxiliary skeleton-fibres more or less rectangular hexradiate, profusely spinous, distal terminations clavate, large and numerous. Tension-spicula rectangular hexradiate, smooth, long and slender, radii subclavate. Retentive spicula trifurcated attenuato-hexradiate stellate; and spinulo-trifurcated hexradiate stellate, minute and very numerous. Gemmules membranous, aspiculous.

Colour unknown in the living state.

Hab. Barbadoes (*Dr. Cutting*), "Martinique par M. Plée, 1829." Examined in the state of skeleton.

Stutchbury's paper descriptive of this sponge was read at the Zoological Society, Oct. 26, 1841, and was published in vol. ix. p. 86 of their Proceedings. A full account of the paper is also published in the 'Annals and Magazine of Natural History,' vol. ix. p. 504. The author describes the sponge as being "formed entirely of silex, the reticulate structure of the mass being composed of transparent vitreous tubuli without any admixture of keratose or calcareous matter." This is a mistake, as the adult fibres are solid in every portion of them from the type specimen that I have submitted to microscopical examination.

Stutchbury has characterized the species as follows:—

"Sponge fixed, rigid, siliceous; incurrent canals uniform in size; excurrent canals large, forming deep sinuosities on the outer surface, radiating from the root to the outer circumference."

In this description the author has reversed the positions of the inhalant and exhalant organs, the former being placed on the outer surface and the latter on the inner one.

The whole of these characters appertain only to its outward appearance; and the description would serve equally well for several other species beside the one to which he has applied it. I have therefore thought it necessary to characterize the sponge from its internal

structure as well as from its external aspect, in the preceding manner. The type specimen was a widely expanded cup 16½ inches in diameter. It was divided into about equal parts; one half remains in the Bristol Museum, and the other is in the British Museum; the sides rather exceeded an inch in thickness.

The expansile dermal system, which usually contains the most strikingly characteristic parts of such sponges, is entirely absent from the general mass of the animal. The nature of the dermal membrane, the pores, and the oscula are therefore unknown to us; but without the aid of these organs there still remain sufficient permanent specific characters to enable us to readily separate this species from its nearly allied congeners, in their present denuded state. Of the two species in the British Museum, *Dactylocalyx pumiceus* and *Iphiteon Ingalli*, the latter has been figured by Dr. Gray in the 'Proceedings' of this Society for 1867 (plate 27. fig. 2), and has been erroneously designated *Dactylocalyx pumicea*; and this error is the more remarkable as the surface-characters of the two specimens differ very materially from each other. The outer surface of *D. pumiceus* is furnished with deep channel-like depressions, disposed in irregular lines radiating from the basal portion towards the margin of the sponge. These channels or large interstitial spaces penetrate deeply into its substance, so as to convey within it the newly imbibed streams from the inhalant pores. On the upper surface of the sponge these channels do not exist; but *in lieu* of them there are numerous large round or oval orifices, varying in diameter from about two lines to nearly half an inch. There is a slight tendency to an arrangement in lines radiating from the centre to the circumference. There can be little doubt of these orifices being the terminations of the great excurrent system of the sponge, and that above each of them in the living state there would be the true oscula of the dermal system of the sponge. *I. Ingalli* differs materially in its surface-characters from *D. pumiceus*. The inner surface of the cup is furnished with numerous deep channels or depressions with sharp margins, while in *D. pumiceus* the corresponding part of the sponge is occupied with numerous circular or oval orifices with rounded margins; the outer surface of *I. Ingalli* is furnished with deep more or less sinuous channels with rounded margins, while the similar channels in *D. pumiceus* are decidedly arranged in nearly straight lines. Beside these differences in external appearance, the characters of their respective skeletons at once separate them not only as species, but as genera. The irregular structure of *D. pumiceus* is readily to be distinguished from the characteristic symmetrical configuration of the circular confluent areas of *Iphiteon*.

There is also in the British Museum a piece of *D. pumiceus*, about 2 inches long by 1½ inch broad and about ¼ inch thick, on a tablet, said to be from Barbadoes; this is probably a fragment off the large specimen from the Bristol collection, as its microscopical characters agree precisely with those of the large portions which I have examined.

There is also a small specimen of the species in the Belfast Mu-

seum in about the same degree of preservation as the type one; but in consequence, probably, of not having been so much washed to make it look pretty, it abounds in the beautiful and characteristic spinulo-trifurcate hexradiate stellate retentive spicula.

The fibre in the skeleton is abundantly but irregularly tuberculated, as represented in fig. 1, Plate III., from a section of the type specimen from Barbadoes in the British Museum, × 108 linear.

The tuberculation of the fibre is remarkable and very characteristic; when viewed with a power of about 700 linear, their apices are always more or less papillous; in some the papillæ are numerous and well produced, while in others they are in an incipient condition. Fig. 13, Plate III., represents two of the tubercles on the side of a portion of skeleton-fibre with their terminal papillæ, × 666 linear.

Beside the large primary fibres, there is a secondary series of skeleton-fibres, which are evidently auxiliary to the larger system. They occur especially in the large interstitial spaces of the sponge, their office being apparently that of filling up those vacant spaces when no longer necessary in the economy of the animal, and to sustain therein the multiplied folds of the interstitial membrane; their office in this respect is the same as that of the large rectangulated hexradiate spicula (Pl. III. fig. 2) which occur so frequently in the interspaces of the skeletons of the siliceo-fibrous sponges, and their mode of development very closely resembles that of those spicula. In an early stage of their growth they very closely simulate the form of the spicula; but instead of being freely developed amidst the membranous tissues, they are always based on the primary skeleton-fibres. A single small fibre pullulates from some part of one of the larger skeleton-ones, and is projected in a straight line into the vacant space: if it meets with none other in its progress, at some distance from its origin four lateral branches are thrown out at right angles to the axial fibre and to each other, and the axial fibre continues its progress in a straight line. If it meets no other fibre in its progress, the distal ends of the axial fibre and of the lateral ones become clavated, and all parts of the shaft and radii profusely spinous, and the whole constitutes a perfect simulation, in form, of a rectangulated hexradiate spiculum. But, on the contrary, should the axial or the radial branches meet with other such fibres, they immediately inosculate, and the previously straight radii are contorted in various directions to meet the necessities of the situation; and, as is frequently the case, where many of these fibres are projected from different bases into the same space, they unite and form one mass of small contorted fibres, while there is good reason, from the gradual increase in size of the basal portions of some of them, to believe that they are ultimately developed into the size and form of the primary skeleton-ones.

The primary skeleton-fibre averages $\frac{1}{588}$ inch in diameter; the auxiliary fibres vary from $\frac{1}{3000}$ to $\frac{1}{8000}$ inch in diameter. However closely they may simulate the form of true hexradiate spicula, they may always be distinguished from them by their attach-

ment to the primary skeleton-fibres and by their habit of inosculation.

Beside the auxiliary fibres, there are in some parts of the sponge an abundance of true rectangular hexradiate spicula (Plate III. fig. 2); but they are rarely found mixed with the auxiliary fibres or in the same spaces with them. Although occurring in closely packed groups, they never unite with each other, nor are they even attached to any parts of the surrounding skeleton-fibre, and they always preserve their normal form. They are slender, smooth, and their radii are very slightly inclined to become clavate. The termination of the elongated basal portion of the spiculum is frequently incipiently spinous. Their length is $\frac{1}{34}$ inch, the expansion of the lateral radii $\frac{1}{100}$ inch, and the diameter of the axial shaft varies from $\frac{1}{8000}$ to $\frac{1}{10000}$ inch.

The trifurcated attenuato-hexradiate stellate (Plate III. fig. 5) and the trifurcated spinulo-hexradiate stellate spicula (Plate III. fig. 4) are both very abundant, and in some small masses of sarcode they are so numerous and so closely packed together as to render it quite impossible to count them. The sarcode appears to have been very abundant, as in some parts it completely fills up the reticulations of the skeleton; it is of a full amber-yellow colour.

Thus far we have positive characters by which to discriminate this beautiful species of sponge from its nearly allied congeners; but I have been fortunate in finding other characters, which, from the mode in which they have been obtained, although not so decisive in their nature, are yet of such importance that their description cannot be omitted in treating of this species.

I carefully examined the half of the type specimen of *D. pumiceus* that is in the British Museum in the hope of finding a small fragment of the dermal portion of the sponge, but I did not succeed in detecting any remains of it on the cup-shaped portion of the specimen; but on the basal surface of the pedicel there were remains of what appears to have been the basal membrane. It consists of a dense yellow incrustation, closely intermingled with the basal skeleton-structure, and agreeing in colour and appearance with a few very minute specks of the animal matter of the external surface of the sponge. I mounted a small portion of this basal matter in Canada balsam; but this material did not render the fragments transparent; yet there were at some portions of their margins unmistakable evidences of their containing spicula. There were also fragments of the skeleton-structure of the base of the sponge, the reticulations of which were, as might be expected from their situation, very close and dense (Plate III. figs. 14 and 15); and along with these fragments there was a group of three large and very remarkable verticillately spined cylindrical spicula, very closely resembling in their structure the one represented by fig. 69, plate 3, vol. i., 'Monograph of British Sponges,' and also by fig. 23, plate 36, Phil. Trans. for 1862, but differing from those figures in being much longer in their proportions, and in having a greater number of circles of spines (Plate III. fig. 6). Having seen thus much of the dermal

structures, I treated the remaining portion of the specimen by boiling it in nitric acid, and obtained not only numerous specimens of the spicula I have described above, but others of an exceedingly interesting description, which I shall now proceed to describe.

The large verticillately spined spicula are very numerous, and exceedingly various in their proportions. They are usually more or less curved, and vary greatly in size and in the mode of their spination: some of the larger ones are acerate; that is, each end terminates in a well-produced point; others have at one end an irregular aggregation of stout spines, while the other is acutely terminated; and in some both ends are crowded with stout spines; and the general character of the shaft is that of a cylindrical spiculum. They occur in every imaginable stage of development, from extremely delicate diameters with the whorls of spines in quite an incipient condition (Plate III. fig. 6 *a*) up to the fully developed spiculum (fig. 6 *b*). The number of whorls of spines vary from 9 to 16; one with the latter number measured $\frac{1}{38}$ inch in length, and the diameter of the shaft was $\frac{1}{888}$ inch. The spines are large, acutely conical, and there are seldom more than five or six in each whorl. These spicula must have been very numerous and closely disposed in the membrane. The two small pieces acted upon by the acid would not have exceeded the space of a quarter of a superficial square inch, while the results of their dissolution by the acid would cover more than a superficial square inch, and in a microscopic field of view $\frac{1}{13}$ inch in diameter I counted as many as twenty-one of them. Under all these circumstances there can be no reasonable doubt of these spicula being those of the defensive system of the dermal membrane of the sponge; and such spicula are usually found as abundant in the basal membrane as in other parts of the dermal system.

I found also a considerable number of small equiangular or subinequiangular triradiate spicula with smooth attenuated radii, varying in size, from point to point of the rays, from $\frac{1}{222}$ to $\frac{1}{322}$ inch (Plate III. fig. 7). Such spicula are usually comparatively few in number, and are dispersed irregularly on the surfaces of the dermal or interstitial membranes of sponges. At the margin of a fragment of the sponge from very near the basal attachment, which was mounted in Canada balsam in its natural condition, I found the small equiangular spicula and little acerate ones (Plate III. fig. 8) imbedded in the membrane amidst minute attenuato-stellate ones. In this position they may therefore be regarded as tension-spicula of the dermal membrane.

Amidst the other spicula resulting from the dissolution of the fragments from the base of the sponge by nitric acid there were several furcated attenuato-patento-ternate (Plate III. fig. 9) and dichotomo-patento-ternate (fig. 10) connecting spicula. One large one of the last-named form measured across its ternate termination $\frac{1}{50}$ inch; and all of them had large central canals in their radii. These spicula appear to vary considerably in size; a smaller one measured $\frac{1}{166}$ inch in greatest expansion. There can be no doubt that they belonged to the expansile dermal system of the sponge; and the small number of them found may be accounted for by their

forming no part of the economy of the basal membrane, although usually abounding in the dermal one; and their presence may be accounted for by the fact that the material operated on was principally taken from the margin of the base of the sponge, at the junction of the membrane of the pedicel with that of the base.

Imbedded in the remains of the membranous structures operated upon by nitric acid, there were a few very minute attenuato-stellate spicula; and I subsequently found at the margin of a fragment of the basal portion of the sponge, mounted in Canada balsam in its natural condition, several dichotomo-patento-ternate connecting spicula *in situ*, and along with them a crowd of the minute attenuato-stellate ones. They were so numerous as to entirely obscure the small portion of dermal membrane on which they reposed. The regular mode of their disposition on the membrane, and the contact of the latter with the expanded outer surface of the heads of the dichotomo-patento-ternate connecting spicula, unmistakably indicates their especial office and true position in the sponge as retentive and defensive spicula of the dermal membrane.

I measured several of these minute spicula. The largest was $\frac{1}{1287}$ inch from the opposite points of their radii; the smallest was $\frac{1}{2703}$ inch in extreme diameter; but by far the greater number were about $\frac{1}{2000}$ inch in diameter, and the largest measurement was of rare occurrence. Occasionally, but very rarely, the radii were cylindrical, instead of attenuating to an acute point.

From the indications afforded by the spicula I have described above we may reasonably predict that, when a specimen of *D. pumiceus* shall have been found in a living state and perfectly preserved, we shall find it to be furnished with a beautiful expansile dermal system similar in character to those of the siliceo-fibrous sponges which are well known to us in a perfect state of preservation, such as *D. Prattii* and *D. Masoni*. But our evidence regarding the structure of the sponge is not yet exhausted; for by a careful examination of a series of minute fragments which I subsequently obtained from the margin of the base of the type specimen in the British Museum and mounted in Canada balsam in their natural conditions, I strengthened the evidence obtained from the spicula operated on by nitric acid. In several cases these spicula were seen imbedded together in the same membrane at the transparent edges of the fragments under examination. In one such case the membrane was thickly studded with the minute attenuato-stellate spicula, and amidst them was imbedded one of the subequiangular triradiate and several of the small acerate tension-spicula; from the edges of another fragment the ternate heads of two connecting spicula, covered by dermal membrane containing innumerable minute attenuato-stellate spicula, were projected, thus confirming the inferences raised by the spicula arising from the dissolution of the fragments in nitric acid.

The evidence derived from the dissolution of portions of the basal part of the sponge in nitric acid might reasonably be questioned; but when we are able to confirm it by detecting the spicula separated

by the acid imbedded together in their natural conditions in the membranes of the animal, this at once removes all doubts respecting their really appertaining to the animal under consideration.

In a small fragment of the skeleton from the inner surface of the sponge near the base I found portions of the interstitial membranes filling the areas of the network of the skeleton in a good state of preservation; they were coated with dense yellow sarcode, in which were a considerable number of trifurcated hexradiate stellate spicula completely imbedded; but I could not detect any of the minute attenuato-stellate, the equiangular triradiate, or the small acerate spicula; it may therefore be fairly inferred, from their absence in the interstitial membranes, that the latter three forms appertain more especially to the dermal one, in which they occur in such abundance.

In the Museum of the Jardin des Plantes at Paris there are two very interesting specimens of *Dactylocalyx pumiceus*; one is a small and apparently young specimen, the other a tall ewer-shaped specimen in a well-developed adult condition. The first of these two specimens, I was informed, had not been in the possession of Dr. Lacaze-Duthiers more than a few weeks previously to my seeing it. It was labelled "*Iphiteon panicea*, Valenciennes. La Martinique." It is $2\frac{3}{4}$ inches in height, and the same in diameter at the top of the cup. It is based on the edge of a flat piece of what is apparently tufa. In form, it is a symmetrical cup without a pedicel; the base is about $1\frac{1}{4}$ inch by 1 inch in diameter. The thickness of the cup at the margin varies from a quarter to rather exceeding half an inch. On the outer surface there are deep channels running most frequently in a longitudinal direction, varying in width from about 1 to 2 lines, and in length from $\frac{1}{2}$ inch to 2 inches; and where they are not present, their places are supplied by round or oval deep apertures. On the interior surface there are also 9 or 10 lines of large round or oval apertures radiating from the base of the cup to the margin. Many of these deep interstitial cavities pass entirely through the sides of the cup, so that they are common to both internal and external surfaces. In some of these cavities on the inside of the cup there were one or two long slender spicula, the whole lengths of which could not be seen.

The structural peculiarities of the skeleton agree perfectly with those of the type specimen of Stutchbury's genus *Dactylocalyx*, and the specific characters, as far as they were present, with the species *pumiceus*. The specimen has been too well washed, to make it look beautiful; but notwithstanding this injudicious treatment, I found, in the minute section of the skeleton, made at right angles to its surface, several little groups of spinulo-trifurcated hexradiate spicula imbedded in the remains of the animal matter.

The second or ewer-shaped specimen is 14 inches in height; its upper margin is not circular, but has one portion of its circumference bent outward and downward like the lip of a large water-ewer. At this depressed part it is $12\frac{3}{4}$ inches across; and at right angles to this line the measurement is 10 inches. It is labelled "*Iphiteon panicea*" from "Martinique par M. Plée 1829." It has no part

remaining of the basal membrane or true surface of attachment, and has in the centre of its present base a hole through it big enough to receive my first finger; and it is probable that the true base was an inch or more below the present one. On its external surface it has numerous wide and deep channels, radiating irregularly from the base towards the margin of the cup. The ridges between these channels have rounded edges, and they have frequently round or oval apertures irregularly dispersed upon them. Both channels and round orifices penetrate deeply into the substance of the sponge. The interior surface has very few of these interstitial channels; but there are an abundance of large cavities of a somewhat funnel-shaped form, their lower orifices being small compared with their surface ones, many of which are ½ inch in diameter. There is a very slight tendency towards a radial arrangement of these large orifices.

The results of the microscopical examinations of fragments of the tissues of this sponge from various parts were exceedingly satisfactory. From the part of the base of the sponge, where it is stained yellow by the remains of the animal matter, I obtained portions of membranous structure containing numerous specimens of dichotomo-patento-ternate spicula, like those in the basal membrane of the type specimen in the British Museum. Dense patches of small acerate spicula with numerous minute simple attenuato-stellate ones intermixed with them, precisely similar to those in the type specimen, were also abundant and *in situ*, completely covering and concealing comparatively large fragments of the skeleton-tissues. A few fragments of a basal siliceous reticulation similar to that in the type specimen were also observed.

From a part of the external surface of the sponge near its upper margin, which was stained of a brown colour by the animal matter, I obtain fragments containing numerous patches of dark amber-coloured sarcode and a considerable number of gemmules *in situ*. They are globose and variable in size (Plate III. fig. 12); they are membranous and aspiculous, and are very like those figured in plate 25. fig. 340, 'Monograph of British Spongiadæ,' vol. i., from *Iphiteon panicea* in the Museum of the Jardin des Plantes. Imbedded in the patches of sarcode there were trifurcated attenuate and spinulo-trifurcated hexradiate stellate spicula in considerable quantities; and in some dust shaken out of the inside of the sponge numerous fine specimens of the large fusiformi-acerate spicula, like those of the type specimens, were obtained. The discovery in the French specimen of the dichotomo-patento-ternate spicula, and the patches of the small acerate and simple attenuato-stellate spicula intermingled, is highly satisfactory, as it places beyond a reasonable doubt their true positions in the sponge, and that they were not adventitious in the type specimen, but were really characteristic of the species; and at the same time it marks the specific identity of the French specimen with the type one of Stutchbury's genus.

None of the large acerate or cylindrical verticillately spinous spicula which abound in the basal membrane of the type specimen, or of the subequiangular triradiate spicula of the dermal membrane,

were observed; but their absence may be readily accounted for by the condition of the basal portion of the French specimen and the apparently total destruction of its dermal membrane. In every other specific character there is a complete agreement between the two specimens under consideration.

Among the spicula resulting from the dissolution of a portion of the basal structures of the type specimen of *D. pumiceus*, I found two trifurcated expando-ternate spicula, which are represented by fig. 14, Plate III., ×666 linear. They are very minute, and probably belong to an unknown species of the genus, and were adherent to the basal membrane of *D. pumiceus*. I have never met with this form of spiculum before; I have therefore thought it advisable to record its occurrence.

DACTYLOCALYX HETEROFORMIS, Bowerbank.

Coscinospongia heteroformis, Valenciennes.

Sponge sessile, fan-shaped, plicated sinuously. Surface slightly undulating, minutely hispid. Oscula on the upper surface slightly elevated and marginated, margins rounded; uniform in size and very numerous, irregularly dispersed, rarely exceeding one-third of a line in diameter. Pores congregated on the under or inhalant surface; porous areas scarcely visible to the unassisted eye, slightly depressed, very numerous, dispersed, rarely more than once their own diameter from each other. Expansile dermal system exceedingly ramified and complicated; inhalant surface furnished abundantly with long, slender, flexuous spicula, irregularly dispersed amid the dermal fibres. Dermal membrane pellucid, furnished with a fine but very irregular network of apparently siliceous fibres. Skeleton —reticulations close, irregular, and very much ramified; fibre smooth, slightly compressed; frequently terminating in dense short tufts of minutely ramified fibres.

Colour in the dried state, dark brown.
Hab. Shanghai (*M. Montigny*, 1854).
Examined in the dried condition.

The sponge is composed of numerous sinuous plications or folds from 3 to 4 lines in thickness near the margin. It is 5 inches in height, 4½ inches in breadth, and, including the plications, from 3 to 4 inches from back to front. The membranous and sarcodous tissues are apparently in the same state of preservation as when taken from the sea in a living condition. The surface of the plications is slightly undulated. The hispidation of the surface is not visible to the unassisted eye; but, in a section at right angles to the surface, beneath the microscope it is distinctly apparent. The integral parts of the expansile dermal system appear to be inextricably locked together; but this external layer of tissue is distinctly separated from the solid mass of the skeleton beneath it. The porous system on the under or inhalant surface of the sponge is a very beautiful microscopical object. The inhalant areas are exceedingly numerous and closely adjoining each other; they vary to some extent in their

form from circular to oval, and occasionally they are nearly oblong. They are protected from the incursions of minute annelids and other enemies by the projection into their areas of the furcated terminations of the skeleton-fibres of the surface-tissues (Plate IV. fig. 2). This beautiful mode of defence is very characteristic of the species, and is an excellent substitute for the usual defensive spicula in such organs. Beside this mode of defence, the dermal surface is furnished rather abundantly with long slender flexuous spicula, which pass over the inhalant areas in various directions.

The oscular surface of the sponge is not furnished with the same minute slender acerate spicula that abound on the inhalant one, but the whole of the former surface is protected by a modification of the style of defence that is so beautifully exhibited on the margins of the inhalant areas. The oscular membrane which closes that organ and the slightly elevated ring whence it proceeds have not the same furcated defences that are so abundant at the margins of the inhalant areas; but as we focus downward through the orifice towards the surface of the rigid skeleton of the sponge, we occasionally observe some of the furcated defences projecting from the parietes of the cavities. The oscular membranes at several of these orifices were in a semicontracted state; numerous minute grains of sand were scattered on their external surfaces, but no spicula were apparent in any of the membranes. In one of them the margin was in a very perfect condition, slightly thickened; and the membrane exhibited faint concentric lines of contraction (Plate IV. fig. 3).

The dermal membrane is pellucid, and is furnished with a fine but very irregular network or stratum of slender siliceous fibres, their siliceous structure being well characterized by the frequency of their fractures at right angles to their axes; they do not appear to anastomose, but to overlie each other without any approach to symmetry in the mode of their disposition. Plate IV. fig. 4 represents a small portion of this tissue beneath a power of 308 linear.

The skeleton-tissue is exceedingly irregular and intricate. The fibres of which it is composed are more or less compressed; they are quite smooth, but frequently throw off short branches which terminate with crowded masses of minute ramifications of siliceous structure.

In July 1861, when I first saw this sponge in the collection of the Jardin des Plantes at Paris, the late Professor Valenciennes told me that he had not yet described it; and on the occasion of my last visit to Paris, in May 1868, I could not learn that he had subsequently done so. I am therefore quite ignorant of the characters he would have assigned to his genus *Coscinospongia*; but as it agrees in the structure of its skeleton with Stutchbury's previously established *Dactylocalyx*, I have assigned it to that genus accordingly.

DACTYLOCALYX M^{c}ANDREWII, Bowerbank.

MacAndrewia azorica, Gray, P. Z. S. 1859, p. 438, plate xv.

Sponge pedicelled, sinuously cup-shaped. Surface even or slightly undulating. Oscula small, evenly dispersed on the inner or

exhalant surface; simple or slightly elevated and marginated. Pores inconspicuous, evenly dispersed on the outer or inhalant surface, furnished with a protective fringe of minute short acerate spicula. Expansile dermal system—dermal membrane abundantly furnished with minute, short, stout, acerate spicula, evenly matted together. Connecting spicula foliato-expando-ternate; foliations of the apex depressed, very elaborate and irregular, shaft rather long. Skeleton-surface covered by a secondary dermal membrane; abundantly furnished with minute, short, acerate spicula, same as those of the primary dermal membrane. Skeleton-fibres somewhat compressed, smooth, furnished at intervals with groups of large spicular attenuated spines. Sarcode in the dried state amber-coloured.

Colour, in the dried state, nut-brown.
Hab. St. Michael's, Azores (*Robert M°Andrew, Esq.*).
Examined in the dried state.

This sponge was described by Dr. J. E. Gray in the 'Proceedings' of this Society for 1859, p. 438, plate xv. *Radiata*, under the name of *MacAndrewia azorica*. In its external appearance it very closely resembles *Dactylocalyx heteroformis* of the Museum of the Jardin des Plantes, Paris, and *Dactylocalyx Prattii*; but in its structural characters it differs in many important respects from either of them.

The structure of the skeleton is truly that of a *Dactylocalyx*, and I have therefore referred it to that genus.

The description of the genus in the 'Proceedings' of this Society for 1859 refers only to its external characters, and is so vague that it might be equally well applied to several other species of this tribe of sponges. In the 'Proceedings' for May 1867 Dr. Gray gives another version of its generic characters, in which he designates the sponge as a coral, thus:—"The coral expanded, cyathiform; the upper and lower surface smooth, the upper surface with small oscules; the fibres of skeleton small, with stellate spicules on the dermal surface. The stellate spicules three-rayed; the rays forked and reforked. Bowerbank, British Sponges, fig. 53." This description is not only quite as vague as the original one, but, in addition, is very incorrect. In the first place, the specimen is undoubtedly not a coral; and, secondly, there are no stellate spicula on the dermal surface, nor have the connecting spicula "the rays forked and reforked." And the reference made to 'British Sponges,' fig. 53, is a mistake, as a reference to that work will prove, the spiculum there represented by the figure quoted being "a spiculated dichotomo-patento-ternate" one "from an unknown sponge." And, moreover, no such form of spiculum is to be found in Dr. Gray's *MacAndrewia azorica*. The specimen is in the British Museum.

The sponge is elevated on a short stout pedicel, from the top of which it expands into an irregular sinuously shaped cup with rounded margin. The external or inhalant surface is smooth, but slightly undulating. The internal or exhalant surface is slightly roughened by the presence of the oscula, which are evenly distributed over the

whole of its surface; they rarely exceed a line in diameter; the smaller ones are frequently simple orifices, the larger ones are slightly elevated and marginated. The pores are not visible without the aid of considerable microscopical power; with about 100 linear their structure exhibits an exceedingly beautiful appearance. They each occupy an area formed by the intermingling of the elegant foliations of the ternate connecting spicula; and each little porous area is furnished with a regular fringe composed of a single series of the small dermal tension-spicula, which, projected from its margin inwards, meet at about the centre of the space, forming a complete defence against the incursions of any minute enemy; in the dermal membrane around, the minute tension-spicula are closely and irregularly matted together (Plate IV. fig. 5).

When we view a section of the sponge made at right angles to its surface, the structural peculiarities of the expansile dermal system of this tribe of sponges are very beautifully displayed. The outer surface is densely covered with the terminations of the ternate spicula of that organ, and again with the dermal membrane and its closely matted tension-spicula. Immediately beneath we see the pendent shafts of the ternate spicula, more or less clothed with minute acerate spicula, and with the proximal terminations of the shafts cemented by keratode to projecting portions of the fibre of the rigid skeleton, the surface of which is covered by a stratum of membranous structure, abundantly furnished with minute acerate spicula; the space between this surface-membrane of the rigid skeleton and the under surface of the expansile dermal system forms a large cavernous or crypt-like cavity supported by innumerable pillars at about equal distances from each other.

The arrangement of the fibres of the rigid skeleton have all the complete irregularity of a *Dactylocalyx*, and there is not the slightest approach in any part to the confluent radial structure of an *Iphiteon*. There are a few comparatively large acerate spicula dispersed amid the reticulations of the rigid skeleton; they are about four or five times the length of the dermal ones, and they are not frequently to be seen *in situ*. The connecting spicula are exceedingly beautiful objects. They are very variable in size and structure; and no two of them are alike in the mode of the foliations of their ternate radii, which are evidently modified to meet the necessities of the intermingling of their terminations, so as to secure a strong and elastic covering to the interstitial cavity beneath, and at the same time to produce abundant spaces for the porous areas of the dermis of the inhalant system. The structural aspect beneath the exhalant surface is very different from that of the inhalant one: here we find, as might be expected, large cavernous spaces for the reception of the effete streams from the rigid skeleton beneath, and, instead of the regular crypt-like form with its numerous minute pillars, we have elongated extensive spaces, the sides of which are, to a great extent, composed of irregularly disposed large acerate spicula imbedded in membranous structure; the shafts of the connecting spicula above are some of them connected with the parietes of the cavernous spaces,

while others appear to have no connexion with the tissues beneath them.

DACTYLOCALYX PRATTII, Bowerbank.

Sponge irregularly cup-shaped, pedicelled; surface even, slightly undulating. Oscula simple, small, dispersed, numerous. Pores congregated in areas formed by the distal terminations of the expando-ternate connecting spicula, numerous and large. Expansile dermal system—dermal membrane pellucid, furnished abundantly with minute entirely spined fusiformi-cylindrical spicula, short, frequently semilunate or angulated, irregularly dispersed. Connecting spicula irregularly furcated patento-ternate; radii slightly depressed, apices thin and expanded; ternate heads combining to form a dermal network. Enveloping membrane of the rigid skeleton abounding with the same minute spicula as those of the dermal membrane, and also with numerous separate flat fasciculi of long and slender acerate tension-spicula. Skeleton—rete compact; fibres smooth, or irregularly and slightly spinous; free terminations of fibres ramose, or abundantly tuberculated. Interstitial spicula acerate, long, slender, and frequently flexuous, mostly disposed in lines at right angles to the dermal surface. Interstitial membranes pellucid, furnished with the same form of retentive spicula as the dermal membrane.

Colour in the dried state, light brown.

Hab. East-Indies (*S. P. Pratt, Esq.*); off the island of Formosa (*Mr. Swinhoe*).

Examined in the dried state.

I am indebted to my late friend Mr. S. P. Pratt for the very interesting specimen under consideration. He stated that he was not quite certain of its locality, but he believed he had received it from his son, who was then in India, along with many other interesting marine specimens. The form of the sponge is that of an irregularly shaped cup, the rim of which is nearly an oblong, 4½ inches long and 3½ inches wide; and at one corner there is a depression of the margin, so as to form a lip to the cup of rather more than an inch in depth. The height of the cup in its present state is 4 inches. It has been broken away from its natural base; but, from the indications remaining, it is probable that it was elevated on a short pedestal. The margin of the cup is unequal in its thickness, varying from half an inch to a thin sharp edge. The specimen was evidently in a living state when taken from the sea, and it is still in an excellent state of preservation.

The oscula are simple orifices, without any especial defensive organs; they have the usual contractile membrane to open and close them in accordance with the necessities of the animal. The greater portion of them were closed, while others were more or less open. Through one in the latter condition, in a slice from the surface mounted in Canada balsam, the surface of the rigid skeleton was seen, covered by the enveloping membrane, which was closely adhe-

rent to the outer portion of the rigid skeleton. When the back of this specimen was presented to the eye, this membrane was seen to be abundantly supplied with large, long, flat fasciculi of slender acerate tension-spicula. The minute short fusiformi-cylindrical spicula were as profusely scattered over the surface of this membrane as on the external dermal one.

The porous system, especially when we view its inner surface, is a most beautiful object for the microscope. The interlacing radii of the large patento-ternate connecting spicula form a beautiful series of round or oval areas, each containing from one to four or five large pores, the greater portion of which were open; and the dermal membrane on which they exist is beautifully freckled with innumerable minute, entirely spined fusiformi-cylindrical spicula, so closely packed together as to completely obscure the surface of the membrane, while the acutely conical shafts of the connecting spicula are seen at regular intervals projected towards the eye. A portion of this beautiful membrane is represented by fig. 8, Plate V.

The expansile dermal system is admirably displayed in this sponge by a section at right angles to the surface from almost any part of it. In some portions of such a section the dermal surface is closely pressed on to the surface of the rigid skeleton, while in others it is seen more or less separated from it, forming a cavity above it, into which the shafts of the connecting spicula are projected towards the surface beneath, as represented by fig. 6, Plate V.

The irregularly furcated patento-ternate connecting spicula are singular in their structure, and very characteristic of the species. No two of them are precisely alike, either in size or form; the eccentricity with which the radii are projected from the head of the shaft and the exceedingly variable mode of their ramifications are not a matter of chance, but they are evidently influenced by the necessities of their combinations with each other in forming the dermal network and porous areas; for if we view them *in situ*, we observe no points straying from the lines of combination, but the whole of their radii are locked together so as to form a compact but expansile network for the support of the dermal membrane and the formation of the porous areas.

The interstitial membranes filling the areas of the network of the skeleton are very translucent, and would scarcely be visible when immersed in Canada balsam, if it were not for the minute, short fusiformi-cylindrical spicula which are dispersed over their surfaces. These spicula, though exceedingly minute, afford very decisive specific characters. They are dispersed, more or less, over every part of the membranous structures, but more especially on the dermal membrane and the enveloping membrane of the rigid skeleton, which tissues they completely cover. They require a power of from 700 to 1000 linear to define their structural characters in a satisfactory manner. They vary considerably in size; one of the largest that I measured was $\frac{1}{2333}$ inch in length, and $\frac{1}{11666}$ inch in diameter; one of the smallest measured $\frac{1}{4666}$ inch in length, and $\frac{1}{20000}$ inch in diameter.

The continuous reticulating fibre of the skeleton is smooth and slightly compressed; but there are numerous stout branches projected from it that are full of large tuberculations, so that they very closely resemble the young budding antlers of a stag which are being renewed after the old ones have been shed. There are also occasionally small short groups of tubercles on the angles of the reticulating skeleton; but these are probably an incipient state of the large tuberculated branches which are projected in such great numbers into the interstitial cavities of the sponge. These organs apparently supply the place of auxiliary fibres and the rectangulated hexradiate spicula so plentiful in other species of *Dactylocalyx*, but which appear to be totally absent in this one. The numerous fasciculi of long slender acerate spicula also appear to replace the rectangulated hexradiate ones in their office of supplying support to the interstitial membranes of the sponge in the larger spaces within the skeleton; a few single ones are frequently seen passing amid the reticulations of the skeleton in directions either horizontal or diagonal to the surface.

During a visit to the British Museum on the 23rd of October, 1868, I was fortunate enough to find a second specimen of this species, from Formosa by Mr. Swinhoe. It differs materially in form from the type one that I received from my late friend Mr. Pratt. It is a much less developed sponge; but what there is of it is on a larger scale; and fortunately the basal attachment, wanting in the type specimen, is in a perfect condition. It is seated on one end of a small mass of what appears to be sandstone, the under surface of which is covered by serpulæ. On the sandstone at the base of the sponge there is a cream-coloured patch of a compound tunicated animal, about $1\frac{1}{2}$ inch in length and $\frac{3}{4}$ inch in breadth. The base of the sponge is 2 inches by $1\frac{1}{2}$ inch in diameter; half an inch above the attachment the specimen is contracted (and at that part the development of the cup commences), and it expands slightly upward; the height of the specimen is about 3 inches. The sponge is fortunately in very nearly as fine a state of preservation as when taken from the sea; and every organ that is found in the type specimen appears in abundance in the one from Formosa. In truth, portions of the structures taken from the one specimen cannot, by microscopical examination, be distinguished from those mounted from the other.

There are some points in the state of the two specimens that are very instructive. Thus in the type specimen the porous system is in a beautiful condition, and the numerous pores in the areas are all open, while in the corresponding portions of the dermal membrane in the specimen from Formosa they are entirely closed; so that the important character of the congregation of the pores in areas could not have been determined from the latter specimen alone.

The acquisition of this specimen from Formosa is in favour of Mr. Pratt's belief that the type one was really an East-Indian specimen.

DACTYLOCALYX MASONI, Bowerbank.

Sponge sessile, sinuously fan-shaped; surface even, margin

rounded. Oscula small, slightly elevated, dispersed, very numerous. Pores inconspicuous, dispersed. Expansile dermal system—dermal membrane abundantly spiculous. Connecting spicula furcated, attenuato-patento-ternate, large and numerous; heads combining to form an irregular dermal network. Retentive spicula elongo-attenuato-stellate; radii long and slender, rather numerous. Enveloping membrane of rigid skeleton—retentive spicula same as those of the dermal membrane, rather numerous. Skeleton—areas of reticulation round or oval, nearly equable in size; fibre smooth, but umbonated at intervals; umbones cylindrical, smooth, short; apices very nearly flat. Gemmules membranous, smooth, subglobular.

Colour, in the dried state, nut-brown.

Hab. Madeira (*H. N. Mason, Esq.*).

Examined in the dried state.

The form of this sponge is that of a broad, irregularly sinuous, fan-shaped plate about 5 or 6 lines in thickness; it is $7\frac{1}{2}$ inches high, $12\frac{1}{2}$ inches wide, and $3\frac{3}{4}$ inches from back to front. On the latter, or inhalant surface, at about the middle of its width, there are three sinuously fan-shaped plates given off, the largest one from about midway between the base and top of the sponge, and two smaller ones from near the base; the upper one has grown on a plane about parallel to that of the parent sponge, and its inhalant and exhalant surfaces accord with those of that portion of the specimen. The two lower ones are projected from the large sponge at nearly right angles to its inhalant surface; and they have their inhalant surfaces on their upper sides, and their exhalant ones within the folds of their under ones.

The sponge has evidently been sessile: there are no remains of an expanded base, but the attachment has apparently been near the middle of the basal portion of the specimen; and it appears to have grown on a somewhat elevated piece of rock, as both of the extreme ends of the sponge project below the apparent plane of attachment. It is evidently an old and well-matured specimen, as it has numerous parasites attached to its inhalant surface, among which are several specimens of *Vermetus*, and three of what is apparently *Caryophyllia Smithii*, two of which are full-grown, and one of them has numerous parasites on its external surface.

The condition of the sponge is excellent: all its organs are evidently in the state they were when it was taken alive from the sea; and it has apparently never undergone the deterioration of immersion in fresh water, as a quantity of salt remains in crystals on its surface.

This specimen is therefore especially valuable as leading to a natural elucidation of the general characters of the singular and beautiful class of sponges to which it belongs.

The oscula present no very striking characters; the margins are slightly elevated and rounded; many of them are completely closed, while others are only partially so; and through the central orifice on these the enveloping membrane of the rigid skeleton, thickly studded

with elongo-attenuato-stellate spicula, may frequently be seen *in situ*. The connecting spicula are very numerous beneath the dermal membrane of this surface, and their closely intermingled ternate heads form a strong and very complicated dermal network. Occasionally the oscula run from two or three to six or seven in a line, on a slightly elevated ridge; but in other respects there is no approximation to a definite arrangement. The pores are situated each in a single area, the margin of which is slightly thickened and elevated; the areas are visible by the aid of a lens of 2 inches focus; they are very numerous, and about equidistant from each other; the greater portion of them were in a closed condition.

The expansile dermal system of this sponge affords excellent specific characters: the furcated attenuato-patento-ternate connecting spicula are large and strong, and their shafts comparatively long, and the central canals in both the shaft and the radii are large and well defined; the furcations of their ternate heads are closely intermingled, forming a fine but very irregular and complex dermal network. They vary very considerably in size and proportions: one of the largest measured $\frac{1}{88}$ inch in length, and $\frac{1}{80}$ inch in the extreme expansion of its ternate head; one of the smallest measured $\frac{1}{143}$ inch in length, and in extreme expansion of its ternate head $\frac{1}{154}$ inch.

The elongo-attenuato-stellate retentive spicula of the dermal membrane are very minute; two of the largest measured $\frac{1}{1777}$ inch and $\frac{1}{2050}$ inch in length. Their shafts are rarely straight; they have usually two or three angular bends. The radii are long, slender, and exceedingly acutely terminated. Their structure and profuse dispersion on the surface of the membrane renders them a most effective protection against the insidious attacks of voracious enemies on that organ. Those on the oscular surface are larger than those of the inhalant one.

The skeleton is also strikingly characteristic. The fibre is somewhat compressed; it is perfectly smooth excepting the umbones with which it is studded at intervals; they project from half to once their own diameter from its surface, are nearly cylindrical in form, and have either a flat or a hemispherical apex. In the dried condition of the sponge, when closely adherent to the inner surface of the dermal membrane, they may at first sight be readily mistaken for pores; their form and general appearance is unlike any corresponding organs of a similar description in any other known species of this tribe of sponges.

A few gemmules were observed; they were somewhat globular, with a broad attachment; with a power of 308 linear they appeared to be filled with minute semitransparent molecules. Their general character is very much that of the similar organs in *Iphiteon panicea* of the Porto-Rico specimen in the Museum of the Jardin des Plantes.

When portions of the interior of the skeleton of this sponge are immersed in water, and examined beneath the microscope, the sarcode is found to be abundant in the interstices of the skeleton, sometimes completely filling the interstitial spaces, and quite ignoring

the idea that it occurs in but very small quantities in the siliceo-fibrous sponges. In truth, if we compare the abundance of its presence in this species, as well as in *D. M'Andrewii* and other such sponges which have been preserved in their natural condition, we cannot come to any other conclusion than that this vital substance is as abundant in the siliceo-fibrous sponges as it is in the Halichondroid species, and even in the true *Spongiæ*.

DACTYLOCALYX BOWERBANKII, Johnson.

Sponge sinuously and expansively cup-shaped, sessile. Surface even; margin flat and angulated. Oscula simple, dispersed, numerous. Pores inconspicuous, dispersed. Expansile dermal system —dermal membrane abundantly spiculous; connecting spicula furcated patento-ternate, and rarely dichotomo-patento-ternate, large and long; tension-spicula fusiformi-acerate, small and short, few in number; retentive spicula elongo-cylindro-stellate, with very short radii, minute, exceedingly numerous; and elongo-attenuato stellate few in number. Skeleton—areas round or oval, irregular; fibre cylindrical, smooth, but irregularly nodulous at intervals; nodules cylindrical, short, terminating hemispherically. Interstitial membrane—interstitial spicula fusiformi-acerate, long, slender, and flexuous, and same form rather short and stout; retentive spicula elongo-cylindro-stellate, and elongo-attenuato-stellate, the same as those of the dermal membrane, few in number.

Colour, alive, white (*J. Y. Johnson, Esq.*), in the dried state light brown.

Hab. Deep water off Madeira (*J. Y. Johnson, Esq.*).

Examined in the dried state.

The only specimen of this species known was obtained from "deep water off the coast of Madeira," by James Yate Johnson, Esq., and was described and named by him in P. Z. S. 1863, p. 259. The general description he has there given is very correct as far as it goes; but he has not given a definite specific description of its characters. The specimen is now in the British Museum.

Dr. Gray, in his "Notes on the Arrangement of Sponges" (P. Z. S. 1867, p. 507), notices the specimen as a synonym of his genus and species *MacAndrewia azorica*, in the following terms:— "The specimen which Mr. J. Yate Johnson has described under the name of *D. Bowerbankii* is larger, more orbicular and expanded than I described years before as *MacAndrewia azorica*; but I cannot see any other difference." But as the learned author has nowhere, that I can find, given any particulars of the structural peculiarities of the specimen as compared with those of his species *MacAndrewia azorica*, his hasty assignment of it to that species is in reality devoid of any authority. Half an hour's microscopical investigation of the two specimens which are in his possession would have completely satisfied him that they were very distinct species of animals, as the reader may readily satisfy himself by comparing the figures illustrating the species under consideration in Plate V. figs. 2, 3, 4, & 5, from *D.*

M^c^Andrewii, with those representing the organization of *D. Bowerbankii* in Plate VI. figs. 6, 7, 8.

The form of the sponge under consideration is that of a shallow cup with expansively undulating margin. The diameter varies from twelve to fourteen inches, and its thickness from half to very nearly one inch. It has six large sinuous doublings of its margin, which extend as much beyond the general plane of the sponge at its under as at its upper surface; two of these foldings of its substance have met at its under surface, and have become cemented together. The greater portion of the sinuous margin of the sponge is flat, the outer and inner edges in some parts being quite sharply defined.

The dermal system in this sponge presents very important specific characters. In some sections made at right angles to the surface it was evidently in a state of complete collapse; the under surfaces of the connecting spicula were closely in contact with the surface of the rigid skeleton, and their shafts were deeply immersed in its substance. This position of the expansile dermal system of the sponge is probably its natural one while the animal is in a state of repose.

The connecting spicula vary considerably in their size, form, and degree of development. The primary ternate rays are usually short; and the secondary furcating ones are five or six times the length of the primary ones, and without any secondary furcations, while at other times one or more of the furcating rays have a second terminal furcation; these terminal radii are short, and are frequently projected on a plane at right angles to the other furcations; these terminal furcations are sometimes very irregular, their apices, instead of two only, having three or four small branches projected in different directions, as represented by fig. 7, Plate VI. The mode of the disposition of the ternate heads of these spicula in the dermis is remarkable: they are not arranged so that their ternate radii form definite inhalant areas; but the rays cross each other in every imaginable direction, and the pores are found in the little irregular areas, one, or rarely two together, and they therefore appear indiscriminately scattered over the whole of the porous surface. They are simple orifices without any defensive spicula such as we observe in *Dactylocalyx M^c^Andrewii*. The dermal membrane is abundantly supplied with retentive spicula; they are so numerous and closely packed as to completely obscure it. They are very minute, and no two are alike in size or form; they require a microscopical power of about 700 linear to render them distinct to the the eye. Under these circumstances they present remarkably thick and obtuse proportions, and are distinctly different from any others of this class of spicula that I have ever seen. Sometimes the shaft is multiangulated, each angle producing a single short cylindrical ray, while in other cases the shaft is quite straight, and the radii are projected from it in a perfectly irregular manner. Besides these two prevailing forms, they assume every imaginable variation of shape that such spicula can be subjected to. One of the largest and most regular of the multiangulated forms that I measured presented the following proportions:—length of spiculum $\frac{1}{1000}$ inch;

greatest lateral expansion $\frac{1}{1647}$ inch; diameter of shaft $\frac{1}{3363}$ inch; length of projection of a ray $\frac{1}{7000}$ inch; diameter of a ray $\frac{1}{17500}$ inch. The greatest disparity existing between them is not in the size of the shaft, or in the length of the projection of the radii, but in the length of the spiculum and in the various modes of its structure. I have been thus particular in its description because it is a new form of spiculum, and is especially characteristic of the species of the sponge in which it occurs (Plate VI. fig. 8*a*).

The elongo-attenuato-stellate spicula are comparatively few in number, and very different in their general aspect to the elongo-cylindrical ones. They vary exceedingly in their forms: sometimes they assume the shape of spiculated biternate ones; but generally their long, slender and attenuated radii are projected without any approximation to regularity. An average-sized one measured, length $\frac{1}{514}$ inch, length of a ray $\frac{1}{1166}$ inch, diameter of shaft $\frac{1}{7000}$ inch (Plate VI. fig. 8*b*).

There are also a few short cylindrical spicula, with an irregular inflation near the middle; but this form is probably an undeveloped state of the elongo-cylindro-stellate spiculum.

From the collapsed state of the expansile dermal system, no very clear view could be obtained of the investing membrane of the rigid skeleton; but in sections parallel to the surface, mounted in Canada balsam, small portions of it were occasionally visible; and these appeared to be rather sparingly supplied with the elongo-cylindro-stellate and elongo-attenuato-stellate spicula that are so abundant in the dermal membrane. A few of both these forms of spicula are also found dispersed on the interstitial membranes.

The long, slender and flexuous interstitial spicula occur either singly or in bundles of four or five together, and are usually disposed at nearly right angles to the surface, immediately beneath the investing membrane of the rigid skeleton. They are very long and slender, and attenuate to extremely acute terminations.

Short, stout fusiformi-acerate spicula in considerable quantities are sometimes found intermixed with the skeleton-fibre, immediately beneath the enveloping membrane of the rigid skeleton; but they are not found in such quantities in all parts of the sponge; amid the deeper portions of the skeleton a few single ones only are occasionally found. A few short, stout cylindrical spicula were found among the spicula obtained by the dissolution of portions of the sponge in nitric acid; but these are probably cases of immature development.

The sarcode is as abundant in this as in other species of the same genus. Its quantity cannot be correctly appreciated in its dried condition, or when mounted in Canada balsam; but in wet preparations of portions of the skeleton, when fully expanded by moisture, it is in many cases to be seen completely enveloping the skeleton-fibre, and filling the interstices of its reticulations.

DACTYLOCALYX POLYDISCUS, Bowerbank.

Sponge irregularly cup-shaped, pedicel short. Surface even; sides of cup thick; margin rounded. Surface even. Oscula slightly

elevated and margined, dispersed. Pores inconspicuous. Expansile dermal system—dermal membrane pellucid, furnished abundantly with small fusiformi-acerate spicula irregularly dispersed. Retentive spicula fusiformi-cylindrical, short and variable in size. Connecting spicula—apices discoid, irregularly circular or oval, smooth and thin; margins entire; shafts short and conical. Skeleton—fibres cylindrical, smooth, their free terminations abundantly tuberculated; tubercles cylindrical, short, terminations hemispherical. Interstitial membranes—tension-spicula fusiformi-acerate, short, rather numerous, dispersed. Gemmules membranous, spherical.

Colour light fawn-brown in the dried state.

Hab. Island of St. Vincent, West Indies (*Rev. Lansdowne Guilding*).

Examined in the dried condition.

This interesting little specimen is in the collection of the British Museum. It was obtained by the Rev. Lansdowne Guilding at the Island of St. Vincent, West Indies.

The specimen is a small, unequally developed, cup-shaped sponge; the margin is nearly oval, with an average diameter of seven-eighths of an inch, and it is about five-eighths of an inch high; the thickness of the sponge near the margin is about three lines. From its general aspect it would seem that the specimen was a young one in an early stage of development. The oscula are slightly elevated, have a thin margin, and are about one-third of a line in diameter; they are equally distributed, and are about five or six lines apart, just as they might be expected to appear on a sponge of very much larger dimensions.

The pores are dispersed on the outer surface of the cup; they are not readily detected even in a piece of the dermis when mounted in Canada balsam; they are found in intervals between the discoid plates, which frequently have semilunar notches to afford space for the passage of the inhalant streams.

The dermal membrane is very translucent; but the fusiformi-acerate spicula with which it is furnished are so exceedingly numerous that they render the discoid heads of the connecting spicula immediately beneath them perfectly undistinguishable. An average-sized one measured $\frac{1}{1\,6\,0}$ inch in length (Plate VI. fig. 12). The retentive spicula are comparatively few in number; they are very much smaller than the tension ones, and although mixed with them are readily distinguished by their fusiformi-cylindrical shape (Plate VI. figs. 13 & 14).

The connecting spicula are singular in their form, and very characteristic of the species; the normal form of their discoid heads appears to be nearly circular, but they vary to a very considerable extent to suit the circumstances of their situation. Their margins lap over each other to frequently the extent of one-third or one-half of their diameters, so that they not only form a secure and continuous platform for the support of the dermal membrane, but they also admit of a very considerable extent of lateral expansion and

contraction. Their margins are entire, and their surfaces perfectly smooth and even.

In a section made at right angles to the surface of the sponge, a portion of the expansile dermal tissue remained *in situ*, and the sharply conical shafts of the connecting spicula were seen projecting into the space between the dermal membrane and the surface of the rigid skeleton of the sponge. The spaces of the rete of the skeleton are tolerably equable, but without any approximation to order in their arrangement. The fibres of the skeleton are cylindrical and quite smooth, excepting at their free terminations, which are frequently abundantly tuberculated. The tubercles are cylindrical, with hemispherical terminations, and are usually about once their own diameter in height.

The interstitial membranes are very pellucid, and are rather abundantly supplied with the same description of tension-spicula that are so abundant in the dermal membrane; and they may also frequently be seen imbedded in the sarcode that surrounds the skeleton-fibres.

A few gemmules were observed; they were globular, membranous, and very like those of *Iphiteon panicea*; they were adherent to the inner surface of the dermal system.

When sections of the sponge were examined in water, there were numerous moniliform series of spherical molecules, varying from three or four to six or eight in number, on the inner surfaces of the discoid heads of the connecting spicula, and also on the surfaces of the interstitial membranes. Such molecules in moniliform series are not uncommon in the sarcode of the interstitial membranes of many species of Halichondroid sponges; and this arrangement apparently arises from axial attraction. It is the first case of their occurrence that I have observed in the siliceo-fibrous sponges.

DESCRIPTION OF THE PLATES.

PLATE III.

Fig. 1. Surface of the rigid skeleton of the type specimen of *Dactylocalyx pumiceus*, Stutchbury, exhibiting the irregularity of the skeleton-structure and the auxiliary skeleton-fibres in the large interstitial cavities opposite, *a*, *a*, *a*, magnified 108 linear.

Fig. 2. A rectangulated hexradiate tension-spiculum, magnified 108 linear.

Fig. 3. A portion of one of the large fusiformi-acerate spicula from amidst the rigid skeleton of the type specimen of *D. pumiceus*, magnified 108 linear.

Fig. 4. A trifurcated spinulo-hexradiate stellate retentive spiculum, magnified 666 linear.

Fig. 5. A trifurcated attenuato-hexradiate stellate retentive spiculum, magnified 666 linear.

Fig. 6. A large and a small verticillately spined spiculum from the basal portion of the type specimen of *D. pumiceus* in the British Museum, magnified 108 linear.

Fig. 7. Subequiangular triradiate tension-spiculum from the type specimen, magnified 108 linear.

Fig. 8. Acerate tension-spiculum from the type specimen, magnified 108 linear.

Fig. 9. A furcated attenuato-patento-ternate connecting spiculum from the type specimen, magnified 108 linear.

Fig. 10. A dichotomo-patento-ternate connecting spiculum from the type specimen, magnified 108 linear.

Fig. 11. Minute attenuato-stellate retentive and defensive spicula from the type specimen, magnified 666 linear.

Fig. 12. A gemmule adhering to auxiliary fibres of the skeleton from the large specimen of *D. pumiceus* (*Iphiteon panicea*, Valenciennes) in the collection of the Jardin des Plantes, Paris, magnified 108 linear.

Fig. 13. A profile view of two of the tubercles on the skeleton-fibre of the type specimen of *D. pumiceus*, exhibiting the papillation of their summits, magnified 666 linear.

Figs. 14 & 15. Portions of the densely reticulated basal skeleton-structure from the type specimen, magnified 108 linear.

Fig. 16. Trifurcated expando-ternate connecting spicula, probably belonging to an unknown species of *Dactylocalyx*, magnified 666 linear.

Plate IV.

Fig. 1. A portion of the rigid skeleton of *Dactylocalyx heteroformis* (*Coscinospongia heteroformis*, Valenciennes), exhibiting the complicated reticulations of the structure, and the ramified free terminations of the fibres, magnified 175 linear.

Fig. 2. One of the large incurrent areas of the inhalant surface of the same sponge, exhibiting the protective furcated terminations of the marginal fibres, magnified 308 linear.

Fig. 3. One of the oscula from the exhalant surface of the same sponge, exhibiting the ocular membrane in a half-open condition, magnified 183 linear.

Fig. 4. A portion of the dermal membrane of *D. heteroformis*, with its fine but very irregular network of siliceous fibre, magnified 308 linear.

Fig. 5. A portion of the dermal membrane of *Dactylocalyx M^{c}Andrewii* (*Mac-Andrewia azorica*, Gray), exhibiting the ramifications of the foliato-expando-ternate connecting spicula beneath, and one of the inhalant pores with its defensive system of minute acerate dermal spicula, magnified 183 linear.

Plate V.

Fig. 1. A portion of the rigid skeleton of *Dactylocalyx M^{c}Andrewii*, magnified 175 linear.

Fig. 2. A foliato-expando-ternate connecting spiculum from the expansile dermal system of *D. M^{c}Andrewii*, with the inner surface towards the eye exhibiting the short acutely conical shaft of the spiculum, magnified 175 linear.

Fig. 3. An elongated and more ramose variety of the ternate head of the same sort of spiculum as that represented by fig. 2, magnified 175 linear.

Fig. 4. A view in profile of a spiculum of the same form as those that are represented by figs. 2 & 3, magnified 175 linear.

Fig. 5. One of the minute fusiformi-acerate tension-spicula of the dermal membrane of *D. M^{c}Andrewii*, magnified 666 linear.

Fig. 6. A section at right angles to the surface of *D. Prattii*, exhibiting a portion of the expansile system (*a*) in a state of separation from the rigid siliceo-fibrous skeleton beneath, with the shafts of the connecting spicula pendent in the space between them, and also the primary dermal membrane, and the secondary membrane covering the external surface of the rigid skeleton filled with the innumerable retentive spicula of those organs, magnified 108 linear.

Fig. 7. Two of the retentive spicula of the dermal membrane and the investing membrane of the rigid skeleton, magnified 1250 linear.

Fig. 8. A view of the inner surface of a portion of the expansile dermal system, exhibiting the interlacing of the radii of the irregularly furcated patento-ternate connecting spicula to form the inhalant areas, in which are situated the pores of imbibition, magnified 108 linear.

Figs. 9, 10, & 11. Three of the irregularly furcated patento-ternate connecting spicula, exhibiting their extreme diversity of form, magnified 108 linear.

PLATE VI.

Fig. 1. A piece of the fibre of the rigid skeleton of *Dactylocalyx Masoni*, magnified 108 linear.
Fig. 2. A view of the inner surface of part of the expansile dermal system of *D. Masoni*, with a portion of the rigid skeleton *in situ*, magnified 108 linear.
Fig. 3. One of the furcated attenuato-patento-ternate connecting spicula of *D. Masoni*, magnified 108 linear.
Fig. 4. A minute elongo-stellate retentive spiculum from the dermal membrane of *D. Masoni*, magnified 666 linear.
Fig. 5. A piece of the fibre of the rigid skeleton of *D. Bowerbankii*, magnified 108 linear.
Fig. 6. One of the furcated attenuato-patento-ternate connecting spicula of the normal form from the expansile dermal system of *D. Bowerbankii*, magnified 175 linear.
Fig. 7. A furcated attenuato-patento-ternate connecting spiculum with ramified terminations to the furcations of the radii. This form, with more or less ramified terminations, is frequently found in this species. Magnified 175 linear.
Fig. 8. Retentive spicula from the dermal membrane of *D. Bowerbankii*: *a*, *a*, the elongo-cylindro-stellate form, variable in size, and very numerous; *b*, the elongo-attenuato-stellate form, few in number: magnified 666 linear.
Fig. 9. A fragment of the fibre of the rigid skeleton of *D. polydiscus*, magnified 108 linear.
Fig. 10. A portion of the expansile dermal system of *D. polydiscus*, with the discoid expando-ternate connecting spicula *in situ*, magnified 108 linear.
Fig. 11. Two varieties in form of the connecting spicula of *D. polydiscus*, magnified 108 linear.
Fig. 12. A fusiformi-acerate tension-spiculum from the dermal membrane of *D. polydiscus*, magnified 666 linear.
Figs. 13 & 14. Two of the retentive spicula of the dermal membrane of *D. polydiscus*, magnified 666 linear.

4. Report on the Eared Seals collected by the Society's Keeper François Lecomte in the Falkland Islands. By JAMES MURIE, M.D., F.L.S., Prosector to the Society.

(Plate VII.)

An account of the Society's keeper Lecomte's expedition to the Falkland Islands for the purpose of collecting live specimens of Eared Seals, Penguins, &c., has already, in November last, been laid before the Scientific Meeting by our Secretary, Mr. Sclater (see P. Z. S. 1868, p. 527). It devolves upon me to add to that report memoranda concerning the skins and skeletons of the *Phocidæ* obtained during Lecomte's sojourn at the above islands. The specimens in question, owing to difficulties and mishaps in the way of transport, did not arrive in England until some time after the live stock, brought home by Lecomte himself. Furthermore, I regret to mention that, from a variety of causes, the condition of the objects is not so perfect as could be wished; but, under the adverse circumstances incident to the voyage, this is not to be wondered at. I am happy to add, though, that some points in connexion with the

Otariidæ, which hitherto have been indefinite, receive elucidation, even from the imperfect supply now furnished.

The skins were preserved in a salted condition, the bones roughly dried. They have been compared and identified with those in the British Museum.

The total number of animals to which the specimens belong is sixteen: they comprise but two species, namely, the *Otaria jubata*, Foster, and *Otaria nigrescens* (*Arctocephalus nigrescens*, Gray). Of these, fifteen belong to the first, and but one to the second species.

I. Otaria jubata.

1. Skin and cranium (tolerably perfect) of an adult male, but not aged, Sea-lion, technically called by the traders a "Bull;" shot at Kelp Island, one of the eastern islets of the group of the Falkland Islands.

Lecomte states that there were altogether about 40 Seals composing the herd of which this male was a member. Another, much larger and maned male was wounded by a shot at the same time, but it managed to escape.

The above skin, in its present moist condition, measures 96 inches from the muzzle to the posterior end of the hind flippers as they are thrown backwards; from the muzzle to the tip of tail 73 inches; from point to point of the outstretched fore flippers 76½ inches.

The pelage on the back and belly is worn and rubbed off, the animal evidently having been just shedding its coat when slain. There is a very slight tendency to development of a mane, the longish hairs here being of a brindled yellow-and-brown shade. The throat is lighter-coloured and with shorter hairs; but towards the mandible they are longer, darker, and beard-like. The upper surface of the head, almost as far as the nose, is of a light or yellowish-brown shade; the two cheeks dark brown; the muzzle black. The fresh undercoat of shorter hairs (not the underwool) all along the back inclines to a yellowish grey. The long and partially abraded hairs in scattered patches are dull brown, which becomes slightly redder and richer in tint at the buttocks and posterior tibial regions. This same hue is apparently the original one previous to the shedding of the outer coat; it is well seen in the axillæ. The belly, with very short and finely set hair, is of a brownish yellow. The flippers are black where bare of hair.

The skull is a good representative of the species during middle life—that is, before the extraordinary high occipito-parietal and longitudinal parieto-frontal crests peculiar to very old age are developed. These elevations have just commenced to show themselves in a raised narrow plate of bone. The surface of the cranium is altogether rough. The palate is broad, and but moderately deep (see fig. 1, p. 103).

The teeth exhibit a most remarkable condition, and such as I have only witnessed (and that but slight in comparison) in one other specimen of the genus. Not only the whole of the smaller-sized molars and premolars, but also the great canines of both upper and lower

jaws, in the specimen under consideration, are worn in a circular grooved manner, as if compassed by a ring in their middles. The canines are not so grooved round about, but rather deeply excavated behind. The crowns of the canines and the grinding-teeth are likewise ground down and flattened; but this is of less moment than the way in which the dentine is grooved. The worn surface is blackened, but smooth.

Three reasons may be given for the wearing of the teeth in this uncommon way:—

(*a*) It is possible for the dental apparatus of the upper and lower jaws to effect a wearing away of the softer dentine by their unequally fitting and rubbing against each other. Examination, however, of the maxillæ when approximated proves this to have been unlikely—in fact, impossible.

(*b*) Again it may be suggested that granules of sand and pebbles, which these animals swallow, as I shall afterwards mention, may have ground down the teeth at the gums. This also is a most unlikely circumstance, if we attentively consider the nature of the polished surfaces and the apparent mode in which they are eroded. Besides, it would be too good a joke to admit that the Sea-lion possessed a bad dentifrice and tooth-brush.

(*c*) In the human being, cases do come before dentists where circular abrasion occurs such as we have here. This has been proved beyond doubt to be effected by an altered condition of the glandular fluids ejected into the mouth. The tongue, laving the surfaces of the teeth with the changed secretion, by degrees abrades the dentinal surface, wears irregular grooves, and leaves the harder enamel comparatively unchanged. Such may likewise happen even to an Eared Seal for aught I know to the contrary.

2. Skin and skeleton (the cranium considerably injured) of a pregnant female Eared Seal (termed "Clapmatch"). This was killed by the stroke of a baton at Kelp Island on the 8th June 1868. The sex is well authenticated, inasmuch as Lecomte extracted a fœtus of about a foot long from the womb. This fœtus, curious to say, was pounced upon and carried off by a Chimango (?), which had been hovering overhead watching the operation.

Greatest length of skin, including hind extremities, 80½ inches; from muzzle to end of tail 66½ inches; tip to tip of fore limbs outspread 58 inches.

Teats well developed, 4 in number; front ones 2 inches from the middle line of abdomen, and distant 5 inches behind the axillæ; hinder ones 1 inch outside the median line, and 9 inches distant from the pectoral ones.

From the forehead, along the whole line of the back and the upper sides of the body to as far as the tail, the colour is blackish mingled with grey, the tips of the hairs being grey, their bases black. There is a black streak from the muzzle to the forehead, on either side of which and above the eye is a light grey patch, the cheeks outside of that being of the same shade as the back. A light and longer-haired beard is partially developed; behind is a moderate-sized darker patch;

and then the throat and the whole of the abdomen posteriorly is of a yellowish-grey or light drab tint. Around each eye is a narrow circlet of brown. The hair on this skin, as well as on those of the next three females, is much shorter than the outer coat of the male No. 1; indeed it resembles, both in colour and texture, the inner coat of the said male.

The skull of this female being considerably injured in the maxillary and premaxillary regions, I shall make no comments on it further than to mention the size—namely, greatest length 10·3 inches. The skeleton agrees with that of specimens of *Otaria jubata*.

Fig. 1.

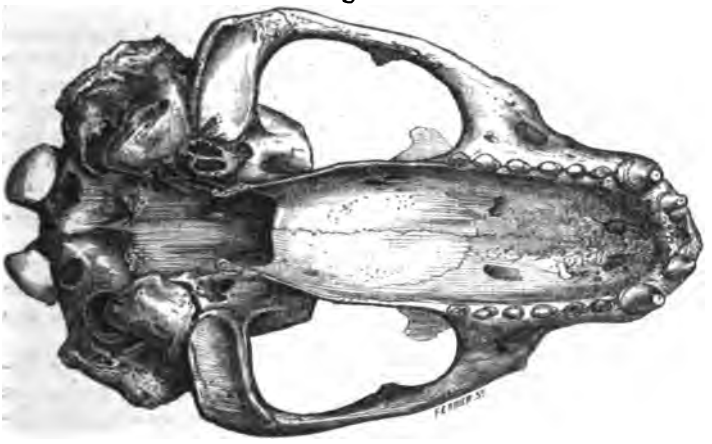
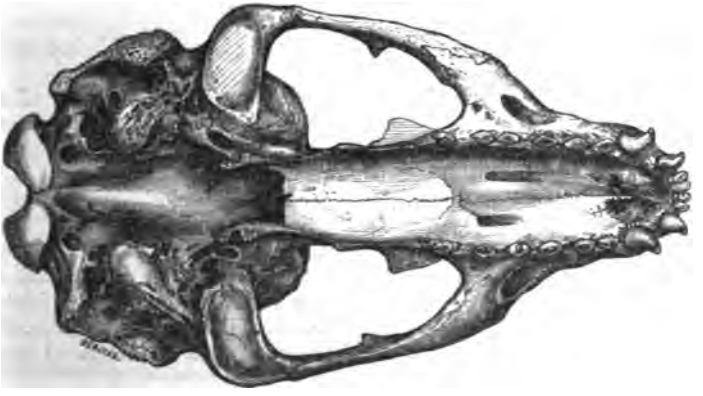


Fig. 2.



Under views of male and female skulls of *Otaria jubata*.

Fig. 1. Adult male, that described in text as No. 1.
2. Adult female, the specimen referred to as No. 3.
(Both reduced to one-third of nat. size.)

3. Another skin and skeleton (in better condition) of an adult and pregnant female, killed at the same time and place as the foregoing (No. 2). The fœtus found in this specimen corresponded in size to the other.

The colour of this skin corresponds in every particular with that described as No. 2, only it is not quite so dark.

The maxillary and premaxillary bones of this skull are also partly broken by the fatal blow with the baton. The palate, however, a good character of the species, is entire. This demonstrates, as does the whole inferior region (compare figs. 1 and 2), that the cranium of the female is much narrower and shallower than that of males of the same age and size. Especially is this the case in the maxillary region of the palate. The teeth altogether are much weaker and more sharply pointed than in the male. So marked is this that the skull of a female can at a glance, and by this character alone, be distinguished from that of a male. In some respects the female skull approaches that of *Arctocephalus hookeri*; but the posterior nares and great length of the palatines of both male and female *Otaria jubata* readily separate them. The greatest length of this cranium is 10·5 inches, the greatest breadth (at the zygoma) 6 inches. The crests of the roof are but feebly developed.

4. Skin and skeleton (not perfectly complete) of a female *Otaria*, young but nearly adult. This was captured alive on the 4th June 1868, at North-Point Island, situate at the south-east corner of the Falklands.

In markings and colour this younger female is hardly to be distinguished from the older pregnant animals. There is perhaps a more marbled aspect, produced by a greater and more irregular distribution of the light upper hairs.

5. Skin, disarticulated fragmentary skull, and leg-bones of another female, about the same age as No. 4. This specimen also was taken alive at North-Point Island, 4th June 1868.

No difference in colour and hairy covering is appreciable between this and No. 4.

6. Skin, leg-bones, and cranium, with imperfect dentition of a young but considerable-sized male Sea-lion. This animal was taken alive at Kelp Island on the 8th June 1868, and said to have been about eighteen months old at date of capture.

The entire head, neck, and body of this skin is clothed with short, fine, smooth, closely set hairs of a nearly uniform chocolate tint. The nape of the neck and the belly are a trifle lighter than the other parts.

7. Skin only of a very young male *Otaria*, technically called a "pup." Caught alive, 16th February 1868, on one of the islets near Kelp Island. This and the three succeeding specimens (Nos. 8, 9, and 10) were seized at one raid. They shall be described and commented on together.

8. Another skin, closely resembling the last.

9. A skin, vertebral column, leg-bones, and feet of a similar very young but female Seal.

10. Similar skin of another young female.

One of the females died on the 3rd of March 1868, the other three days after, namely, on the 6th. One of the males lived a month longer, to the 9th April; the last of the four specimens died on Good Friday (April 10th).

The accompanying admeasurements of three of their bodies were taken in centimetres by Lecomte immediately after their death. I have reduced these to inches and decimals.

	♀	♀	♂
Length from the muzzle to the tip of the tail.....	34·0	33·2	37·1
Length from the muzzle to the furthest point of the backwardly stretched hind flipper.....	47·7	41·3	46·7
Greatest length of the pectoral extremity	11·3	11·7	12·9
Greatest length of the pelvic limb	9·0	9·0	11·0

The hair on these skins is short, firm, and thick in the pile. Beneath is a reddish underwool, but very sparsely scattered. The colour of one and all is a very rich dark brown, approaching black on the upper parts, and appearing quite so under certain lights when the skin is moist. The flippers are black only where bare. Scarcely any appreciable difference exists between the males and the females; if any, the males are darkest.

By way of comparison with the adult male and female of the same species (Nos. 1 and 2), I shall here give the diameters of the soft skins of the young ones (Nos. 7 and 10)—all four, adult and young, having been pickled in the same manner. No. 7. Greatest length (from the muzzle to hinder flipper) 50 inches, to the end of the tail 40¾ inches; breadth between the furthest point of the extended pectoral members 32 inches. No. 10 gives these consecutive measurements as 47, 39, and 30½ inches.

11. Large and much worn skull of a very old Sea-lion.

12. Large and much worn skull, also old. This specimen has the left ramus of the lower jaw attached.

13. Another aged cranium, but without mandible.

14. Another aged cranium, but without mandible.

15. Another aged cranium, but without mandible.

The respective proportions of the above venerable cranial remnants of the once plentiful race of Falkland-Island Sea-lions may be tabulated thus:—

No. 11.	Length	14·8	inches.	Greatest (zygomatic) breadth		10·0	inches.
12.	,,	14·1	,,	,,	,,	10·0	,,
13.	,,	14·0	,,	,,	,,	—	
14.	,,	13·9	,,	,,	,,	8·7	,,
15.	,,	13·5	,,	,,	,,	9·0	,,

The occipito-parietal crests of all are enormously developed, and the extra processes in No. 12 are peculiarly prominent. The mandible of the latter specimen measures 11·5 inches long, and it is 6·5 inches in vertical height at the coronoid process.

These five skulls, evidently much worn by being rolled on the

shingle, were picked up on the beach at Elephant Island, on the east side of the Falklands. Lecomte and his companions believed these large old skulls of *Otaria jubata* to be those of the Elephant-Seal (*Morunga elephantina*), as it was stated by some of the party that these animals formerly did exist on this island. One of the pilots (Louis Despreaux by name) had resided thirty-two years on the Falkland Islands, and he distinctly remembered shooting many Elephant-Seals in the neighbourhood in bygone years; but about twelve years ago they began to get scarce and disappear. While Lecomte was absent on one of his excursions, a report was current on the islands that a young Elephant-Seal, about 8 feet long, had been killed with a baton by the lighthouse-keeper at Cape Pembroke. On his return Lecomte endeavoured to obtain the skeleton, but it had in the meantime been destroyed.

II. Otaria nigrescens.

16. Bones of the two pectoral extremities of an adult male Fur-Seal. Specimen shot by Mr. Cobb (the Manager of the Falkland-Island Company) on the Volunteer Rocks, north-east of the Falkland-Island group.

Habits and Economy of the Eared Seals.—Under this heading I append chiefly such observations as I have received verbally from Lecomte upon interrogating him respecting what he had witnessed of the daily life of these creatures.

He corroborates the statements of the older voyagers as regards the gregarious habits of the Eared Seals. At various times he has seen families of six, a dozen, and even up to twenty; but, generally speaking, he supposes from ten to fifteen to be the average number of a family group. Several families, again, congregate near each other in the same creek or islet, but, notwithstanding, they do not intermingle. In one instance he calculated there would be about forty individuals, old and young, in the herd. This was when the old male was shot and the four youngsters captured alive. On another occasion, that on which the two adult pregnant females were killed, he reckoned there would be as many as 100 in the herd, distributed, of course, hither and thither in clusters.

They seem to prefer (it may be through a wise precaution on their part) headlands or isthmuses, and choose the most southern locality thereon as a resting-place. One of the old males guards as a sentinel. Usually he is seen perched on an eminence, and invariably, as Lecomte affirms, with outstretched neck and upraised head, as if sniffing around for the slightest ominous warning. The signal of a grunt or growl sets the others on the alert; and on any real approach of danger they rush all helter-skelter towards the water, which they never wander far from.

Their daily occupation seems divided between sleeping and procuring food. They lie huddled together in a drowsy condition, or slumber, for a great part of their time, and this both during the day and night. At high tides, day and night, they take to fishing near

the entrance of the freshwater rivulets into the sea. At such times they will remain a whole tide dabbling about singly after food. This consists of fish and crustaceans. In capturing their prey they swallow it either above or below the water. Our live Sea-lion in the Gardens, as a rule, comes to the surface during the process of deglutition; the other Seals swallow underneath the water. Lecomte says the Eared Seals never drink water; and he substantiates the fact that he kept the first animal he brought to this country for a year without fluid, except such as adhered to the fish he fed it with. He tells me, moreover, he has noticed the common Seals in our own collection occasionally suck in water as a horse would, but the Otaria never. Another curious circumstance he assures me of is, that in the stomach of every one he has examined, with the single exception of a young animal, there existed a quantity of pebbles. The amount varied in individuals from a few to many. Indeed one of the Falkland-Island pilots told Lecomte in good faith that he himself had removed 28 lb. of stones from the digestive cavity of an Elephant-Seal, an old *Otaria jubata* (?). The common notion among the traders and hunters is that these Seals swallow the stones as a kind of ballast to enable them to dive quickly after their prey. For my own part I cannot at all accept this reason on the evidence.

The voices of the old and young animals differ in tone. The adult, and more particularly the old ones either growl in an undertone, or, when excited during the breeding-season, heighten this to a voluminous interrupted roar. The young cries with a kind of bleat like a sheep. In the first Sea-lion possessed by the Society the pupils of the eyes contracted and dilated to an enormous extent; and when enlarged, which took place towards sunset, they became of an opaline hue. The live *Otaria jubata* at present in the Gardens also manifests considerable dilatability of the pupils, but not quite the same change of colour. At night the eye of *Phoca vitulina* appears iridescent, as in some Carnivora. As regards this frequent change in the diameter of the pupil in Otaria, this may have relation to its nocturnal habits as much as to the difference of medium in which the animal lives.

The sexual season lasts for about a month, namely, between the latter end of February and that of March. As has been described by other observers, Lecomte remarks there are then regular pitched battles, the females looking on but not interfering. The males at such times are savage, and if attacked do not run away; but the females are rather timid and shy. After these matches are adjusted, a good deal of playing and gambolling in the water occurs, but the act of coupling takes place on the land. When a male, through age or otherwise, is driven away, he leads a solitary life, and then often goes further inland.

The females go with young about ten months, giving birth to a single one about Christmas or the end of the year, equivalent to our midsummer in this country. Lecomte says there is no great interval between parturition in the females of a herd, as the young range much of a size. They rear their offspring at a short distance from

the water's edge; the young, however, does not enter the water for some time. At the earliest stage the baby Seals are like so many puppy dogs, fat, plump, and shapeless. They play, fight, and frisk about in twos and threes, at times dabbling and floundering in the shallow pools left by the receding tide. Suckling continues until they are about three months old, at which period the mother entices them by degrees towards and into the water. From that time the young begin to cater for themselves. In youth, as has been shown, the skin is of a dark brown hue. This changes very gradually, and lightens after they are a year old; it then seems sensibly to alter annually by a partial shedding of the coat. The males remain darkest, and have always the longest hair throughout life.

No lean animals are ever observed.

There appears to be a periodical migration towards the south. In November the Sea-lions come to the Falkland Islands, where they remain till June or July, when the greater number depart; but some remain at the islands the whole year round.

With respect to certain doubtful specific forms of the genus *Otaria* which Dr. Peters and Dr. Gray have named, I must say I do not entirely agree with their determination.

I differ from Dr. Gray in ranking the skin described by him in the 'Annals of Natural History,' 1868, i. p. 219, as a distinct species—his *Arctocephalus nivosus*. This I believe to be but a variety, seasonal, sexual, or of a different age from those specimens hitherto obtained.

Also I do not acquiesce in his critical remark that Dr. Peters's figured skull of *Otaria philippii* is most nearly allied to *O. stelleri* from California, inasmuch as I consider it to be nothing else than *O. hookeri*. As in Dr. Gray's case, I have not seen the skull, but base my judgment on a careful comparison of Dr. Peters's figure with the British-Museum specimens of skulls named *O. hookeri*.

On the other hand, I unhesitatingly agree and support Dr. Gray's criticisms on Dr. Peters as regards the species of Sea-lions termed respectively *O. byronia*, *O. leonina*, *O. godeffroyi*, and *O. ulloæ*, as I am perfectly convinced they are but differently aged specimens of Foster's *Otaria jubata*. From the manner in which Dr. Peters ranges these in his tabular view, I have no doubt that he has arrived at the same determination, although still clinging somewhat to his own nomenclature.

P.S.—The fresh information gained, and the clearing of dubious points, in connexion with the *Otariidæ*, which the preceding report conveys, may be summed up as follows:—

1. The young of both sexes of *Otaria jubata* are alike of a dark brown or very deep chocolate colour.

2. The males of a year old or thereabout retain somewhat of the chocolate tint of youth, which, however, is paler, and subsequently changes annually as the coat is shed.

3. The females of equal age assume a dark grey hue dorsally,

while the abdominal parts are light yellowish. As they grow older they alter little.

4. Males a couple of years old or more become of a rich brown shade on the back and sides, and lighter or yellowish beneath. Old males alone are maned.

5. There is a sparse underwool on the young, which sensibly diminishes with age.

6. The skulls of the adult male and female differ considerably, the latter being comparatively the narrower of the two—the former possessing a somewhat different form of teeth, besides proportionally immense canines.

7. The teeth of *Otaria jubata* are occasionally subject to a peculiar wearing, of a median constricted character.

8. The sexes differ in size, the males attaining far the largest growth.

9. Between the female and male of this species there is a wide difference as regards the stretch of the pectoral flippers. In the skin of the male the breadth from tip to tip of the fore flippers is equal to or greater than the length of the body; in the female the reverse obtains. This fact points to greater strength and swimming-power in the former.

10. It appears that the Elephant-Seal (*Morunga elephantina*) is now only rarely met with in the Falklands.

11. The bones of the pectoral limb of the Fur-Seal of commerce (*Otaria nigrescens*, Gray) differ from those of the Sea-lion (*Otaria jubata*).

DESCRIPTION OF PLATE VII.

Fig. 1. Adult male *Otaria jubata*, from the skin No. 1. The abraded surfaces have not, however, been delineated.
2. Adult female of the same species, from the skin described as No. 2.
3. Young *Otaria jubata*, about four months old, referred to as No. 10 in the preceding list.

5. On a new British Nudibranch (*Embletonia grayi*).

By W. S. KENT, F.R.M.S.

(Plate VIII.)

The last October excursion to the Victoria Docks of the Quekett Microscopical Club afforded me the pleasure of capturing, in some quantity, a minute representative of the Nudibranchiate Mollusca.

It belongs to Alder and Hancock's genus *Embletonia*, which is characterized as follows:—"Head terminal, furnished with two flattened lobes, broadly expanded laterally. Tentacles two in number, linear. Branchiæ papillose, placed in a single or double row down each side of the back, alternating posteriorly." Three species are described by the authors above quoted, viz. *E. pulchra*, *E. minuta*, and *E. pallida*. Of these, *Embletonia pallida* is the most closely allied

to the species I here introduce, it being the only one possessing a double row of branchial papillæ down each side of the back.

In the species recently obtained from the docks, and for which I here propose the name of *Embletonia grayi*, the branchial papillæ are developed to a still further extent, three, in the adult specimens, entering on each side into the formation of the second anterior fasciculus*. The oral lobes, moreover, are highly developed, while in *Embletonia pallida* they are described as being small and indistinct. The lingual membrane, or odontophore, again, furnishes points of distinction, the median denticles surpassing the lateral ones in size more considerably than in *E. pallida*; and the odontophore in this respect more closely approximates to that of *Eolis nana*. The number of lingual plates also exceeds that possessed by *Embletonia pallida*, being not fewer than thirty-five, while in the latter there are said to be but twenty-one.

The colour of the little Mollusk is a semitransparent white, having the integument of the antero-dorsal region usually more or less sprinkled with minute ramifying pigment-cells of a blackish hue, these occasionally extending over the papillæ. The eyes are deeply sunk beneath the integument, and situated, some distance apart, immediately behind the tentacula; in many instances these organs are scarcely discernible, more especially in those specimens wherein the superficial pigment-cells are greatly developed.

It is particularly remarkable that this Nudibranch is a denizen of water containing but about one-third of the saline constituents of pure sea-water. Its habits are gregarious; and its tastes appear to be eminently carnivorous, the luxuriant masses of *Cordylophora lacustris* clothing the submerged timber-balks in the docks proving a special attraction, and serving not only for the purpose of food, but also as a suitable nidus whereon to deposit its spawn. The ova, or spawn, on being extruded are enveloped in a gelatinous mucus, adherent at first to any object wherewith it may be brought into contact; this property, however, disappears after a brief exposure to the surrounding medium. The spawn masses are of an irregular oval form, each mass containing from five or six to as many as forty or fifty ova.

On first leaving the egg the young are, in common with other Nudibranchiata, furnished with a delicate nautiloid shell, and propel themselves through the water with great activity by means of their ciliated lobes, or epipodia. Figs. 12 and 13 represent the animal about one month after quitting the egg; but further stages of development remain to be traced. The length of the adult animal varies from one to as much as three tenths of an inch, though the majority of the specimens examined have not exceeded that of two tenths of an inch.

* One or two specimens have been met with having three papillæ in the first anterior fasciculus also.

The arrangement of the papillæ also holds good in distinguishing this species from the *Calliopæa bellula* of D'Orbigny, figured and described in the 'Mag. de Zoologie' for 1837.

EXPLANATION OF PLATE VIII.

Fig. 1. *Embletonia grayi*, natural size.
2. The same, magnified.
3. The same, viewed dorsally when in a state of repose.
4. The head, seen from above, showing the expanded oral lobes.
5. A portion of the odontophore, viewed laterally.
6. The same, from above.
7. A single lingual plate detached and magnified 300 diameters.
8. A mass of ova.
9. First condition of the embryo on quitting the egg.
10. The same having lost its ciliated lobes, or epipodia.
11. The cast nautiloid shell.
12 & 13. The embryo about a month old, showing at *a* the eyes, at *b* the auditory vesicles, and at *c* the heart.

February 11th, 1869.

Osbert Salvin, Esq., M.A., in the Chair.

The following extract was read from a letter addressed to the Secretary by Dr. John Anderson, C.M.Z.S., dated Calcutta, January 5th:—

"I have brought back a tolerably large collection from Yunan and Upper Burmah; but I had great difficulties to contend with, and it is not so large as I expected it would be. Once across the Kakhyen Hills, our road lay through paddy-fields in elevated valleys (4000 to 5000 feet), defined by long ranges of high mountains. It was unsafe to venture on the hills; so that my spoils are almost entirely derived from a cultivated country. *Ailurus* abounds; and two, if not three, species of *Manis* are very common. Pheasants are plentiful; and Western Yunan, on the very confines of Burmah, is apparently rich in *Thaumalea amherstiæ*. If I could have ventured on the hills, I believe I could have made good bags of this splendid bird. On our way through the Shan states we saw its handsome tail-feathers very frequently in the hands of the natives, who use them as ornamental fly-switches. But all the information gained in the journey will be given in the Report which will be submitted to Government."

Mr. W. B. Tegetmeier exhibited a pair of remarkably large horns of the Cape-Buffalo (*Bos caffer*), and two remarkable pairs of horns of the Domestic Goat.

Mr. William Jesse read the following Report to the Council of the Society upon his proceedings in connexion with the Abyssinian Expedition:—

Gentlemen.—It is with pleasure that I find myself in a position

to lay before you a sketch of my proceedings during my recent journey with the late expedition in Abyssinia.

I should first like to state that, my late arrival on the scene of action having prevented me from accomplishing anything like the work I wished to carry out, I eagerly seized upon an opportunity which presented itself, after the close of the campaign, of supplying the deficiencies thus occasioned.

I heard from Mr. W. T. Blanford, Geographer to the Expedition, that he, Capt. Mokeler (political officer), and Mr. Munzinger (H.B.M. Consul at Massowah) contemplated an excursion into the Bogos country; and I therefore wrote to the Consul begging his permission to make one of the party. This permission I subsequently received, and under these auspices found means to fulfil my mission more completely than I had anticipated.

On the 27th of January, 1868, I left England, and on the 24th of February we cast anchor in Annesley Bay. My arrangements on shore not being completed, I obtained a boat and crew from the Captain and started with a party to the head of the bay. I spent a couple of days here, examining the surrounding country and shooting. I procured specimens of the Naked-necked Francolin of the plains, one species of Hornbill, and a variety of other birds, the most important of which were eight specimens of the *Dromas ardeola*. These latter I especially wished to bring home, both as skeletons and in spirits. Unfortunately I could not carry out this intention, as, instead of returning safely in about two hours' trip to the 'Great Victoria,' we were nearly wrecked on the opposite shore; and the energies of our crew and selves were so severely tried by wind and rain that we with difficulty, and utterly exhausted, reached the fleet at the end of twenty-four hours. My specimens being spoiled, this was rather a discouraging commencement of my duties. I may here remark that I did not again obtain specimens of this bird until on my voyage home, at Suakim.

On the 27th I landed at Zoulla, and reported myself to General Stuart, there awaiting orders from the Commander-in-Chief. In a few days I received an intimation from his Excellency that I should find ample scope for my researches in the neighbourhood of Zoulla; it was, however, at that time impossible to prosecute them with any result, on account of the country being utterly devastated of wood and grass, offering but small opportunities for the zoologist. I obtained a few specimens, when an attack of sickness put an end to my endeavours, and compelled me to go on board the hospital ship. After some days I returned ashore; but in the course of a few hours I had a relapse, which induced me to leave the plain and move up towards the highlands. I was also disappointed in not meeting at Zoulla with the taxidermists Lieut. R. C. Beavan had given me reason to expect would be there; but before quitting the place I was fortunate enough to find a man who eventually proved of use to me in this department.

The country lying between the sea and the foot of the hills at Koomayli was of the most barren description—to the seaward sandy,

and nearer the hills broken ground, bearing, at the period of which I speak, but few traces of vegetation beyond those of low thorny mimosas and a stunted species of cypress. The plain is intersected by dry watercourses, running from the hills towards the sea. The presence of salt in the soil is to be detected from the sea even up to Koomayli. Along the seashore are belts of mangroves, affording shelter for many species of waterfowl. About an hour's ride from Zoulla towards the head of the bay are some hot springs, near a large grove of tamarisks. It was at this place I found spoor and dung of Elephants, three species of Antelope, and one of Bustard. The tenants of these barren districts, as far as I could ascertain, are Elephants (during the wet season), three species of Antelope, Wart-Hogs, a small Hare, one species of Hyena (probably the spotted), one of Jackal (probably *Canis anthus*), a Jungle-Cat (supposed to be identical with the Syrian Cat, of which I obtained a female and cubs), also a Jerboa-like Rodent. Scorpions are here numerous and large. For further details I shall refer to my collections at a later date. The character of the fauna of the plains is migratory, changing almost monthly from the hills to the plains, and *vice versâ*.

Proceeding up the passes, the only object worthy of special notice was the curious Rodent named by Mr. Blyth *Pectinator spekii*, the existence of which was made known to me by Mr. Blanford, and of which I obtained specimens. I should have procured more specimens had not my taxidermist fallen ill with fever, and my own health continued far from good.

On arriving at Senafe I made that place my headquarters; and health rapidly improving, I set to work in the surrounding neighbourhood. Here, on one of my excursions, a companion who had separated from me was robbed of one of my rifles, and returned to camp stripped. Unfortunately, this happening out of my reach, I lost the opportunity of procuring a skeleton of one of the inhabitants for our investigation in England. From Senafe I made a short trip to Addigerat, adding somewhat to my collection.

The rapid and successful termination of the Abyssinian campaign brought my labours to an unexpected close; but I continued working until Lord Napier's return to Senafe obliged me to return.

I here found the list of birds numerically increased. About Senafe and Rareguddi the "Koodoo," or "Aggazin" (*Strepsiceros kudu*), was found in small herds, and a fine young buck came into my possession alive—a present to the Society from Dr. Knapp, surgeon to the 25th Bengal Native Infantry. Unfortunately, two consecutive attacks of dysentery reduced the animal to such a state of weakness that it was impossible to save it—a fact which I much regretted, as I believe at that time the Society did not possess a specimen alive in their gardens. The "Klipp-springer" Antelope existed in these regions; and the "Beni-e-Israel" Antelope I found in the valleys at the back of Senafe, as also the "Wart-Hog."

Two species of "Ground-Squirrel," one striated, the other not, and one species of Ichneumon came under my notice up the passes.

On the hills in the neighbourhood of Senafe I found another

species of Hare, about equal in size to a threequarter-grown English Leveret, and of the same colour. A small sandy, strong-haired Rat I also procured a specimen of, which was unavoidably lost.

On the return journey I spent a few days at Undel Wells, with a view of obtaining a more specific knowledge of the fauna of that elevation, having reason to believe it differed materially from that of the higher and lower zones. I did not, however, obtain much satisfactory information until my subsequent trip, at a later date, into Northern Abyssinia.

I arrived with the rearguard at Zoulla, where, after having made some additions to my collection, I prepared seven cases to be sent to England. As I have before stated, I obtained permission from H.B.M. Consul at Massowah to join him, Capt. Mokeler, and Mr. Blanford in an expedition into the Bogos country, which, although already explored by Brehm and Heuglin, I thought worthy of attention. Had opportunity offered, I should, in accordance with my instructions and my own wishes, have visited the country towards lake Assal. During the third week in June we were occupied in preparing for our proposed trip. We sent our baggage and provisions round to Massowah by buggalow, and our animals by land. We ourselves started on board the 'General Havelock' for Massowah, where we had to remain a few days arranging our affairs.

On the 22nd of June we left Massowah for the mainland, assembling our caravan at about four miles distance, at Monkooloo, and started the next morning with 38 camels, 8 horses, and about 30 men. We halted at Sahati, *en route* for Ailet, and heard there of Lions, but found no traces of them, so proceeded to Ailet the following day. Our camp here was situated on the banks of a wild nullah, watered by a hot spring at no great distance. This place is noted but too truly for its man-eating Lions and Panthers. It is a legend in the village "that no man dies in his bed." During one or two days I accompanied Capt. Mokeler (Mr. Blanford being lame) in pursuit of a lioness, tracks of which we had seen close to our tent, but with no success, Capt. Mokeler only obtaining one shot, which was without effect.

On the 27th of June, after some premonitory symptoms, I received a sunstroke, which completely put an end to my researches. My friend Mr. Blanford was more fortunate, and laid the good foundation of his subsequent collection. On the 29th, at about 12 o'clock at night, I was awoke from a sick bed, along with my companions, by shrieks of the most fearful kind. It was pitch dark; and we rushed out of our tents with our arms in our hands, to find our followers in a state of most dire terror and confusion, filling the air with cries of "the Lion, the Lion;" and then a dusky form was seen to bound away over the thorn fence and disappear in the darkness. After having in some degree quieted the fears of our people, we called the roll, and found that one of my gun-bearers, a Shunkgalla of huge proportions, lay dead in the midst of us, his throat bearing but too terrible marks of the manner in which the poor fellow had perished. I may add that, only the night before, Mr. Blanford's butler had been severely wounded in the head by the claws

of what we supposed to be a Panther. These brutes had passed by our camels, horses, milch-goats, and fires without harming anything. In the morning, after a useless search for the brute of the preceding night, on which we naturally desired to wreak our vengeance, we buried the poor victim, covered him with a pile of stones, and left for Asoos. From here we started the same day, and halted at Kooserit.

On the 31st we left Kooserit, and, halting at Anagully, arrived in the evening at Kanzal, where I managed to stroll out, but I was still very ill. I fired at two Panthers without effect. At 6 p.m. on the 4th of July we started across the desert to Ain, on the river Lebka, which rises in the hills and flows across the plains to the sea. I stopped to look at a Bedouin village, consisting of about 100 mat huts. The inhabitants were a portion of nomad tribes which pasture their flocks, during the wet season, on the coast, moving up towards the highlands as the pasturage fails. We passed through the Ostrich-country, but we did not see any. During the night, the moon being up, we saw several herds of Antelopes.

We arrived at Ain at about 10 o'clock. In the afternoon I went out, and succeeded in procuring some specimens. This place is very prettily situated, forming quite an oasis in the desert. A bright stream runs through grass and high reed jungle, bordered with tamarisks and other trees; a background of rugged barren hills, rising tier above tier, enhances the beauty of the scene.

On the 7th of July we left Ain for Mahabar; and when there I began to regain my health. Between Ain and Mahabar we found spoor of Elephants, evidently in a state of migration from the lowlands to the highlands. At Mahabar I added considerably to my collection, particularly by specimens of a small hawk, which I take to be the *Nisus sphenurus* of Rüppell. Mr. Blanford obtained several. The night before our arrival a native had been killed by a Lion. The animal left his track by the waterside, and it was taken up by Mr. Blanford and Capt. Mokeler without effect. I took up the track of a solitary Elephant with a like result. At 5 o'clock a.m. the next day we continued our march, halting at Gelamet for lunch, and arrived at 6 p.m. at Kokai, or the City of the Lions. Between Gelamet and Kokai the scenery improved greatly, exchanging rather stunted tamarinds and barren mimosas for the baba tree, or *Adansonia*, the cactus-like *Euphorbia*, and a dense jungle, with a strong undergrowth of rank grass and aloes.

Here the climate was truly European, and, indeed, at night intensely cold. The fauna began to show the peculiarities which I had expected at Undel Wells, and in which I was disappointed; the transition was so sudden that on the first day I procured three species of "Roller," a Parrot, and several other birds.

The next morning we found on inquiry that Elephants were in the neighbourhood; so, having supplied my taxidermist with materials for his day's work, I joined Capt. Mokeler and Mr. Blanford in an excursion in search of them.

I remained two days longer in this neighbourhood collecting with success, and then proceeded over the pass to Bejook on the river

Anseba. Here I had a good week, securing many specimens I had hitherto failed to obtain. On the 14th of July we went out in pursuit of a Rhinoceros we had heard of the day before, and which Mr. Blanford and I had the good fortune to shoot. The next morning I went out with my attendants and *posse comitatus* of natives, to bring in the skeleton, and on arriving at the place I witnessed a scene precisely similar to that described by Sir Samuel Baker as taking place over the carcass of a Hippopotamus:—women, old and young, the former hideous, scratching, screaming, and fighting over the entrails, pulling furiously at these or at one another's hair, it mattered not which so that possession of the prey was secured; the men jabbering like jackals, fighting with sticks and knives, one and all knee-deep in filth and blood; so that between them, in about four hours, the skeleton was utterly bared of meat and skin, leaving not an atom for the Vultures.

On the 18th we had the first earnest of the rainy season, which was ushered in by a terrific storm of rain and hail, some of the hail-stones being as large as small walnuts. The Anseba, an affluent of the Barca, from a dry bed with an occasional waterhole became a splendid river, varying from 50 to 100 yards in width, and flowing between banks of dense jungle and fine forest trees. The spoor of Elephants, Black Rhinoceros, and Lions were plentiful along the banks, so much so as to give the appearance of a place frequented by giant rabbits. The valley here varied from 15 to 20 miles in width, the jungle and forest limiting itself to about a couple of miles on each side. The remainder of the ground was stony and barren, rising gradually towards the hills, and intersected by numerous nullahs running into the Anseba. Here we came in for a glimpse, on two occasions, of another species of Antelope, slightly larger than the "Beni-e-Israel." Unfortunately I had but a momentary view of it, and never succeeded in obtaining a specimen. On the 19th we left Bejook for Waliko, seeing on the road plenty of spoor of Elephants and Rhinoceros; from the dung of the latter I collected a few Coleoptera. While at Waliko, finding a great scarcity of birds, I followed up more closely the tracks of the Rhinoceros, passing through very dense jungle that is never penetrated by sun or air, by means of their paths, which are from 2 to 3 feet broad, and formed like galleries in a mine, about four feet high—and so entering their dens, which are very curious, having the appearance of immense arbours; they vary in size from 13 to 20 feet square, and have in some cases a smaller retreat adjoining.

On the 24th, Mr. Blanford and I went out birding, and came upon fresh tracks of two Lions; they had followed Elephants' spoor for over two miles. The herd consisted of three old ones and a young one. The next day we left for Maraguay, where Capt. Mokeler shot a doe Koodoo, and I procured a few birds, one species of "*Indicator*." Mr. Blanford obtained a new Kingfisher, of which I also secured a specimen the next day. I also shot a pair of fine Ground-Hornbills (*Bucorax abyssinicus*), which I prepared as skeletons. The rains having set in, and the term of our excursion

drawing to a close, we left Maraguay on the 31st of July on our return journey. When I arrived at Waliko, to which place Capt. Mokeler had preceded us, I found that he had been charged by a herd of some twenty Elephants, and had been forced to make good his escape into a tree, after hard running, and having left a bullet in the head of a large bull. At a later date I found myself in the same disagreeable predicament, and under a like disagreeable necessity. At Waliko I found two species of crested Cuckoo and the English Cuckoo. I also obtained a Bateleur Eagle, two species of Tortoise, and a small Squirrel. I must here state that Waliko is not, as represented in the map, on the right side of the river, but on the left, running down stream. From here we crossed over to Gabena Weld Gonfallon, or the River-plain, where Mr. Blanford and Capt. Mokeler killed a Rhinoceros. We returned by the old route to Kokai and Gelamet, and then branched off to Rairo; here we stopped two days collecting. On the 15th of August we moved on again to Mombarharattby, where we killed a Lioness, one out of four, the others running away,—from this place to Ain (where we reentered our former route), which we quitted on the 17th of August for Amba and Mai Wallet. Mr. Blanford and I stayed in Amba from the 19th to the 21st, trying to obtain specimens of the "*Oryx beisa*." I unfortunately did not even see one; Mr. Blanford procured four specimens. We went from Amba to Massowah, which I left on the 27th for England.

I append a list of my collections, full information relative to which will appear at a later date:—

Skins of mammals, about	24
Skull of an aboriginal	1
Skull of African Elephant	1
Skeleton of Rhinoceros	1
Heads of Antelope	3
Skeletons of other mammals, about	8
Skins of birds, about	750
Birds and Mammals in spirit, about	20
Reptiles in spirit, about	6
Tortoises and Lizards, about	6
Fish, about	30
Crustacea, about	50
Lepidoptera, about	150
Coleoptera, about	200
Total number of specimens, about	1250

The following living specimens were also forwarded to the Zoological Society from Zoulla:—

Young Wild Cats *	2
Jerboa-like Land-Rats	2
Guinea-fowls	2

* These were the only specimens forwarded by Mr. Jesse that reached the Society alive. They were the young of *Felis maniculata*, Rüppell.—P. L. S.

The following papers were read:—

1. On a Collection of Birds from the Solomon Islands. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

(Plates IX. & X.)

Our Corresponding Member Mr. Gerard Krefft, the active Curator and Secretary of the Australian Museum, has most kindly presented to me a collection of birds in spirits, made by the captain of the (former) yacht 'Chance,' owned by Mr. J. A. Buttray of Bristol, during a voyage to the Solomon Islands*.

The collection contains thirty specimens, belonging to twenty-one species, many of them of great interest. But before speaking of them I will say a few words upon what has hitherto been recorded concerning the ornithology of this group of islands.

Our present authorities upon this subject are few in number, namely:—

(1) The "Zoologie" of the voyage of the French ships 'L'Astrolabe' and 'La Zélée,' under the command of Dumont-d'Urville, in 1837–1840, commonly known as the 'Voyage au Pôle Sud.'

The "Atlas" to this voyage contains figures of ten species of birds from the Solomon Islands, concerning which some further details are given in the letterpress of the same work, subsequently written by Dr. Pucheran and published in 1853. These ten species, which are all described as new to science, are:—

	Zool. vol. iii.	Atlas.	ex ins.
Athene tæniata	p. 50,	pl. 3. fig. 1.	S. George.
Pachycephala orioloides	p. 57,	pl. 5. fig. 3.	S. George.
Lamprotornis fulvipennis	p. 81,	pl. 14. fig. 2.	Isabel.
Dicæum æneum	p. 97,	pl. 22. fig. 4.	S. George.
Myzomela lafargei	p. 98,	pl. 22. fig. 5.	
M. solitaria	p. 99,	pl. 22. fig. 6.	
Lorius cardinalis	p. 103,	pl. 24 *bis*. fig. 2.	
Pionus heteroclitus	p. 103,	pl. 25 *bis*. fig. 1.	S. George and Isabel.
P. cyaniceps	p. 105,	pl. 25 *bis*. fig. 2.	
Cacatua ducorpsii	p. 109,	pl. 26. fig. 1.	

(2) Mr. Gould's notices of new birds collected during the voyage of the 'Rattlesnake' (P. Z. S. 1856, p. 136 *et seqq.*). The species here described from the Solomons are:—

1. *Centropus milo*, from Guadalcanar.
2. *Turacœna crassirostris*, from Guadalcanar.
3. *Lorius chlorocercus*, from San Cristoval.
4. *Iotreron eugeniæ*, from "the Solomons."

* The name of these islands is variously spelt "Salomon" and "Solomon" Islands. But we learn from Hakluyt (iii. p. 802) that the discoverer (Mendana) "named them the Isles of Salomon to the end that the Spaniards, supposing them to be those isles from whence Solomon fetched gold to adorn the Temple, might be the more desirous to go and inhabit the same." It would appear, therefore, to be better to call them in English "Solomon" Islands, according to the ordinary English orthography of Solomon's name.

(3) Mr. G. R. Gray's 'Catalogue of the Birds of the Tropical Islands of the Pacific Ocean' (London, 1859), which mentions seven species as occurring in the Solomon Islands, besides those given by the two already quoted authorities, namely:—

Halcyon cinnamomina, Sw.
—— *sancta*, Vig. & Horsf.
—— *leucopygia* (Verr.).
Trichoglossus massenæ, Bp.
Carpophaga pistrinaria, Bp.
—— *rubracera*, Bp.
Nycticorax manillensis.

Mr. Gray has not stated his authority for the occurrence of these species in the Solomon Islands, and there is probably some error as regards the first two of them. *H. leucopygia* is described by Verreaux from the Solomons, and the type is in the British Museum. Of *Trichoglossus massenæ* and the two *Carpophagæ* there are examples from San Cristoval (collected by M'Gillivray) in the British Museum. The *Nycticorax* is probably given on the authority of Bonaparte's 'Conspectus' (ii. p. 140), but must be regarded as a very doubtful denizen of the Solomon Islands until the statement is confirmed.

(4) My description of the new *Nasiterna* from the Solomon Islands, published in the Society's 'Proceedings' for 1865 (p. 620). For this interesting representative of the *N. pygmæa* of New Guinea I was likewise indebted to Mr. Krefft's kindness. When I described it I was not certain from what island it came; but a subsequent communication from Mr. Krefft informed me that it was obtained in New Georgia, or St. George* Island.

The present collection from the Solomon Islands contains the following species:—

1. SAULOPROCTA MELALEUCA.

Muscipeta melaleuca, Q. et G. Voy. Astr. Zool. i. p. 180, Atlas, t. 4. f. 4.
Rhipidura melanoleuca, Bp. Consp. i. p. 322.
Sauloprocta melanoleuca, Cab. Mus. Hein. i. p. 57.

Originally discovered by the naturalists of the 'Astrolabe' expedition in New Ireland. A specimen from the same island (with which my example agrees), in the British Museum, was obtained in New Ireland during the voyage of the 'Sulphur.'

A fine series of this species is in Mr. Wallace's collection, from Bouru and other Moluccan and Papuan islands. *Rhipidura atripennis*, G. R. Gray, from the Aru Islands, appears to be scarcely distinguishable.

2. DICRURUS MEGARHYNCHUS.

Edolius megarhynchus, Q. et G. Voy. Astrol. Zool. i. p. 184, Atl. t. 6.

My single specimen of this *Dicrurus* seems to agree with a mounted specimen in the British Museum, received from "New Ireland"

* *Cf.* Finsch, Papag. i. p. 328.

through the late Sir Charles Lemon, F.R.S. Messrs. Quoy and Gaimard give Havre Dorey, New Guinea, as the habitat of this Drongo. But this is probably an error, as Mr. Wallace and other collectors who have since visited that locality have never met with it, and Drongoes are mostly abundant individually, and not easily missed if present. The species is probably restricted to the group of New Ireland and the Solomon Islands.

3. PHILEMON VULTURINUS*.

Tropidorhynchus vulturinus, Hombr. et Jacq. Voy. au P. S. Zool. iii. p. 88, Atl. t. 18. f. 1.

A single imperfect skin of a Honey-eater, which seems to agree generally with the figure above referred to. Pucheran gives the locality as Raffles Bay, New Holland; but the species is not known to the Australian fauna, and it is more than probable that there has been some error in M. Jacquinot's notes as to the locality.

The present bird is generally darker above than is represented in the figure, and has the apical portion of the bill light yellow. It is more like the so-called *Tropidorhynchus diemenensis*, Lesson, than any other species I am acquainted with, but has not the bluish wing-patch which distinguishes that species.

4. CALORNIS METALLICA (Temm.).

Lamprotornis metallica, Temm. Pl. Col. 266.
Aplonis metallica, Gould, B. Austr. Suppl. pt. 1.
Calornis metallica, Gould, Handb. B. Austr. i. p. 477.

Three skins (two ♂ and one ♀) agree with marked specimens in the British Museum. The species was originally described by Temminck from Amboina, but seems to extend over the whole of the Moluccan and Papuan Islands, including the northern promontory of New Holland. Mr. Wallace has a fine series from many localities, which vary but little *inter se*.

5. GRACULA KREFFTI, sp. nov. (Plate IX.)

Æneo-nigra: regione oculari late denudata flava: caudæ tectricibus superioribus et inferioribus, speculo alari et ventre imo albis, hoc flavescente tincto: rostro et pedibus aurantiacis: long. tota 11·0 *poll. Angl., alæ* 6·3, *rostri a rictu lin. dir.* 1·5, *caudæ* 4·2, *tarsi* 1·45.

Hab. Inss. Salomonenses.

Obs. Proxima *Graculæ dumonti*, sed valde major, cauda longiore, et ventre medio non flavo differt.

* It is always a misfortune to be obliged to change well-established names; but there seems to be no doubt that *Tropidorhynchus* of Vigors and Horsfield (1826) must give place to *Philemon* of Vieillot (1816). The first type given by Vieillot (Analyse, p. 47) is *Le Polochion* of Buffon = *Merops moluccensis*, Latham. This species is stated to inhabit Bouru, and is clearly the same as that subsequently described by Mr. Wallace (P. Z. S. 1863, p. 31) as *Tropidorhynchus bouruensis*. It is a typical species of the genus, and should be called *Philemon moluccensis*.

This fine new *Gracula* is, as might have been expected from its *patria*, nearest to *Gracula dumonti* of New Guinea and the Aru Islands, of which I exhibit a fine skin from Mr. Wallace's collection for comparison. The naked space round the eye is nearly, though not quite, of the same form. There is also a narrow naked line along the lower edge of the mandible; but this is not nearly so broad as in *G. dumonti*, and is almost hidden by the feathers on each side. The primaries have a broad white bar across them, about halfway up on the outer primary, but descending gradually towards the apex on the inner primaries. This forms a white speculum, as in *G. dumonti*. All the dimensions of the new species exceed those of its ally; but this is particularly the case in the tail, which in *G. dumonti* is rather stumpy, measuring only 2·6 inches from the insertion of the feathers in the coccyx, instead of 4·2.

I have great pleasure in naming this new Grackle after our active Corresponding Member Mr. Gerard Krefft, to whose kindness I am indebted for the whole of the very interesting series of which it forms a part.

The stomach of the single specimen in the collection contained seeds and stones of semidigested fruit.

There is a single skin of this *Gracula* in the British Museum, received from "New Ireland" through the late Sir Charles Lemon, F.R.S. It agrees very well with the present specimen, except in having the lower belly rather more deeply tinged with yellow.

6. EURYSTOMUS CRASSIROSTRIS, sp. nov.

Similis E. pacifico, *sed major, rostro latiore, crassiore, robustiore; capite supra nigricante nec fuscescente; dorso toto viridescenti-cæruleo: ventre magis cæruleo: cauda valde longiore: long. tota* 11·5, *alæ* 7·2, *caudæ* 5·0, *rostri ab ang. oris lin. dir.* 1·6, *ejusdem lat.* 1·2.

Hab. Inss. Salomonenses.

There is a single specimen of this Roller in the collection. I have compared it with Mr. Wallace's series of *E. pacificus*, from which it presents readily appreciable differences, and with other Australian specimens. The strong thick bill and longer tail seem to render it impossible to leave it as a variety of *E. pacificus*. In Mr. Wallace's collection, however, is a single skin from Waigiou which is generally very similar to the present example, differing principally in having the wing-coverts of a more bluish tinge. The wing-coverts of *E. crassirostris* are more like those of *E. pacificus*.

7. TODIRHAMPHUS CHLORIS (Bodd.).

Alcedo chloris, Bodd. ex Buff. Pl. Enl. 783. f. 2.
A. chlorocephala, Gm.

One specimen apparently referable to this widely distributed species, which is diffused from the north-east coast of Africa over India, the Malayan archipelago, and the Moluccan and Papuan Islands. In Australia it appears to be represented by *T. sordidus*.

8. Buceros ruficollis.

Buceros ruficollis, Vieill. Temm. Pl. Col. 557.

A young male of this species, which is the only one of the family found in the Papuan subregion.

9. Centropus ateralbus.

Centropus ateralbus, Less. Voy. Coq. Zool. i. p. 620, Atlas, t. 33; Bp. Consp. i. p. 108.

One example of this Coucal, which was originally discovered by Lesson, during the voyage of the 'Coquille,' at Port Praslin, New Ireland.

10. Cacatua goffini.

Plictolophus goffini, Finsch, Papag. i. p. 308.

A single skin of a white Cockatoo, is apparently referable to this species, of which the exact habitat was previously unknown.

11. Geoffroius heteroclitus.

Pionus heteroclitus, Hombr. et Jacq. Voy. au P. S. t. 25; Puch. ibid. Zool. iii. p. 105.

Pionias heteroclitus, Finsch, Papag. ii. p. 390.

Two skins apparently referable to the female or young of this species as represented in the second figure of the Atlas of the 'Voyage au Pôle Sud.' Dr. Pucheran has recoguized in this form a distinct species, which he has proposed to call *Pionus cyaniceps*, but Dr. Finsch believes him to be in error on this point.

Dr. Finsch has examined the two specimens in the present collection. One of them has had its wings cut, having been apparently in captivity.

12. Lorius chlorocercus.

Lorius chlorocercus, Gould, P. Z. S. 1856, p. 137; G. R. Gray, List of Psitt. p. 49; Sclater, P. Z. S. 1867, p. 183, pl. xvi.

Domicella chlorocerca, Finsch, Papag. ii. p. 767.

Three skins of this splendid species are in the collection.

13. Lorius hypœnochrous.

Lorius hypoinochrous, G. R. Gray, List of Psitt. p. 49 (1859).

Domicella hypoinochroa, Finsch, Papag. ii. p. 768.

One skin of this fine Lory is in the collection. I have compared it with the typical example in the British Museum, which is, as far as I know, unique.

14. Eos cardinalis.

Lorius cardinalis, Homb. et Jacq. Voy. au P. S. Zool. iii. p. 101, t. 24 *bis*. f. 2.

Domicella cardinalis, Finsch, Papag. ii. p. 785.

Dr. Finsch has kindly undertaken the examination of this rare

Parrot, and his notes upon it will be read to the Meeting; so I need say no more*.

15. TRICHOGLOSSUS MASSENÆ.

Trichoglossus massenæ, Bp.; Finsch, Papag. ii. p. 834.

One skin agreeing with the specimen so named in the British Museum (*cf.* Finsch, *l. c.* p. 826).

16. ATHENE VARIEGATA.

Noctua variegata, Quoy et Gaim. Voy. Astr. Zool. i. p. 166, Atl. t. 1. f. 2.

Athene variegata, Bp. Consp. i. p. 41.

One example which seems to agree well enough with Quoy and Gaimard's figure and description. These naturalists met with the species in New Ireland.

17. CARPOPHAGA RUBRICERA.

Globicera rubricera, Bp. Consp. ii. p. 31.

Carpophaga rubricera, G. R. Gray, List of Columbæ, p. 18.

C. lepida, Cassin, Proc. Acad. Phil. 1854, p. 230.

I have compared this with the type specimen in the British Museum. Bonaparte states that an example in the Paris collection is from New Ireland. A second example in the British Museum is from San Cristoval (*M'Gillivray*).

18. RALLUS INTACTUS, sp. nov. (Plate X.)

Supra olivaceo-brunneus; capite colloque toto et remigibus primariis externis rufis: uropygio et cauda nigricanti-cinereis: subtus gula albicante; pectore toto rufo, capite concolori; ventre plumbeo, crisso nigricante: hypochondriis et tectricibus subalaribus nigricantibus, albo guttatis: long. tota 10·5, *alæ* 6·8, *caudæ* 1·8, *rostri a rictu* 1·9, *tarsi* 2·5, *dig. med. c. u.* 2·0.

Hab. Inss. Salomonenses.

Obs. Similis *R. plumbeiventri* (G. R. Gray, P. Z. S. 1861, p. 432), sed rostro breviore, capitis et pectoris colore rufo obscuriore, ventris autem dilutiore plumbeo distinguendus.

The collection contains only a single skin of this Rail, which is more nearly allied to *Rallus plumbeiventris* of Mysol and Morty Island than to any other species known to me.

19. ARDEA SACRA (Gm.).

Two skins of this wide-spread and variable species:—one in uniform nearly black plumage (as represented by Buffon, Pl. Enl. 926), with faint indications of a narrow gular stripe; the other white, but showing traces of the black plumage gradually making its appearance. Upon this species consult Hartlaub and Pelzeln (Fauna Central-Polynesiens, p. 201).

* See below, p. 126.

20. TRINGOIDES HYPOLEUCUS (Linn.).

Three skins of this species, or of the Australian form of it, *Actitis empusa* (Gould, B. Austr. vi. pl. 35).

21. STERNA LUNATA, Peale; Finsch et Hartl. Fauna Centr. Pol. p. 231.

A skin of a Tern in transition plumage, which Dr. Finsch has kindly determined for me.

After inserting in their places such of these twenty-one species as have not been previously recorded by the before-named authorities upon this subject, we shall have the following list of well-authenticated species of birds from the Solomon Islands:—

	Distribution.
I. PASSERES.	
1. *Sauloprocta melaleuca*	Papuan subregion.
2. *Pachycephala orioloides*	Peculiar to Solomons.
3. *Dicrurus megarhynchus*	New Ireland.
4. *Philemon vulturinus*	Probably peculiar.
5. *Dicæum æneum*	Peculiar.
6. *Myzomela lafargei*	Peculiar.
7. —— *solitaria*	Peculiar.
8. *Calornis metallica*	Papuan subregion.
9. —— *fulvipennis*	Peculiar.
10. *Gracula kreffti*	New Ireland.
II. PICARIÆ.	
11. *Eurystomus crassirostris*	Probably peculiar.
12. *Todirhamphus chloris*	Papuan subregion and India.
13. —— *leucopygius*	Peculiar.
14. *Buceros ruficollis*	Papuan subregion.
15. *Centropus ateralbus*	New Ireland.
16. —— *milo*	Peculiar.
III. PSITTACI.	
17. *Cacatua goffini*	Probably peculiar.
18. —— *ducorpsii*	Peculiar.
19. *Nasiterna pusio*	Peculiar.
20. *Geoffroius heteroclitus*	Peculiar.
21. *Lorius chlorocercus*	Peculiar.
22. —— *hypœnochrous*	Lousiade Islands.
23. *Eos cardinalis*	Peculiar.
24. *Trichoglossus massenæ*	New Caledonia and New Hebrides.
IV. ACCIPITRES.	
25. *Athene variegata*	New Ireland.
26. —— *tæniata*	Peculiar.
V. COLUMBÆ.	
27. *Carpophaga rubricera*	New Ireland.
28. —— *pistrinaria*	Peculiar.
29. *Macropygia crassirostris*	Peculiar.
30. *Philonopus eugeniæ*	Peculiar.
VI. GRALLÆ.	
31. *Rallus intactus*	Peculiar.
32. *Tringoides hypoleucus*	Generally distributed.

	Distribution.
VII. Herodiones.	
33. *Ardea sacra*	India, Australia, and Polynesia.
VIII. Gaviæ.	
34. *Sterna lunata*	Polynesia.

It thus appears that of the thirty-four authentically determined species of birds of the Solomon Islands seventeen are certainly, as far as is hitherto known, and three others probably, peculiar to the group. Of the remaining fourteen, five have likewise been met with in New Ireland, which is one of a neighbouring group of islands probably belonging strictly to the same fauna; one has hitherto only been found in the Louisiade Islands; and the remainder are of more or less extended distribution, being, however, mostly restricted to the Papuan Islands.

But to obtain a better idea of the true nature of the avifauna of the Solomon Islands we may first consider very shortly what are the principal divisions of the great region of which it forms a part. The Australian region (Regio australiana), as I have proposed to call this*, appears to be most naturally divisible into five subregions, namely:—

1. The Papuan subregion (*Subregio papuana*), or Austro-Malayan Subregion of Wallace†.

2. The true Australian subregion (*Subregio australis*), comprising continental Australia, with, perhaps, the exception of the northern promontory of Cape York, which has been overrun by Papuan forms (such as *Cuscus, Casuarius, Manucodia,* &c.).

3. The New-Zealandian or Maorian subregion (*Subregio maoriana*), which is characterized by the recently extinct *Dinornithes*, as well as by the presence of numerous peculiar ornithic types.

4. The Polynesian subregion (*Subregio polynesica*), comprising the numerous groups of Polynesian islands lying between the Equator and the Tropic of Capricorn.

5. The Sandwich-Island subregion (*Subregio sandvicensis*), comprising only the Sandwich Islands, which are so very peculiar in their zoology that they must, I think, stand by themselves.

A very short examination of the foregoing list of the birds of the Solomon Islands will be sufficient to show us to which of these subregions this group of islands properly belongs. One of the principal features which distinguishes the Papuan subregion from the true Australian subregion is the occurrence in the former of numerous Indian types which do not extend into the latter. For example, the Hornbills (*Bucerotidæ*) are entirely foreign to Australia, but are found in the Papuan and Moluccan Islands. One species (*Buceros ruficollis*) only has yet been met with in New Guinea. This bird also occurs in the present collection from the Solomon Islands. Again, the genus *Gracula* is a well-known Indian form, but extends also over the Papuan subregion of *Regio australiana*, being, however,

* Journ. Proc. Linn. Soc. Zool. ii. p. 130.

† *Cf.* Wallace, P. Z. S. 1864, p. 273, et Journ. Geogr. Soc. xxxiii. p. 217.

non-existent in Australia. Two species of it occur in New Guinea (*G. dumonti* and *G. anais*). Of the former of these we meet with a beautiful representative in the present collection from the Solomons.

Again, the existence in the Solomons of two species of true *Lorius* and one of *Geoffroius* is quite sufficient to show the Papuan tendencies of the fauna; and from these facts alone Mr. Wallace has already included the Solomon Islands in his Austro-Malayan region*.

The subsequent discovery of a second species of the peculiar Papuan type *Nasiterna* in the Solomons has materially strengthened Mr. Wallace's argument from what was then known of the Psittacine fauna of these islands.

On the whole, therefore, it is manifest that the results derivable from the study of the present collection serve only to confirm the views Mr. Wallace has already put forward upon the avifauna of the Solomons, namely that these islands constitute an eastern outlier of the Papuan subregion. It need hardly be added that this makes the further investigation of their fauna still more desirable. Where such forms as *Nasiterna pusio* and *Gracula kreffti* occur, it is reasonable to expect that other brilliant representatives of Papuan types likewise remain to be discovered. It would not be surprising if even new species of *Paradiseæ* were yet to be found in some of these islands, or in the adjacent lands of New Ireland or New Britain, the latter of which has already produced to us a very remarkable form of one of the most characteristic of Papuan types (*Casuarius bennettii*).

Under these circumstances, I trust that our Corresponding Member Mr. Krefft and other numerous friends in Sydney will use their best endeavours to persuade the owners of the vessels which, as I understand, are trading between Sydney and these islands to lose no opportunity of acquiring specimens of their natural productions. And I trust that the time may not be far distant when it may be possible to fit out a regular expedition for the investigation of this rich but hitherto comparatively neglected district.

2. On a very rare Parrot from the Solomon Islands.

By Dr. O. FINSCH, C.M.Z.S.

(Plate XI.)

Amongst the species of Parrots which are more or less obscure there is scarcely one rarer than the *Lori cardinal* of MM. Hombron and Jacquinot, which is only known by the figure published in the Atlas of Dumont-d'Urville's 'Voyage au Pôle Sud' (pl. 24 *bis.* fig. 2) in the year 1843. This plate represents a Lory belonging apparently to the subgenus *Eos*, Bp., being throughout of a brilliant scarlet, therefore an unmistakable species. The descriptive part of the zoology of the French voyage, published ten years later, by

* *Cf.* P. Z. S. 1864, p. 278.

M. Jacquinot and Dr. Pucheran, gives no further account of the *Lorius cardinalis* (page 103), except the short notice that the species comes from the Solomon Islands. If I am right, the only specimen collected by the French naturalists of the expedition was, unfortunately, lost by the shipwreck of the 'Astrolabe.' When I was working out my Monograph of Parrots, I therefore was not able to give more than a description taken from the figure in the voyage; all my endeavours to get better information were without success. A new beam of hope arose when I was reading Prof. Rietmann's 'Wanderungen in Australien und Polynesien' (St. Gallen, 1868), and found mentioned in that amusing and, in many respects, interesting book (page 194) "shining-red Parrots," which were offered for sale by the natives of Guadalcanar during the stay of the traveller on that island. In the belief that these Red Parrots could be nothing more than *Lorius cardinalis*, I wrote a letter to Prof. Reitmann begging for more special information. In his kind answer the traveller was sorry to say that he was not sure whether these Parrots were quite red or not, not having brought home specimens of them; so that our knowledge of the Cardinal Lory remained as imperfect as before.

During my recent visit to London Dr. Sclater kindly showed me a very interesting collection of birds from the Solomon Islands, forwarded to him by Mr. Gerard Krefft of Sydney. This collection contained, besides two or three new species, most of the Parrots known from that group of islands, namely *Plictolophus ducorpsi*, Hombr. et Jacq., *Pionias heteroclitus*, Hombr. et Jacq., *Domicella hypœnochroa*, Gray (new to the Solomon Islands), and *Domicella chlorocerca*, Gould. Amongst them was a species of *Lorius*, which I, to my greatest pleasure and surprise, recognized immediately as the *Lorius cardinalis*, Hombr. et Jacq. A comparison with the plate shows some differences, in the specimen not being throughout of a brilliant scarlet, but having the upper parts decidedly brownish red and the feathers of the body beneath margined with pale orange-yellow. The latter peculiarity may be perhaps a sign of the specimen not being in mature state. The brilliancy of the colours in general has probably lost somewhat by the specimen having been preserved in spirits; but in any case one may say that the coloration of the plate in the 'Voyage au Pôle Sud' is too bright and a little exaggerated.

Concerning the generic position of this Parrot, it may be remarked that it belongs, according to coloration, along with *Domicella rubra*, Gm., *D. rubiginosa*, Bp., and the allied species, to the subgeneric division *Eos* of Prince Bonaparte. The shape of the bill, and the structure of the quills and tail-feathers, show a greater affinity to the so-called genus *Chalcopsitta*, Bp. (based upon *D. scintillata* and *D. atra*, Scop.), which is chiefly distinguished by a narrow, naked, black ring round the mandible, and more extended naked orbits.

Before describing this scarce specimen, I must remark that there are a few more Parrots of a more or less uniform red plumage, all being nearly, or entirely, unknown.

The first is the beautiful *Eclectus corneliæ*, Bp. (Finsch, Parrots, ii. p. 348), well described and figured in P. Z. S. 1849, pl. xi., and seen once or twice living in the Zoological Gardens at London and Amsterdam, but without any information about the dwelling-place —probably from one of the islands of the Malayan archipelago.

Another uniform red one is the *Psittacus unicolor* of Shaw (Finsch, Parrots, ii. p. 924), a very doubtful species, and known only from the descriptions of the older authors. It is not quite impossible that the *P. unicolor* may be related to the *Eclectus corneliæ*, being evidently a short-tailed *Eclectus* or *Pionias*, and not an *Eos*, as Mr. G. R. Gray suggests (List Psitt. p. 20); but it differs in having all the quills and the bill red. Levaillant mentions having seen two specimens in the collection of M. Temminck; but that I believe is one of his mystifications, and his figure (pl. 125) is only copied from Shaw's; for there is no reference to the *Lori unicolor* in Temminck's 'Catalogue Systématique du Cabinet d'Ornithologie,' of the year 1807. If that species really exists, I believe it will be found also in the Moluccan region; but I consider it to be more probable that the *P. unicolor* was based upon a manufactured specimen, and never will be found again.

A third thoroughly red Parrot is an *Arara*, mentioned by Alexander von Humboldt (Reise in die Aequinoctial-Gegenden des neuen Continents, iv. 1860, p. 6; Finsch, Parrots, ii. p. 935) in the following short note:—"In one of the huts of the Pacimonales we bought an *Ara*, being a species of *Aras*, about 17″ long, and of an entirely purple plumage, like the *Psittacus macao*." The celebrated traveller made this notice at the missionary station San Francisco Solano, on the left side of the Casiquiare, a country not yet explored by zoological collectors. If the information is correct, there can be no doubt that the *Ara* might be certainly new, and one of the most wonderful species in the whole tribe. It must be recollected, however, that Von Humboldt was not at all an ornithologist; and there may have happened a mistake, as in the case of the celebrated *Caperote* of Madeira, which was nothing more than our well-known *Sylvia atricapilla*, Lath.

About all those questionable points we must wait for further explanations. These will come, perhaps, as unexpected as in the case of *Domicella rubiginosa*, Bp. (Finsch, Parrots, ii. p. 781), also a red-coloured species, which was for a long time said to be a native of New Guinea, but was found by the Novara expedition on the small island Puynipet, of the Senjawin group, in a region where nobody would have expected Parrots at all.

Now we will give for the first time a full description of the excellent

DOMICELLA CARDINALIS. (Plate XI.)

Lori cardinal, Hombr. et Jacq. Voy. au Pôle Sud, Atlas, pl. 24 *bis*. f. 2 (1843).

Lorius cardinalis, Jacq. et Pucher. Voy. au Pôle Sud, Zoologie, iii. (1853) p. 103; Hartl. Journ. f. Ornith. (1854) p. 165; G. R. Gray, Gen. of B. App. p. 20.

Eos cardinalis, Bonap. Compt. Rend. 1857; G. R. Gray, List Spec. Brit. Mus. Psittac. (1859) p. 53.

Eos unicolor, part., Wall. P. Z. S. 1864, p. 291.

Eos cardinalis, G. R. Gray, B. of Trop. Isl. p. 31.

Domicella cardinalis, Finsch, Papageien, ii. (1868) p. 785.

Head and nape deep crimson, the under parts of the same colour but lighter, and each feather pale orange-yellow-margined at the end, giving a somewhat undulated appearance; the under tail-coverts uniform crimson; back and other upper parts purplish brownish red, darkest on the shoulders and quill-coverts, lighter and more crimson on the rump and upper tail-coverts; on the mantle some feathers with narrow obsolete yellow margins; primaries on the outer web reddish brown, with olive-yellow lustre in certain lights; on the inner web dark reddish brown; secondaries brownish red, like the back, the tail-feathers also; quills and tail-feathers beneath brownish red, in some light shining red.

Bill orange; cere, a naked ring round the mandible, and the considerably extended naked orbits black; legs and claws blackish.

Long. corp. 11½″, al. 6″ 4‴, rectr. intern. 5″ 5‴, rectr. ext. 3″, culm. 9‴, alt. rost. ad basin 9‴, tars. 9‴ (French meas.).

Hab. Solomon Islands.

3. Notes on the Species of the Genus *Asturina*. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.

Recent investigations having convinced us that there is still much confusion amongst the American species of Hawks of the genus *Asturina*, we beg leave to submit to the Society the following notes upon the subject.

The genus *Asturina*, founded by Vieillot in 1816 upon his *Asturina cinerea* (*Falco nitidus*, Lath.), embraces a small series of American birds closely resembling *Buteo* in structure, but in habits more nearly approaching *Accipiter*. The most noticeable difference between *Asturina* and *Buteo* consists in the shorter wings of the former; but in this respect *Buteo pennsylvanicus* (which has the habits of *Asturina*) is nearly intermediate between the two genera. Putting this bird aside for the present, we have left seven species of true *Asturina*, which may be separated into three groups, as follows:—

(1) The species allied to *A. nitida*, of which there appear to be two representative forms,—one occupying Central America and Mexico, which has been named *A. plagiata*; the other the true *A. nitida*, which, commencing its range at Panama, extends itself over the greater part of tropical South America.

(2) The species allied to *A. magnirostris*, which is the type of the genus *Rupornis* of Kaup. These are four in number, each

occupying a distinct area, as will be seen by reference to our notes below.

(3) The isolated species *A. leucorrhoa*, which appears to be a true *Asturina* in structure, but in plumage forcibly calls to mind the *Buteo brachyurus*, Vieill. The latter bird has likewise been referred by some authors to *Asturina*—but, from its lengthened wings, should, we think, be either placed with *Buteo* or stand by itself under the designation *Buteola*, proposed for it by Bonaparte from Du Bus's MS.

The subjoined table may, perhaps, assist in distinguishing the seven species in their adult dress:—

A. Supra cinereæ aut fuscæ: subtus plus minusve transfasciatæ.
  a. rem. prim. pogoniis internis albis nigro transfasciatis:
    supra transfasciata ..... 1. *nitida*.
    supra unicolor ..... 2. *plagiata*.
  b. rem. prim. pogon. int. rufis nigro transfasciatis:
    a'. caudæ fasciis cinereis:
      tibiis albis, cinereo transfasciatis..... 3. *magnirostris*.
      tibiis fulvis rufo transfasciatis..... 4. *nattereri*.
    b'. caudæ fasciis rufis:
      gula et pectore cinereis..... 5 *ruficauda*.
      gula obscure fusca, pect. albicante ..... 6. *gularis*.
B. Supra et subtus unicolor nigra ..... 7. *leucorrhoa*.

1. ASTURINA NITIDA.

Falco nitidus, Lath. Ind. Orn. i. p. 40.

Asturina cinerea, Vieill. Analyse, p. 68; N. D. iii. p. 41; E. M. p. 1260, et Gal. Ois. t. 20.

Falco striolatus, Max. Beitr. iii. p. 209; Temm. Pl. Col. 87 (ad.) et 294 (jr.).

Astur nitidus, D'Orb. Voy. Ois. p. 95; Burm. Syst. Ueb. ii. p. 68; Leotaud, Ois. Trin. p. 46.

Asturina nitida, Cab. in Schomb. Guian. iii. p. 737; Pelz. Orn. Bras. p. 3; Scl. et Salv. P. Z. S. 1864, p. 369, 1867, p. 589, 1868, p. 173; Lawr. Ann. L. N. Y. vii. p. 316; Scl. P. Z. S. 1860, p. 288.

Supra in fundo alba, dorso toto et alis extus grisescentioribus; schistaceo frequenter transfasciata: gula alba. Junior, tibiis rufescentibus immaculatis.

Hab. Panama (*M'Cleannan*); Western Ecuador (*Fraser*); Bogota (*Mus. S.-G.*); Venezuela (*Goering*); Trinidad (*Leotaud*); Cayenne (*Buff.*); British Guiana (*Schomb.*); Lower Amazons (*Wallace*); Barra, Borba, Cuyaba et Araguay (*Natterer*); Wood-region of S.E. Brazil (*Max. et Burm.*).

This well-known species is, as will be seen from our list of localities, widely distributed in South America. The most northern point from which we have seen examples is the isthmus of Panama, where many specimens have been procured by M'Cleannan and Arcé. In Costa Rica the next species replaces it.

2. ASTURINA PLAGIATA.

Asturina nitida, Cassin, in Baird's Birds of N. Am. p. 35; Scl.

et Salv. Ibis, 1859, p. 217; Salvin, Ibis, 1861, p. 68; Scl. P. Z. S. 1857, pp. 201 et 227, 1859, pp. 368 et 389, 1864, p. 178; Lawr. A. N. Y. Lyc. ix. p. 133.

Asturina plagiata, Schl. Mus. d. P.-B. *Asturinæ*, p. 1; Scl. et Salv. P. Z. S. 1868, p. 173.

Supra schistacea fere unicolor: gula cinerea. Junior, tibiis albicantibus fusco transfasciatis.

Hab. Mexico, New Leon (*Couch*); Jalapa (*Sallé*); Vera Cruz (*Mus. Berol.*); Guatemala (*Salvin*); Costa Rica (*Arcé*).

This northern representative of *A. nitida* is easily distinguishable by the darker and uniform slaty plumage above in the adult bird. In *A. nitida* the feathers of the head and upper neck are white, with numerous narrow transverse bars of slaty grey. On the back and wings externally the ground-colour is ashy, but the darker transverse bars, though wider, are numerous and very conspicuous. In the present bird the transverse barring is wholly absent, leaving the upper surface nearly uniform, though traces of transverse markings are apparent in some places beneath on raising the feathers, and are also faintly visible on the wing-coverts in some specimens. The lower of the two white tail-bands is narrower in the present bird than in *A. nitida*, but the upper appears to be usually more strongly shown in *A. plagiata*.

The young plumage of the northern bird generally resembles that of the southern, but, as appears from the specimens we have met with, presents a constant difference in having the tibiæ distinctly marked by numerous cross bands. In the young of *A. nitida* the thighs are of a uniform ferruginous, more or less deep.

The most southern locality we have yet met with for this species is Costa Rica, whence Arcé transmitted a single immature specimen in 1864.

Dr. Peters having most kindly lent to us the type of *Buteo plagiatus*, Licht., upon which Schlegel established his *Asturina plagiata*, we have been enabled to ascertain without doubt that it is the young of the present species.

3. ASTURINA MAGNIROSTRIS.

L'épervier à gros bec de Cayenne, Buff. Pl. Enl. 464.

Falco magnirostris, Gm. S. N. i. p. 282.

Nisus magnirostris, Tsch. F. P. *Aves*, p. 104.

Rupornis magnirostris, Cab. in Schomb. Guian. iii. p. 737.

Asturina magnirostris, Sclater, P. Z. S. 1857, p. 261, 1858, p. 451, 1859, p. 147, 1860, p. 288; Scl. et Salv. P. Z. S. 1866, p. 198, 1867, pp. 589, 753.

Astur macrorhynchus, Pelz. Orn. Bras. p. 6.

Falco insectivorus, Spix, Av. Bras. i. p. 17, t. 8ª (partim).

Supra clare cinerea: subtus gula et pectore cinereis; ventre toto cum tibiis albo et rufescente cinereo frequenter transfasciatis.

Hab. Cayenne (*Buffon*); Brit. Guiana (*Schomb.*); Rio Negro, Rio Brancho, and Rio Madeira (*Natterer*); Venezuela (*Goering*);

Mexiana (*Wallace*); Eastern Peru (*Bartlett et Tschudi*); New Granada, Bogota (*Mus. S.-G.*); Western Ecuador (*Fraser*).

The first and, indeed, only author who has appreciated the distinction between the present species and its Brazilian representative is von Pelzeln, who, in his 'Ornithologie Brasiliens,' considers the latter the true *Astur magnirostris*, and calls the present bird *Astur macrorhynchus* from Natterer's MS. Of this being the case we are enabled to speak with some confidence, as one of Natterer's marked specimens from San Carlos on the Rio Negro, in the collection of Salvin and Godman, is undoubtedly referable to this species. But Gmelin's *Falco magnirostris* is based entirely upon Buffon's *Epervier à gros bec de Cayenne* (Pl. Enl. 464). This figure, leaving the locality out of the question, clearly represents the northern species, which must therefore retain the name *Asturina magnirostris*.

Comparing a considerable series of specimens of these two allies together, we cannot but fully agree to von Pelzeln's separation of them. The present bird may be readily distinguished from the next species by the cinereous colour below, slight indications of rufescent tinge being only seen upon the darker bands of the belly and thighs. In *A. nattereri* the throat is darker cinereous and distinctly striped with white longitudinally; the breast is rich rufous in very adult birds, almost without cross markings; the belly is very pale fulvous or almost cream-colour, with numerous cross bands of deep ferruginous; the thighs are covered by minute cross bands of the same colour. In *A. magnirostris* the thighs are pure white, cross-banded with pale cinereous with merely a slight rufescent tinge.

4. ASTURINA NATTERERI.

Falco magnirostris, Max. Beitr. iii. p. 102; Temm. Pl. Col. 86 (avis jr.).

Astur magnirostris, Pelz. Orn. Bras. p. 6.

Nisus magnirostris, Burm. Syst. Ueb. ii. p. 76.

Falco magnirostris, Spix, Av. Bras. i. p. 18 (partim).

Supra brunnescenti-cinerea; subtus gula cinerea albo striata: pectore ferrugineo: ventre toto cum tibiis ferrugineo-rufis pallido fulvo transfasciatis: cauda nigricante, cinereo trivittata et terminata.

Hab. South-eastern Brazil (*Max. et Burmeister*); Bahia (*Wucherer*); S. Paolo et Mattogrosso (*Natterer*).

As will be seen from von Pelzeln's list, Natterer collected a large number of this species in various parts of Southern and Inner Brazil; but the specimens referred to as obtained by him at Barra do Rio Negro are more probably referable to the true *A. magnirostris*. An excellent series of examples of this Hawk, collected in the vicinity of Bahia, has lately been received by Salvin from Dr. Wucherer. We have also to thank the authorities of the Norfolk and Norwich Museum for the loan of many specimens of this and the preceding species from their fine collection of Rapacious birds.

Having already explained why the name *magnirostris*, which has

always been applied to this bird, must be restricted to the preceding species, we propose to call it after the naturalist who first appreciated the differences between them.

5. ASTURINA RUFICAUDA, sp. n.

Asturina magnirostris, Sclater, P. Z. S. 1856, p. 285, 1859, p. 368, 1864, p. 178.

Asturina magnirostris, Scl. et Salv. Ibis, 1859, p. 217; Lawr. Ann. L. N. Y. vii. p. 316, viii. p. 178; Moore, P. Z. S. 1859, p. 52.

Supra obscure cinerea: subtus gula et pectore obscure cinereis: ventre toto cum tibiis ferrugineo et pallido fulvo frequenter transfasciatis: cauda nigra, ferrugineo trivittata et terminata.

Hab. Cordova (*Sallé*); Jalapa (*De Oca*); Mexico city (*White*); Omoa (*Leyland*); Guatemala (*Salvin*); Veragua (*Arcé*); David (*Hicks*).

As in the case of *A. nitida*, the northern representative of the present group of *Asturinæ* appears in its adult dress to be readily distinguishable from the southern forms, and to require specific separation. From *A. magnirostris* and *A. nattereri* it differs in the deep-red tail-bands, the corresponding colour in the two last-mentioned species being pale cinereous. In younger specimens of *A. ruficauda* these bands are likewise cinereous, but in nearly every case show traces of rufescent colouring beginning to appear. In the general colour of its under plumage *A. ruficauda* more nearly resembles *A. nattereri* than *A. magnirostris*, having the belly, flanks, and thighs of the same rich ferruginous tinge which distinguishes *A. nattereri*; but in the present bird the throat and chest are usually of a pale cinereous, thus more resembling *A. magnirostris*.

We have examined a great number of specimens of this bird from various parts of Southern Mexico and Central America. In Guatemala, where it is one of the commonest species of Hawk, Salvin obtained examples from the plains of Zacapa, the Pacific coast-region, the valley of the river Polochic, Choctum in the forest-region of Vera Paz, and the savannas of the district of Peten. We have also received specimens from Costa Rica, Veragua, and Panama, besides the Mexican series obtained by Sallé and his coadjutors.

Asturina ruficauda, though thus widely distributed, is not found in the elevated mountain districts, but frequents the lowland plains up to an elevation of about 2500 feet above the sea-level. Its food in Guatemala consists almost entirely of small snakes and lizards.

6. ASTURINA PUCHERANI.

Esparvero indayé, Azara, Apunt. i. p. 131. no. 30.

Astur magnirostris, Hartl. Ind. Azara, p. 2; D'Orb. Voy. Ois. p. 91.

Nisus magnirostris, Burm. P. Z. S. 1868, p. 623.

Asturina pucherani, J. et E. Verreaux, R. Z. 1855, p. 350.

Falco gularis, Licht. in Mus. Berol.

Rupornis gularis, Licht. Nomencl. p. 3.

Asturina gularis, Schlegel, Mus. des P.-B. *Asturinæ*, p. 4 (1862).

Supra obscure fusca: capite toto cum gutture obscurioribus: pectore et ventre toto cum tibiis pallide fulvis, lineis angustis ferrugineis parce transfasciatis: cauda nigricante, rufo late trivittata et terminata.

Hab. Buenos Ayres (*Schlegel*); Corrientes (*D'Orb.*); Paraguay (*Azara*); Bolivia (*Bridges*); prov. Yungas (*D'Orb.*).

In speaking of his so-called *Astur magnirostris*, D'Orbigny (*l. s. c.*) calls especial attention to the differences between his series of this bird from Corrientes and Bolivia and that in the Paris Museum from Brazil, and concludes that they form "two distinct and constant varieties." We have little doubt that it is to this so-called variety that Lichtenstein applied the name *gularis*, afterwards adopted by Schlegel in his 'Musée des Pays-Bas.'

But this term must, we think, give way to that of *pucherani*, under which the MM. Verreaux described a species of *Asturina* in 1855. A mounted specimen belonging to the Norwich Museum is marked as the original of this description in the handwriting of M. Jules Verreaux, and perfectly accords with the characters given. We believe we are correct in referring it to the immature dress of the present species. A nearly similar specimen is in the British Museum, also received from Verreaux, under the name *Asturina pucherani*, but with "Guatemala" attached as a locality. This is probably an error, as it does not correspond with any one of our extensive series of the Central-American form, which is *A. ruficauda*.

The only adult example we have yet seen of this bird is in the British Museum. It was obtained in Bolivia by Bridges.

7. ASTURINA LEUCORRHOA.

Falco leucorrhous, Q. et G. Voy. Uranie, Zool. p. 91, t. 13.

Nisus leucorrhous, Tsch. F. P. *Aves*, pp. 18, 103.

Asturina leucorrhoa, Bp. Consp. p. 30; Kaup, Isis, 1847, p. 199; Schlegel, Mus. des P.-B. *Asturinæ*, p. 5.

Astur leucorrhous, Pelz. Orn. Bras. p. 7.

Nigra: tectricibus caudalibus supra et subtus albis: tibiis rufis: cauda ad basin alba, inde nigra albo bifasciata.

Hab. Brazil, vic. of Rio (*Mus. Vindob. et S.-G.*); Venezuela (*Dyson in Mus. Brit., et Levraud in Mus. Paris.*); New Granada, Bogota (*Mus. S.-G.*); Peru (*Mus. Berol.*).

4. On the Hybrid between the Chamois and the Domestic Goat. By EDWARD BLYTH.

Upon a recent occasion (*cf.* P. Z. S. 1868, p. 623) I exhibited four pairs of horns which puzzled me exceedingly at first, but which I learn from Mr. Joseph Wolf are those of hybrids raised from the

Horns of hybrid Chamois.
a. Horn of pure Chamois, for comparison.

Chamois and the Domestic Goat. It appears that it is not unusual for a tame buck Chamois to interbreed with domestic she-Goats; and as the horns of the hybrid so produced are so remarkable that they might well be suspected to indicate some undescribed species, intermediate to the Chamois and the Himalayan Thar (*Hemitragus jemlaicus*), I now submit a photograph of the series, considering the figures to be quite worthy of publication, in order to prevent, if possible, any mistake of the kind. For comparison, the horn of a pure Chamois (*a*) is placed along with them.

February 25, 1869.

W. H. Flower, Esq., F.R.S., in the Chair.

A letter was read from E. L. Layard, Esq., F.Z.S., dated Cape Town, December 31st, 1868, enclosing a drawing of another species of Ribbonfish (*Gymnetrus*), which had come ashore in rather a bad state at Simon's Bay on the 23rd of December, 1865, and been drawn on the spot by P. D. Martin, Esq. Mr. Layard believed it to be perfectly distinct from the species mentioned in a former communication to the Society (P. Z. S. 1868, p. 319), and could not find any description that answered to it.

The Secretary exhibited specimens of some Reptiles which had been collected for the Society's Menagerie by Mr. George Wilks, of Buenos Ayres, C.M.Z.S., but had, unfortunately, died before reaching their destination. They consisted of two Snakes taken *in copulâ*, which had been determined by Dr. Günther to be *Coronella anomala*, Günth. (Cat. of Snakes, p. 57), and some specimens of a small Cayman (*Jacare ocellata*, Gray).

Mr. J. E. Harting called the attention of the Meeting to the steps

now being taken to protect Sea-fowl during the breeding-season, and stated that it was proposed to bring in an Act of Parliament on the subject during the present session.

The following papers were read:—

1. Notes on the mode of Capture of Elephants in Assam.

By Dr. A. CAMPBELL, late Superintendent of Darjeeling.

By far the greater number of the Elephants for the supply of the Bengal markets are now caught in Assam; the Dooars of Bootan are so iniquitously misgoverned that the Elephant-catchers nearly shun them altogether.

The Nipal Tarai furnishes Elephants for the marts of the central and western provinces; Mymunsingh and Sylhet for lower Bengal, &c. &c.

The people who are principally engaged in catching Elephants for upper Bengal live in the northern parts of the Purneah and Rungpoor districts. Titalya is the most central position for the collection of Elephants by these people, and it is close to all the routes from the Elephant-catching districts*.

The Elephant-merchants who conduct the trade between the eastern districts and other parts of India come from the central and western provinces; some even from the Punjab, Cashmere, and Cabool.

The men who keep koonkis and supply the funds for catching Elephants are known as "Keda Walas." They often take their own Elephants for sale to the Hajipoor Fair, or further west; but usually look to the merchants, zemindars, baboos, &c. of their own districts as purchasers. At the Nek Mured Fair, in the Dinajpoor district, annually held in April, there is a good deal of business done in Elephants.

An Elephant-catcher (or keda wala)'s establishment consists—1st, of "Koonkis," *i. e.* tame Elephants trained to hunting and catching wild ones; 2nd, "Phanaits," or noosemen; 3rd, Lohattias, or Elephant-drivers, who sit on the croup and urge on the koonkis with an iron-spiked mallet; 4th, mates, or under drivers; and 5th, an abundant supply of ropes and cables for catching and tying up their gigantic quarry.

The old system of decoying or driving wild Elephants on pits dug for them is altogether exploded; and the lassoo, or "phan," is the only mode now employed to catch them.

The process is described as sufficiently simple, although it is attended with some danger. It is very extraordinary to hear a thin miserable-looking fellow (as many of the "phanaits" are) describing in the quietest way possible how he has caught very large and fierce Elephants.

The usual mode seems to be to form the "keda," or encampment,

* See Hooker's Himalayan Journals, vol. i. p. 181.

at a likely place outside the forest and near water, generally selected on intelligence of its being the haunt of wild Elephants, or by finding their fresh trail.

From this you take out the koonkis, three or four together, and reconnoitre in all directions in the open places at early morning or in the afternoon; for the wild Elephants always keep to the heavy forest during the heat of the day, coming into the more open spots morning and evening only. When any of your parties have found a "khanja," or herd, it singles out one and gives immediate chase, sometimes even with one koonki only, if you have no more in your "keda," and when the quarry is a small one; but it is better to do so with two, and three are requisite to catch and master a large animal. The chase is kept up until one of the koonkis gets alongside the wild Elephant, the great object being to lay a koonki on either side of the wild one, as fast as possible. When alongside and he sees his opportunity, the "phanait" (nooseman), who drives his Elephant and holds the open noose with both hands above his head, lets it fall over the wild one's head and on the trunk, which in running is pendent to the ground. Immediately the noose touches the trunk, the animal by an instinct which is fatal to its liberty coils it inwards, and by this movement it passes at once under the neck. The lohattia who holds the coil of the lassoo immediately pulls upon it, and the koonki is kept close upon the wild one and pressing against it until another koonki comes on the opposite side and a second noose is delivered. When this is done both koonkis move off in opposite directions, and thus in a short time the wild Elephant is suffocated and stretched on the ground between them. This takes some time, however, when the noosed animal is a powerful one, as it sets off at speed and struggles long and violently before it is choked and down. As soon as it is, the running nooses are loosed to give the animal breath, and a stopper put on each to prevent their running. The two koonkis again press on each side; and by this means and one or two more pushing from behind, the captured animal is forcibly dragged away to the keda, where it is strongly picketed and starved into tameness. After a month or two it is quiet and tractable enough to be marched homewards, being in the meantime led out frequently with koonkis, and gradually accustomed to a rider.

During the first six months fresh Elephants become thin and weak-looking, and then begin to pick up again. During the first rainy season (or, rather, during August, September, and October of the first year) they are most liable to illness and death. The risk decreases the second season, and is not great in the third, after which they are considered "pucka," *i. e.* safe and acclimatized.

There is no procuring any data by which to arrive at the rates of mortality of fresh Elephants. It seems to depend on circumstances quite unknown to the catchers (who suffer most from it), and is therefore always attributed to "kismut," chance. Sometimes all the catchings of a season will die in one man's hands; at other times he will have a succession of seasons without any losses. The

"keda wala" is emphatically described as always being in the way of wealth or ruin. He is an "Ameer" or "Fugeer," *i. e.* a "prince or a beggar;" so proverbially uncertain are his gains, and his trade so full of risks.

The proportion of adult females caught is probably as eight to one. This arises from two causes. They are less violent and more easily subdued; and it is rare to find more than one male with a whole herd of females, and he is always an immense one and rarely to be mastered.

The catchers and dealers give numerous divisions or varieties of the Elephant, such as Muringi, Kumulia, Kooji, &c. They also notice the peculiarities of arched and straight backs; but it is sufficient to attend to the following for practical purposes. The males are tusked or tuskless, *i. e.* "Dantal" or "Mukuna;" one-tusked ones are prized by Hindoos. One with the left tusk is a "Ganess," God of Wisdom; with the right a "Manik dunta." The females are maiden or mothers, the terms being "Sareen" and "Dohi;" a barren one is also a "Sareen," and the Dohi is not reckoned of equal value. The Sareen is distinguished from the Dohi by the small teats and undeveloped mammæ. A male is 20 per cent., at least, more prized than a female, on account of his greater strength and powers of endurance. It seems difficult to ascertain the period required for the full growth of the Elephant. After comparing many opinions and statements, I make it twenty-five years, and the known age eighty-five in the same manner. The female goes eighteen months with young, and gives suck for two years. In addition to the smaller size, youth is indicated by a general smoothness and roundness of the face and trunk, with an almost unmistakable expression of simplicity and innocence as you examine the face standing right in front. The central depression on the top of the head is but faintly developed in youth, while in an aged animal the coronal protuberances stand up prominently. The ears in youth and middle age are thin, light, and unbroken along the outer margin; in age they are large, flapping, thick, and jagged.

There is no particular breeding-season. "Elephants, like cows in India, have young all the year round." The mother shows great affection for her young, and even when chased by the catchers will not leave it, if it gets into trouble or is too young to follow. The mothers frequently fall an easy prey on this account, allowing themselves to be noosed while they are helping on the young one. A young one of six months will fly off when the mother is taken; under that age it will stick to the captive mother. Twins are unknown.

The catching-season is from November to July; June is the month in which the greatest number are taken. The fresh grass and reeds, after the annual burning, is then greatly relished by these animals, who come far out of the forest to seek it. The Elephant is gregarious in the highest degree: herds of more than a hundred are sometimes seen; fifty, thirty, and twenty are common. Sullen males, which have been driven out of the herd by hard fight-

ing, are the only solitary ones to be met with. Large males with a herd are rarely ventured on by the catchers; they are bold and ferocious. The females and young males take instant alarm at the approach of the koonkis; and sometimes a whole herd becomes bewildered with fright on seeing them, and breaks up in all directions. This is the harvest of the catchers, and a bold and expert "phanait" will sometimes noose three wild ones out of one herd. So soon as he can get his "phan" off the neck of a prostrate one, he sets upon another, and similarly on a third. This prowess and luck are rare, but they happen occasionally. Mr. P. had a phanait who did this two seasons. He was a "Koch," and the quietest, most unpretending fellow in the world out of the keda. In the field he was a perfect Nimrod, full of energy and life, and for six or seven years he brought eight to twelve Elephants home annually of his own noosing. His pay was 10 rs. per mensem at home, 12 when in the field, and an annual present of a pair of silver bangles weighing 20 rupees, and a pair of gold earrings worth 20 rs. more. These "honorary distinctions" gained, he used to take a short leave to his home, when he bestowed them on his wife, and again took to the forest in search of fresh laurels.

"How many Elephants have you caught in your time?" I one day asked Mr. P. "I cannot tell you how many," he replied; "but I was seven years engaged in the business; one year I caught 180, some years I got 100, some 80, some 60." We may safely put down 1000 to his name, I think; and this gives a pretty good idea of the supply and demand in this business. Mr. P.'s "keda" was always a strong one, ranging from ten to twenty koonkis.

Although I have set down eighteen months as the most generally adopted period of the Elephant's going with young, I must state that it is not universal in this part of the country. Rambullub Sah of Choora Bundur, on the Bootan frontier, who has been an Elephant-catcher for many years, says the period of gestation is twenty-two lunar months; and this is supported by a case of gestation which originated in his own stables, and in which the union of the sexes was known and recorded—a very rare case in the tame state; but this one is quite authentic, *i. e.* the conception, gestation, and birth. The record of the period of gestation I have not seen, but all the people of Choora Bundur are familiar with the facts, and many of them corroborate the twenty-two months' period.

In 1849 I saw an infant Elephant that had been born in the October of 1848. He was with his mother. She had been caught in June 1847; and although then pregnant, there were no signs of unusual size until the January following. This case does not help to fix the limit of gestation; but it proves that sixteen months is *under* that period. This female had immensely large breasts; and I tried to procure some of the milk to taste, but in vain. She lay down on her side at the command of the Mohout, but swung her trunk about and roared when we commenced pulling her teats. The young one applied himself to the breasts every five minutes, and for a minute or so only. The trunk appears quite in the way of a sucking Ele-

phant; but it is dexterously turned upwards and to one side when he is at the breast; and the usual position is standing at right angles with the mother. The young one generally sleeps under the mother's belly, lying on his side, his legs stretched out straight. He not unfrequently lies down under other Elephants, and is quite fearless among them, they always treating him kindly, never hurting him. "The smallest Bucha may go up to the largest male, even when he is Musth*, and he will be kindly treated." The large one will welcome him with his trunk, laying it over him and smelling him.

2. Note on the Sublingual Aperture and Sphincter of the Gular Pouch in *Otis tarda*. By JAMES MURIE, M.D., F.L.S., Prosector to the Society.

The following memoranda may be regarded as addenda to the paper on the gular pouch of *Otis kori* and *O. australis*, previously communicated by me to the Society (see P. Z. S. 1868, p. 471). Since then an opportunity has been afforded me of examining a male specimen of the Great Bustard at least six years old, judging from the time the bird had been in the Society's possession. A gular pouch was present, as described underneath.

On looking into the mouth of the bird while the tongue lies between the rami of the lower mandible, no opening into the gular pouch is seen; but when the tongue is raised and the parts held as in the act of gaping an aperture easily admitting one's finger is observed. This is situated beneath, and almost an inch behind, the tongue itself; in fact it lies underneath the upper larynx, occupying the space between it and the submandibular deep and cutaneous tissues. In the stretched condition of the parts above spoken of (displayed in the figure, p. 141), the said aperture (*a*) is oval in form, assuming almost an elliptical figure if its raised whitish marginal membrane is followed. This marginal fold of membrane or lip (*l*) is, indeed, the true boundary of the aperture itself; but as it is partly adherent to the tissue beneath the uro-hyal and to the subcutaneous textures between the rami of the lower mandible, it causes the opening to appear almost arched instead of an acute ellipse, as it truly is when the tongue is pulled out and the skin near the "beard" is held tense. A second short raised membranous fold (*f*) proceeds at an acute angle outwards from the middle of each outer side of the former one and goes to the tissues covering the muscles lying beneath the thyro-hyals. These two latter duplications of the faucial membrane permit of stretching of the parts when the thyro-hyals are by any means thrown outwards; and they may also influence the tonicity of the membrane of the aperture itself when its marginal lips

* The tame males, and males driven out of a herd, are subject to fits of temporary fury, or madness. In this state they are said to be "Musth."

approach. The lips of the opening into the gular pouch, then, may be said in strict language to be composed of a fold of the sublaryngeal membrane stretching between the uro-hyal and the skin of throat.

Fore-shortened and reduced view of Bustard's head, to show the gular aperture under the upper larynx.

T. Tongue dragged upwards and outwards. *a.* Aperture of gular pouch. *l.* Lip or marginal fold. *f.* Fold of membrane. *s.g.* Sublingual gland.

The glandulæ sublinguales (*s. g.*) are elongated flat bodies of considerable size lying just within each dentary portion of the mandible. Between these, and occupying the middle third, is the skin of the throat, the roots of the feathers being barely hidden, when looking into the mouth, by the thin almost transparent subcutaneous tissue.

In the present instance the gular pouch was 4 inches long, and held 2 ounces of water, as it remained in position in the neck of the bird. The thin walls seemed but a continuation or duplicature inwards of the sublaryngeal fibro-mucous tissue or membrane; the same as that constituting its free marginal aperture.

As regards the thin muscular strata around the pouch, these, I apprehend, are slightly different from what I found and figured in *Otis kori* (see P. Z. S. 1868, p. 472). A film of platysma undoubtedly covers the lower part of the sac; a considerable number of small vessels pass beneath and on the surface of the platysma, and as they proceed to the base of the skull run between its internal border and part of the muscle next to be described. What appears

to represent the so-called stylo-hyoideus is here, as in many other birds, divisible into three portions. The posterior is a broad but thin layer; this as it diverges from the common cranial origin proceeds backwards and downwards, and intermingling along with the platysma they both pass round and in front of the gular pouch. The middle one, also broad and thin, passes over the upper or deep surface of the pouch. The third division, long, narrow, and roundish, runs forwards to the tongue. This triparte but singly named muscle may, indeed, be representative of the stylo-hyoid, stylo-pharyngeus, and stylo-glossus. Besides these, a broadish band of very delicate but transversely striped fibres mingling with the tissue of the neck of the pouch itself surrounds it; this I take to be part of the superior constrictor of the pharynx, which encircles the invaginated duplicature of the sublingual or sublaryngeal membrane differentiated into gular pouch during later life in the male Bustards.

The gular pouch, in fact, appears to me but an infolding of the membrane below the upper larynx, developed to a large size in male Bustards only after they attain ripe or old age. This view, therefore, accounts for its absence in the young, its moderate size in adult, and its increased capaciousness in old birds.

The present note serves to show:—1. That the gular aperture is rather sublaryngeal than sublingual. 2. That in a bird six years old it has only reached a very moderate size, compared with what it ultimately attains, according to several observers. 3. That there is good reason for believing in the so-called sphincter of the pouch, but that this is merely a lesser or greater development of the fibres of the superior constrictor of the pharynx and stylo-pharyngeus, and not a specialized structure alone adapted for the office it here subserves.

3. Remarks upon the Habits of the Hornbills (*Buceros*).

By A. D. BARTLETT, Superintendent of the Society's Gardens.

A few weeks after the Wrinkled Hornbill (*Buceros corrugatus*) was received in the Society's Gardens*, the keeper called my attention to a queer-looking fig-like substance he had picked up in the aviary. Struck with its appearance, I took it home and endeavoured to examine it carefully, and opened its closely folded mouth. I found this fig-like bag contained plums or grapes well packed together, the wrapper or envelope looking much like the inner lining of a gizzard, somewhat tough, elastic, and gelatinous. Almost alarmed for the safety of the bird that had thrown it up, and at the same time having some doubt as to its real nature, I at once sought the assistance of our Prosector, Dr. Murie, handing him the specimen and telling him its history.

Dr. Murie's report was as follows:—

"On examination of the specimen I found, as was at first suggested in joke, that the bag did absolutely consist of nothing else

* The specimen was purchased March 27, 1868.

than the thickened semichondrified lining membrane of the gizzard. All the puckerings and indentations were more or less exactly represented, though less sharp in outline than is ordinarily the case. The mucous surface of the inner wall of the bag was slimy, otherwise perfectly identical with the same structure in a healthy bird. The surface outside, on that which might be said to be the submucous tissue, was moist, comparatively uninjured, and free from any effusion or disease. The rim of the mouth of the bag was irregular and shreddy, and thinned away at its free edge.

"The soft egg-like bodies contained within this (so to speak) cast-up sac proved to be seven or eight discoloured grapes; or they might be, so far as appearance went, raisins. None of these had undergone the process of digestion, but, from their sodden aspect, I believe had been slightly acted on by the gastric juice.

"Positive of the nature of this queer rejected pellet, there follows the still more extraordinary circumstance that the Hornbill should live and feed afterwards, seemingly not much affected by the loss of the inner coat of its stomach. Had I not myself seen and examined the objects, I would scarcely have credited the facts."

Having placed the specimen in what I believed to be safe custody, I kept a strict watch over my suspected Hornbill, and a day or two afterwards was rewarded by a second and very perfect specimen of this extraordinary package of fruit. This I at once, after carefully examining the outside only, placed in spirits, and am now able to bring before the Meeting. Since I obtained these two specimens I have seen others, all from the same individual bird; but as the Lyre-bird and others were in the same aviary, these were mutilated and destroyed before I could save them.

Now, notwithstanding all that has been advanced by my friend Dr. Murie, I beg leave to differ from him entirely; and instead of this most wonderful body being the result of indigestion, disease, or derangement of any kind, I have no doubt it is the natural secretion that is provided for this bird during the breeding-season, and that it is the means by which the male Hornbill supplies the female bird with food during the time she is imprisoned by him while sitting upon the eggs in the hollow tree, in which, according to the most trustworthy authorities, the male builds up the entrance to the nest with clay. Dr. Livingstone was the first person, I believe, who called attention to this singular habit in the Hornbills; since then many other observers have confirmed the fact, both in Africa and India. Capt. Tickell speaks of it, saying that he "saw with his own eyes," although he previously "thought it was a fable." The Rev. J. Mason, in his work on Burmah, says of the Concave Hornbills, "their nests are constructed in a superior manner of clay in the stumps or hollows of old trees. After the female has laid five or six eggs, the male bird shuts her entirely in with mud except a small hole, where she can only put out her head. Here she must sit during her incubation, for if she breaks through the inclosure her life pays the forfeit; but to compensate for the loss of freedom, her spirited mate is ever on the alert to gratify his dainty mistress, who

compels him to bring all her viands unbroken, for if a fig or any fruit be injured she will not touch it."

This remarkable passage at once arrested my attention; for doubtless it is the result of careful observation. The point to be noticed is the fig-like appearance of the pellet of food that the male bird offers to the female, as it would be impossible at the distance the observer must be from the birds that he could distinguish the little yellow-skinned bag from a fig or other fruit of about that size. Mr. Wallace says the entrance of the nest is stopped up with mud and gummy substances. Referring to Dr. Livingstone, I find that on page 613, 'Missionary Travels in South Africa,' he says:—"The first time I saw this bird was at Kolobeng, where I had gone to the forest for some timber. Standing by a tree, a native looked behind me and exclaimed, 'There is the nest of a Korwe.' I saw a slit only, about half an inch wide and three or four inches long, in a slight hollow of the tree. Thinking the word Korwe denoted some small animal, I waited with interest to see what he would extract; he broke the clay which surrounded the slit, put his arm into the hole and brought out a Tockus, or Red-beaked Hornbill, which he killed. He informed me that when the female enters her nest she submits to a real confinement. The male plasters up the entrance, leaving only a narrow slit by which to feed his mate, and which exactly suits the form of his beak. The female makes a nest of her own feathers, lays her eggs, hatches them, and remains with the young till they are fully fledged. During all this time, which is stated to be two or three months, the male continues to feed her and the young family. The prisoner generally becomes quite fat, and is esteemed a very dainty morsel by the natives, while the poor slave of a husband gets so lean that on the sudden lowering of the temperature, which sometimes happens after a fall of rain, he is benumbed, falls down, and dies."

It will be seen by this statement that the male dies from exhaustion, doubtless produced by the constant and continual reproducing not only of the actual food taken by the male, but of the supply of nutritive secretion in which the same is enveloped*.

Without, however, allowing this strange statement and supposed discovery to remain simply, as many may think, an unlikely story, let us consider whether there are any other known facts bearing upon the point that will assist us in arriving at a fair conclusion upon this extremely interesting subject.

That Parrots, Pigeons, and many other birds reproduce their partially digested food during the pairing and breeding-season for the support of the female and young is well known. The tame male Hornbill is particularly distinguished at all seasons by this habit of throwing up its food, which he not only offers to the female but to

* The Rev. T. Phillips, in his MS. notes (see Moore's Catalogue of Birds in East-India House), speaking of the common Grey Indian Hornbills, says:—"A specimen killed at Hasanpur, on the Ganges, had in its belly when opened a hard lump about the size of a Pigeon's egg, which on being cut open was found filled with the fruit of the Peepul and other trees."

the keepers and others who are known to him. The male Concave Hornbill (*Buceros cavatus*) now in the Gardens will frequently throw up grapes and, holding them in the point of the bill, thrust them into the mouth of the keeper if he is not on the alert to prevent or avoid this distinguished mark of his kindness.

We have now to consider the facts brought forward; and in no class of animals do we find so many instances of the frequent and easy mode of casting up or reproducing the food, or in other cases the indigestible substances taken with the food, as in Birds. But there is more than this to be noticed; for instance, in the Esculent Swallows. We know the so-called edible Swallow's-nest consists of a gelatinous secretion from the glands of a kind of Swift; and doubtless a portion only is used to form the nest; the secretion is, in all probability, continued to feed the female and young, probably mixed with the insects captured during flight. There is also a similar secretion from the Woodpecker, but in this case made to assist in the capture of their food; and many other instances can, no doubt, be brought forward, showing the power that birds have of ridding their stomachs of that part of their food not required for their nourishment. One very remarkable instance I well remember. A year or two ago I found in my garden, in a small heap, about a handful of the most beautiful blue pills, about the size of peas and studded all over with brilliant and shining blue fragments. I soon discovered that they were the castings of the Flycatchers that had a nest immediately above the spot upon which I found them; the charming colour was due to the outer skins of the Bluebottle flies upon which the birds had fed. All the insect-feeding birds throw up pellets consisting of the refuse or indigestible parts of the insects they swallow, just in the same way as the Raptorial birds (as Hawks, Owls, &c.) cast up the feathers, bones, hair, and food of grain-eating animals in the form known as castings or pellets.

In conclusion, I think I may fairly reason that it is much more likely that these food-pellets of the male Hornbill are intended for the support of the female and young, and belong to the natural and healthy condition of the birds which produce them, than that they are the result of indigestion or disease. For we see that the power and habit of casting up from the stomach is one of frequent and common occurrence among birds, and also find that the secretions of the œsophagus are used as food for the young of many species of birds: in the Parrots and Pigeons I think this is universal.

Another strong argument in favour of my belief is to be found in Dr. Livingstone's statement that "the male bird by his constant attention upon the female becomes so prostrate and exhausted that a slight change in the temperature causes him to fall down and die."

It cannot be supposed that the mere collecting food for the female is the cause of this fatality; it is doubtless the overtaxing the system by the constant secretion of this nutritive matter, reminding one of the blood in the nests of the Esculent Swifts after the birds have been robbed of the first and second nests. But the most positive proof of finding this package of food is given, without, however, under-

standing its use, in the extract from the Rev. T. Phillips's MS., before referred to.

P.S. A singular habit of the Flamingoes has been observed, which induces me to believe that something analogous to the secreting-power already alluded to exists in these birds. During the time the Flamingoes were kept in the same aviary with the Cariamas, the latter birds, as is their habit, frequently turned their bills upwards and uttered their harsh and loud notes. The Flamingoes, apparently under the impression of their want of food, advanced to their assistance, and holding their heads over the gaping mouths of the Cariamas ejected a glutinous fluid (nearly resembling blood in colour), which fell sometimes into the mouths of the Cariamas, but more frequently on to their backs, and rendered their feathers glutinous and, when dry, very dirty.

Since writing the foregoing, I have obtained some of the coloured fluid from the Flamingoes, ejected this day (March 22, 1869), and, having submitted it to the examination of Dr. Murie, find by viewing it under the microscope that it contains a vast proportion of blood-corpuscles, and is little else than blood. Have we here an explanation of the old story of the Pelican feeding its young with its own blood? I think we have; for the Flamingo was, and is still, found plentifully in the country alluded to; and it may be that in the translation the habit of the one bird has been transferred to the other. At any rate, I have no doubt that the Flamingo feeds its young by disgorging its food, as is shown by the bloody secretion that I find ejected by these birds in their endeavour to feed the craving Cariamas. This habit has been observed and remarked upon, and has doubtless led to what we have so long considered a fable. I have yet to learn if the same power may not exist in the Pelicans, and perhaps in other birds, of supplying nutriment to their young by these means.

4. On the Birds of the Vicinity of Lima, Peru. By P. L. Sclater, M.A., Ph.D., F.R.S. With Notes on their Habits; by Professor W. Nation, of Lima, C.M.Z.S. (Part III.*)

(Plate XII.)

A third small collection of birdskins from Professor Nation has lately reached me, together with notes upon some of the species, which I have now the pleasure of submitting to the Society.

1. Campylorhynchus balteatus, Baird, Rev. A. B. p. 103.

C. zonatoides, Scl. P. Z. S. 1860, p. 272.

C. pallescens, Sclater, Cat. A. B. p. 16.

* Continued from P. Z. S. 1867, p. 344.

Professor Baird is probably right in recognizing in the species I have hitherto called *Camp. megalopterus* the true *C. pallescens* of Lafresnaye. I therefore adopt his suggested name for the present species, which I had at one time supposed to be Lafresnaye's *C. pallescens*, and at another time to be his *C. zonatoides*. Mr. Nation sends one young specimen, agreeing with a skin of Fraser's from Babahoyo in my collection.

2. PHEUCTICUS CHRYSOGASTER (Less.).

An adult male of this species. It is a close ally of *P. aureiventris* (Lafr. et D'Orb.), but easily separable in the adult, although I am not yet prepared to say this is always the case in immaturity.

3. NEORHYNCHUS NASESUS. (Plate XII.)

Callirhynchus nasesus, Bp. C. R. xlii. p. 822.

"This rare and singular Finch is a summer visitor; it arrives about the end of November, and leaves about the beginning of May. Its favourite haunts are clumps of tall willow trees, in the vicinity of water. Rarely more than one or two individuals frequent the same clump. During the day it conceals itself in the densest foliage of the trees, utters at intervals a whistling note, not unlike the call-note of *Cardinalis virginialis*; when disturbed, it glides from branch to branch and from tree to tree; and it is so shy and recluse that it requires great caution and perseverance to procure even a glimpse of it. It feeds on the seeds of grasses that grow in wet shady places; in the stomach of one example I found unripe Indian corn and bits of a substance that resembled egg-shells.

"The upper mandible of this species, when perfect, greatly curves over the lower, as in some of the *Psittacidæ*; but the tip, being weak, is very often broken or worn away.

"In March 1867 I picked up a young bird that had escaped from the nest before it could fly; it is now living in a cage along with some *Spermophili*."—W. N.

Mr. Nation has forwarded a single skin of this bird, which is the first specimen that has come under my notice of this rare species. It agrees with the late Prince Bonaparte's short description of his *Callirhynchus nasesus** sufficiently well to prevent my describing it as a new species.

Lesson's term *Callirhynchus* having been previously employed for a well-known genus of fishes, I propose *Neorhynchus* in its place.

4. SPERMOPHILA TELASCO, Lesson; Sclater, P. Z. S. 1867, p. 341.

A young pair of this Finch, of which Mr. Nation had previously sent specimens.

5. STURNELLA BELLICOSA, De Filippi; Sclater, C. A. B. p. 128.

Examples of both sexes of this species.

* This name is printed in the C. R. *masesus*. I suppose this may be a misprint for *nasesus*—in allusion to the worn tip of the upper mandible.—P. L. S.

6. MOLOTHRUS PURPURASCENS, Cassin, Pr. Acad. Phil. 1866, p. 20.

No doubt the species spoken of by Cassin under this name (*l. c.*), but probably not the bird intended by Hahn. Specimens of both sexes.

7. CERYLE CABANISI, Tsch. F. P. *Aves*, p. 253; Sharpe, Alced. pt. 2. t. 16.

A single skin of this Kingfisher.

8. RHODOPIS VESPERA (Lesson).

"This is one of our rarest Humming-birds, visiting us at long and uncertain intervals. I have seen a single individual in immature plumage occasionally in spring, and once or twice I have seen one in adult plumage in summer. Like *Thaumastura cora*, it frequents low bushes and flowering plants near the ground. At a distance it resembles the Cora Humming-bird; but its note is louder and its flight stronger."—W. N.

9. THAUMASTURA FRANCESCÆ, Sclater, Cat. A. B. p. 299.

Ornismya fanny, Less.

"This is the rarest of Lima birds. I saw it for the first time in the winter of 1865; in the spring of 1867 I saw it again. In habits it resembles the Cora Humming-bird."—W. N.

Mr. Nation sends one young male of this species, the only one he has ever obtained.

10. CROTOPHAGA SULCIROSTRIS, Sw.

Crotophaga casasii, Tsch. F. P. *Aves*, p. 256.

11. CHRYSOPTILUS ATRICOLLIS (Malh.).

Chrysopicus atricollis, Malh. R. Z. 1850, p. 156; Mon. Pic. ii. p. 178, t. 88. f. 4.

A male of this distinct species, which I had not previously met with.

12. THINOCORUS RUMICIVORUS, Eschsch.

A single skin of a *Thinocorus* sent by Prof. Nation agrees very nearly in plumage with skins of *T. rumicivorus* from Chili, but is very much smaller in dimensions. Before separating it specifically I should like to have an opportunity of examining more specimens. (See remarks, P. Z. S. 1867, p. 989.)

13. PORZANA ERYTHROPS, Sclat. P. Z. S. 1867, p. 343, t. XXI.; Scl. et Salv. P. Z. S. 1868, p. 457.

A second example of this curious species of Crake.

March 11, 1869.

St. George Mivart, Esq., F.Z.S., in the Chair.

The Secretary exhibited, on behalf of Mr. E. P. Ramsay, of Dobroyde, C.M.Z.S., specimens of some of the new birds described in Mr. Ramsay's paper read before the Society on the 11th of June, 1868. Amongst these were examples of both sexes of *Orthonyx spaldingi* (P. Z. S. 1868, p. 386), *Glyciphila subfasciata* (*l. c.* p. 385), and of a supposed new species of *Podargus*. These skins were to be placed in Mr. Gould's hands to be figured in the Supplement to his work on the 'Birds of Australia.'

The Secretary called the attention of the Meeting to the following remarkable additions to the Society's Menagerie during the months of January and February:—

1. A Black Ape (*Cynopithecus niger*), purchased January 1st, being an example of a form of Monkey that had long been unrepresented in the Society's collection.

2. A young specimen of the Two-wattled Cassowary (*Casuarius bicarunculatus*), purchased January 13th from the Zoological Society of Rotterdam. This Cassowary had been originally described in 1860* from a specimen living in the Society's collection. The original specimen had subsequently died, and was now in the British Museum. As in the former example, the present bird was in the immature brown plumage, but was nevertheless of great interest as serving to confirm the validity of this species.

3. An American Badger (*Taxidea americana*), purchased January 23rd, and believed to be the first living example of this species exhibited in the Society's Menagerie.

4. A Fennec Fox, captured at Mount Sinai by the members of the Sinai Survey Expedition, and presented to the Society on the 19th of February. This animal was obviously distinct from the true Fennec (*Canis cerdo*, Gm.), and appeared to be referable to the species described and figured by Rüppell as *Canis famelicus* (Atlas, p. 15, t. 5).

The Secretary exhibited, on the part of Mr. G. F. Westermann, For. Memb., a stuffed specimen of a hybrid Pheasant, which had been transmitted living from Japan to the Zoological Gardens, Amsterdam. The bird appeared to be due to hybridism between a Silver Pheasant (*Euplocamus nycthemerus*) and a Gold Pheasant (*Thaumalia picta*), but was remarkable for a curious tuft of feathers on the back of the head.

* See Trans. Zool. Soc. vol. iv. p. 358, and P. Z. S. 1860, pp. 211, 248.

The following papers were read:—

1. Note on a Substance ejected from the Stomach of a Hornbill (*Buceros corrugatus*). By W. H. FLOWER, F.R.S. &c.

The body described by Mr. Bartlett and Dr. Murie at the last Meeting of the Society*, and placed in my hands for further examination, consists of a sac of somewhat globular form, and averaging an inch and three-quarters in diameter. On one side it has a large ragged aperture, the margins of which are folded inwards so as to close the orifice. Its walls are thin, slightly plicated, moderately tough and consistent, though torn without difficulty, translucent, and of a dark brown colour. The margins of the aperture are softer and of a paler colour.

The contents of this sac are perfectly non-adherent to it and readily removed. They consist of sixteen raisins in an undigested condition, mostly with their skins broken, packed pretty closely together and somewhat softened; but as the specimen had become partially dry before it was procured, and has been for several months in spirit, their exact condition at the time of ejection cannot now be ascertained. Among the raisins were a few flakes of the same material as that of which the sac was composed.

A superficial examination led at once to the belief that it consisted of the entire epithelial lining of the gizzard; and a closer investigation, aided by comparison with the gizzard of the bird which ejected it, removed after death and preserved by Dr. Murie, corroborated this view.

The muscular coat of this gizzard is thin, almost membranous; and the epithelial lining forms a layer of nearly uniform thickness, having no specially thickened lateral triturating disks as in granivorous birds. It, moreover, peels off from the subjacent fibro-vascular coat (from the follicles in which it is secreted) with great facility. In this instance numerous small nematode worms had lodged themselves beneath it.

Making allowance for the drying and subsequent hardening in spirit that the former has undergone, the microscopic structure of the ejected sac and of the epithelial layer which lined the stomach of the bird at the time of its death are identical. Both swell up and become more transparent when treated with liquor potassæ; both turn a bright yellow colour with nitric acid. Sections of both present a matrix slightly laminated, with scattered nuclei and granules. I was not able to detect in either the definite structure ascribed to the epithelial stratum of the gizzard of granivorous birds†; only near the attached surface, where the secretion is most recent, a parallel striation was observed in vertical sections of both.

The specimens have, through the kindness of Dr. Murie and Mr. Bartlett, been placed in the Museum of the Royal College of Surgeons.

* See P. Z. S. 1869, p. 142.

† See P. Z. S. 1860, p. 330.

2. On Peruvian Birds collected by Mr. Whitely. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.—Part IV.*

(Plate XIII.)

The present collection of Mr. Whitely contains 131 specimens of birds, obtained in May, June, July, and August last, at Tinta on the Vilcamayo, south-east of Cuzco, and at Tungasuca and Pitumarca, two villages in the immediate vicinity of Tinta. Tinta is about 11,000 feet above the sea-level, and therefore belongs to the upper part of Tschudi's Eastern Sierra region†. Tungasuca and Pitumarca are both higher on the hills, the former on the right bank, and the latter on the left bank of the Vilcamayo, and may probably come into Tschudi's Puna region (11,000–14,000 feet).

The total number of species contained in the collection is forty-six, of which four appear to be undescribed, namely *Saltator laticlavius*, *Poospiza cæsar*, *Agriornis insolens*, and *Centrites oreas*. The others are mostly known to us from the researches of D'Orbigny in Bolivia, and Tschudi in higher Peru.

We have added some field-notes, taken from Mr. Whitely's MS. catalogue.

1. Hirundo andicola, Lafr. et D'Orb.

Tinta, May 22, 1868.

2. Diglossa brunneiventris, Lafr.

Tinta, May 1868.

"Shot in a garden. Its habits closely resemble those of a Blue Tit (*Parus*); it frequently clings beneath the branches of trees."

3. Tanagra darwini, Bp.

Tinta, May 10th.

4. Saltator laticlavius, sp. nov.

Saltator aurantiirostris, Lafr. et D'Orb. Syn. i. p. 35, et D'Orb. Voy. Ois. p. 288 (partim).

Supra cinereus, fulvescente tinctus: supercilliis postocularibus albis: capitis lateribus cum torque collari antico lato conjunctis nigris: gula alba; abdomine medio fulvo, lateraliter cinereo perfuso: cauda nigricante, rectricibus duabus utrinque extimis albo terminatis: rostro aurantiaco, pedibus nigris: long. tota 9·5, *alæ* 4·2, *caudæ* 4·2 *poll. Angl.*

Hab. Peruvia alta (*Whitely*).

Obs. Similis *S. aurantiorostri* ex rep. Argentina, sed torque collari lato, et rectricum apicibus albis angustioribus dignoscendus.

* See Part I., P. Z. S. 1867, p. 982; Part II., P. Z. S. 1868, p. 173; and Part III., ibid. p. 568.

† Faun. Per. Vorrede, p. xxv.

In Sclater's "Synopsis of Tanagers" (P. Z. S. 1856, p. 75) he speaks of certain specimens of *S. aurantiirostris* in which the "front, sides of the head, throat, and breast are all deep black, a postsuperciliary stripe and middle of the throat only being white." These specimens (collected by D'Orbigny in Bolivia, and MM. Castelnau and Deville in high Peru) were no doubt identical with the present example, which, however, we believe to be specifically distinct from the true *S. aurantiirostris*, and propose to call *laticlavius* from its broad-bordered throat.

Mr. Whitely's skins of this *Saltator* were obtained at Tinta. One was shot in a garden, the others off cactus plants on the hills above Tinta, in May and June. "Eyes dark hazel; bill orange; legs, toes, and claws black." The sexes, as marked, are coloured alike.

5. CATAMENIA ANALIS (Lafr. et D'Orb.).

Tinta.

"Shot off cactus plants. It frequents lanes, appearing to have the habits of a Finch. Bill bright yellow; legs and feet brownish black; eye dark hazel."—H. W.

6. POOSPIZA CÆSAR, sp. nov. (Plate XIII.)

Supra plumbea: remigibus et rectricibus obscurioribus, unicoloribus: superciliis albis: capitis lateribus nigricantibus: subtus alba, pectore lato et crisso castaneis: ventre lateraliter plumbeo, medialiter albicante: rostro nigricanti-plumbeo, mandibula subtus albicante: pedibus corylinis: long. tota 7·7, alæ 3·2, caudæ 3·1, tarsi 1·1.

Hab. Peruvia alta (*Whitely*).

Two skins of this *Poospiza* are in Mr. Whitely's collection. One is a young male; of the other the sex is not marked, but we should suppose it to be an adult of the same sex. They were both obtained at Tinta in May last.

The species is larger than any other member of the genus known to us. In colour it is something like *P. thoracica*, but has distinct white superciliaries, and no chestnut-colour on the flanks.

"Shot in a hedge. Length 7¼ inches, ditto of wing 3⅛. Bill slate-colour; eye dark hazel; legs and toes brownish flesh-colour."

7. PHRYGILUS PLEBEIUS, Tsch.; Scl. et Salv. P. Z. S. 1868, p. 568.

Tinta, May 1868.

"Shot in a cactus hedge."

8. PHRYGILUS FRUTICETI, Kittl.

Tinta, May 1868.

"Shot off cactus plants. Eye dark hazel; bill, legs, and toes brownish flesh-colour."

9. CHRYSOMITRIS ATRATA (Lafr. et D'Orb.); Scl. Cat. A. B. p. 125.

Pitumarca, August 1868.

10. SYCALIS CHLORIS, Cab.; Scl. et Salv. P. Z. S. 1868, p. 568.

Two adult males of this bird in full plumage, both obtained at Tinta in June last.

"Shot on the banks of the river. Appears to be common, frequenting also the houses of the village."

11. AGELASTICUS THILIUS (Mol.); Scl. Cat. A. B. p. 136.

Agelaius xanthocarpus, Bp. Consp. p. 430 (av. jr.).

One adult male of this species from Tungasuca, May 1868.

"Shot on the margins of the lake, where it frequents the reed-beds. Eye dark hazel; bill, legs, toes, and claws black. Total length $7\frac{1}{4}$ inches, ditto of wing $3\frac{3}{4}$. Stomach contained the remains of small beetles."

12. GEOSITTA TENUIROSTRIS (Lafr. et D'Orb.).

Certhilauda tenuirostris, Lafr. et D'Orb. Syn. Av. p. 72; D'Orb. Voy. Ois. p. 359, t. 43. f. 2.

Four skins from Tinta and Tungasuca; sexes alike.

"Found near the lake, and also near the banks of the river. Eye dark hazel; bill sepia; legs, toes, and claws black."

13. CINCLODES FUSCUS (Vieill.); Scl. et Salv. P. Z. S. 1867, p. 985.

Tungasuca.

14. AGRIORNIS INSOLENS, sp. nov.

Supra fuscescenti-cinerea unicolor; alis nigricantioribus, colore pallidiore marginatis: loris et superciliis indistincte fulvis: subtus pallide fulvescenti-cinerea, gutture albicantiore et nigro striata: ventre dilutiore: subalaribus, crisso et cauda fere tota albis; rectricibus autem duabus mediis cinereo-nigricantibus et his duarum proximarum pogoniis internis cinereo marginatis: rostro et pedibus nigris: long. tota 10·0, *alæ* 5·3, *caudæ* 4·1, *rostri a rictu* 1·4, *tarsi* 1·35.

Fem. *Mari similis.*

Hab. Peruvia, Tinta (*Whitely*).

Four specimens of this *Agriornis* were collected at Tinta in May and June. It approaches nearest to *A. solitaria* of Ecuador, being nearly of the same build, and having, like that species, the three pairs of external tail-feathers wholly white. But it may be immediately distinguished by its much paler colour below, and by the distinct black markings on the white throat.

A. pollens, Sclater* (*A. andicola*, Sclater, nec D'Orb.), has also the external rectrices wholly white, and is very like the present bird in general colour, but is much larger and stronger in form, resembling in these respects *A. livida*, the type of the genus.

"Shot off the roof of a house. Quite solitary in its habits; I have never seen two birds together."

* The name *andicola* having been used by Lafresnaye and D'Orbigny for a species of this genus, I have altered my former name (given P. Z. S. 1860, p. 78) into *pollens*.—P. L. S.

15. OCTHOECA LEUCOPHRYS (Lafr. et D'Orb.); Scl. et Salv. P. Z. S. 1867, p. 986.

Tinta, May.

"Shot off cactus plants. Bill black; eye dark hazel; legs and toes black."

16. MUSCISAXICOLA RUFIVERTEX, Lafr. et D'Orb.; D'Orb. Voy. Ois. p. 354, t. 40. f. 2.

One example from Tinta (marked ♀), May. Rather larger than Chilian specimens, and varying otherwise, but very slightly.

"Shot off the top of a rock. Eye dark hazel; bill, legs, and toes black."

17. MUSCISAXICOLA MACULIROSTRIS, Lafr. et D'Orb.; Scl. et Salv. P. Z. S. 1868, p. 568.

Tinta.

"Shot on a bank."

18. CENTRITES OREAS, sp. nov.

Centrites niger, Scl. et Salv. P. Z. S. 1867, p. 987, et 1868, p. 569.

Niger: dorso castaneo: remigum primariorum pogoniis internis albicantibus: long. tota 5·5, *alæ* 3·2, *caudæ* 2·0.

Fem. *Fusca: dorso luride castaneo: primariis, sicut in mari albicantibus sed cinnamomeo tinctis.*

Hab. Peruvia alta (*Whitely*).

Obs. Centrites niger remiges intus nigros unicolores ostendit.

Two pairs of this *Centrites* were collected at Tinta. D'Orbigny does not appear to have recognized its distinctness from the common species of the Argentine Republic, of which we have examined many specimens. Besides the difference in the wing-feathers, the present species is larger, and has the back of a rather lighter chestnut. Mr. Whitely's former specimen from Salinas belongs also to the present species.

"Shot on the river bank; common."—H. W.

19. PATAGONA GIGAS (Vieill.).

Tinta.

20. COLAPTES RUPICOLA, Lafr. et D'Orb.; D'Orb. Voy. Ois. p. 377, t. 62. f. 1; Sundev. Consp. Pic. p. 78.

Tungasuca and Tinta.

"Appears rather common, frequenting holes in banks, there being no timber in the neighbourhood. Some specimens were shot off a mud wall. Eye greenish yellow; legs and toes greenish brown; bill black."

21. BOLBORHYNCHUS ORBIGNESIUS (Bp.); Finsch, Papag. ii. p. 129; Scl. et Salv. P. Z. S. 1868, p. 569.

Tinta. Sexes, as marked, are alike.

"Found frequenting the top of a church."

22. MILVAGO MEGALOPTERUS, Meyen; Scl. et Salv. P. Z. S. 1867, p. 988.

Adult and young from Tinta.

23. BUTEO ERYTHRONOTUS (King); nob. *l. c.* p. 988.

One skin, marked female, in the plumage figured by D'Orbigny (Voy. t. 3. f. 2), from Tinta.

"Legs and toes bright chrome-yellow; claws black."

24. GERANOAËTUS MELANOLEUCUS (Vieill.).

Tungasuca.

"Bill black at the tip, yellowish green at the base; eye light hazel; legs and toes chrome-yellow; claws black. Total length 18½ inches."

25. TINNUNCULUS SPARVERIUS (Linn.).

Tinta.

26. HYPOTRIORCHIS FEMORALIS (Temm.).

Tinta.

"Shot by a native off the top of a cactus plant. Bill slate-colour at the point, yellow at the base; eye dark hazel; eyelid, legs, and toes bright yellow; claws black."

27. CIRCUS CINEREUS (Vieill.).

One skin, apparently an immature male, of this species from Tinta.

"Bill slate-colour; eye yellow; legs and toes chrome-yellow; claws black."

28. STRIX PERLATA, Vieill.

Tinta.

29. BUBO VIRGINIANUS (Gm.).

Tinta. Smaller, as is usually the case, than northern specimens.

"Shot by a native, in the daytime, off a cactus plant. Eye bright yellow."

30. PHOLEOPTYNX CUNICULARIA (Mol.).

Tinta.

31. METRIOPELIA MELANOPTERA (Gm.); Bp. Consp. ii. p. 75.

Tinta.

32. CHAMÆPELIA ERYTHROTHORAX (Meyen); Scl. et Salv. P. Z. S. 1867, p. 989.

Tinta.

"Shot off the top of a mud wall."

33. VANELLUS RESPLENDENS (Tsch.); Sclater, P. Z. S. 1858, p. 556.

Four examples from Tinta, obtained at an elevation of 12,000 feet. Sexes alike.

"Shot on marsh land. Has the habits of a Plover. Bill pink at the base, reddish brown at the tip; eye, eyelid, legs, and toes pink."

34. GAMBETTA MELANOLEUCA (Gm.).

Tinta and Tungasuca.

"Shot on marshy lands in the vicinity of the lake of Tinta; quite alone. Bill horn-colour; eye dark hazel; legs and toes yellow ochre; claws black."

35. GALLINAGO FRENATA.

Scolopax frenata, MAX. Beitr. iv. p. 712; Tsch. F. P. *Aves*, p. 299.

One skin from Tungasuca, with the tarsus shorter than usual.

"Found in pairs on the borders of the lake, but not common. Bill reddish slate; eye dark hazel; legs and toes brownish flesh-colour; claws black."

36. FULICA ARDESIACA (Tsch.); Scl. et Salv. Ex. Orn. p. 113, t. 57.

Two specimens from the lagoon of Tungasuca.

"Appears to be common. Bill white, marked with orange at the base; crown of the head chocolate-colour; legs and toes light green."

37. ARDEA EGRETTA (Gm.).

A. leuce, Burm. Syst. Ueb. iii. p. 416.

Tungasuca.

"Bill yellow-ochre; eye cream-colour; legs, toes, and claws black."

38. NYCTICORAX OBSCURUS, Bp. Consp. ii. p. 141.

Adult and young from Tinta.

"Upper mandible of bill black, marked with olive-green at the base; lower mandible olive-green, marked with streaks of black; eye crimson lake; legs and toes greenish yellow; claws black."

39. IBIS FALCINELLUS (Linn.); Schlegel, Mus. d. P.-B. *Ibis*, p. 2.

Ibis ordii, Tsch. F. P. p. 298.

Tungasuca.

"Frequents the neighbourhood of the lake in flocks of from twenty to thirty. Bill reddish slate-colour; eye crimson lake; legs, toes, and claws black. Total length 24¼ inches."

40. BERNICLA MELANOPTERA (Eyton).

Anser melanopterus, Eyton, Anatidæ, p. 93; Tsch. F. P. *Aves*, p. 308; Darwin, Voy. Beagle, Zool. iii. p. 134, t. 50; Phil. et Landb. Wiegm. Arch. 1863, p. 185.

Anser andicola et *A. montanus*, Tsch.

Two examples from Pitumarca, in the plumage figured in the 'Voyage of the Beagle.'

"Common on all the large swamps near Tinta. Bill, legs, and toes Indian-red; eye dark hazel."

41. DAFILA SPINICAUDA (Vieill.).

Anas spinicauda, Schlegel, Mus. des P.-B. *Ans.* p. 39.

Two skins from the lagoon of Tungasuca and a river near Tinta, which we believe to belong to this species, although they do not quite agree with Burmeister's description (La Plata-Reise, ii. p. 515). But they are identical with a skin from Buenos Ayres, obtained by Mr. Hudson (*cf.* P. Z. S. 1868, p. 146); and we think Burmeister must have made some error in separating the Peruvian bird (*A. oxyura*, Meyen) from the eastern form.

"Total length 24¼ inches. Upper mandible yellow, marked with a streak of black down the centre; lower mandible yellow at the base, black at the point; eye dark hazel; legs and toes lead-colour."

42. QUERQUEDULA OXYPTERA (Meyen); Scl. et Salv. P. Z. S. 1867, p. 990.

Specimens of both sexes of this Duck from the lagoon of Tungasuca and a river near Tinta. The males and females are alike.

"Found in the river."

43. QUERQUEDULA PUNA.

Anas puna, Tsch. F. P. *Aves*, p. 309.

Two skins, both of females, from the lagoon of Tungasuca. This species seems most nearly allied to *Q. versicolor*, but is readily distinguishable by its larger black bill, blacker head, whiter throat, and finer markings above.

We have previously seen this species only in the gallery of the Jardin des Plantes, where there is a specimen from Cochabamba (D'Orbigny), and a second said to be from Chili (Gay).

"Found in pairs; rare. Bill light blue, with a streak of black down the centre of the upper mandible; eye dark hazel; legs and toes bluish slate-colour."

44. MERGANETTA LEUCOGENYS.

Anas leucogenys, Tsch. Wiegm. Arch. 1843, p. 390.
Erismatura leucogenys, ej. *l. c.* 1844, p. 316.
Merganetta leucogenys, Tsch. F. P. *Aves*, p. 310.

Mr. Whitely has sent a pair of this *Merganetta*, which is certainly distinct from both the Chilian and New-Granadan species. The male was obtained by his friend Mr. Turner; the female was shot by himself at Tinta in July last.

The male has a black neck, like *M. chilensis*, but a pure white neck and throat, with only a small black line round the base of the bill, as in *M. columbiana*. Tschudi's description appears to have been taken from a bird not quite adult. The female appears to

resemble the female of *M. armata*, as figured by Des Murs (Icon. Orn. pl. 48).

"Bill, legs, and toes Indian red."

45. LARUS SERRANUS, Tsch. F. P. *Aves*, p. 307.

L. personatus, Schlegel, Mus. des P.-B. *Lari*, p. 35.

Several skins from Tinta, obtained in July, in winter dress or immature plumage, with the head almost white. One of them, apparently most immature, shows traces of a black subterminal tail-band.

46. PODICEPS CALIPAREUS, Lesson; Tsch. F. P. *Aves*, p. 315.

Lagoon of Tungasuca.

"Bill lead-colour; eye red; legs and toes lead-colour."

47. PODICEPS ROLLANDI, Q. et G.

Lagoon of Tungasuca.

"Bill black; eye red; legs and toes slate-colour."

3. Second List of Birds collected at Conchitas, Argentine Republic, by Mr. William H. Hudson; together with some Notes upon another Collection from the same locality. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.Z.S.

A second collection of birdskins made by Mr. Hudson having been transmitted to us for inspection by the authorities of the Smithsonian Institution, Washington, we beg leave to offer to the Society a list of the species therein contained which were not enumerated in our former paper on this subject*, with occasional remarks upon them.

The collection consists of 105 specimens, referable to fifty different species. The following fourteen were not in the first collection. Two only of these, namely *Cyanotis azaræ* and *Elanus leucurus*, are not mentioned in Burmeister's work on the zoology of La Plata.

1. TROGLODYTES FURVUS (Gm.)

Tr. platensis, Burm. La Plata-Reise, ii. p. 476.

Basacaraguay, Azara, Apunt. ii. p. 19.

Several examples of this widely diffused species. It has been already pointed out (P. Z. S. 1867, p. 321) that the true *Sylvia platensis* of Latham (founded on Buffon's Pl. Enl. 730. f. 2) is Burmeister's *Cistothorus fasciolatus*, which should be called *Cistothorus platensis*. Azara's *Todo voz*, Apunt. ii. p. 29. no. 151 (*Thryothorus polyglottus*, Vieill.), is, no doubt, the same species.

Mr. Hudson gives *Ratoncito* as the vernacular name of the present bird.

* See P. Z. S. 1868. p. 137.

2. PROGNE DOMESTICA (Vieill.).

Hirundo domestica, Vieill. N. D. xiv. p. 521, et E. M. p. 527; ex *Golondrina domestica*, Azara, Apunt. i. p. 502.

Progne domestica, Baird, Rev. A. B. p. 282; Burm. La Plata-Reise, ii. p. 477.

One skin of this species, which seems to us very nearly allied to the Central-American *P. leucogastra*, though larger. Burmeister describes the adult as being steel-blue all over, having, we suppose, confounded it with the southern representative of *P. purpurea* (i. e. *P. elegans*, Baird, Rev. A. B. p. 751).

3. ATTICORA CYANOLEUCA (Vieill.); Burm. *l. c.* p. 479.

Golondrina timoneles negros, Azar. Apunt. ii. p. 508. no. 303.

Two examples of this widely spread species.

4. CYCLORHIS VIRIDIS (Vieill.); Burm. *l. c.* p. 472.

Habia verde, Azara, *l. c.* i. p. 361. no. 89.

Sclater's Bolivian specimen (C. A. B. p. 46) has a rather stronger bill, and the base of the lower mandible black. The chestnut eyebrows are also deeper in colour. It approaches *C. flavipectus*. The present species comes nearer the Brazilian *C. ochrocephala*, and has no black spot on the lower mandible.

5. AGELASTICUS THILIUS (Mol.).

Agelaius thilius, Burm. *l. c.* p. 492.

Tordo negro cobijas amarillas, Azara, *l. c.* i. p. 301.

Agelasticus chrysopterus, Cab. M. H. i. p. 188.

Agelaius xanthocarpus, Cassin, P. Acad. Phil. 1866, p. 12.

Two males and a female of this species, which we agree with Burmeister in regarding as hardly distinct from the Chilian bird. It only differs in its smaller size. The single Peruvian skin we have seen is most like the Chilian in size; so that Bonaparte's *A. xanthocarpus* (ex Peruvia) is probably a mere synonym of *A. thilius*. Cabanis wishes to call the Argentine form *chrysopterus*, from Vieillot's *Agelaius chrysopterus*, which name, however, has no reference to Azara's species, and is a mere synonym of *Icterus cayanensis*.

6. XANTHOSOMUS RUFICAPILLUS (Vieill.).

Tordo corona de canela, Azara, *l. c.* i. p. 315.

Agelaius ruficapillus, Vieill.

Chrysomus frontalis, Burm. *l. c.* p. 492.

Dolichonyx ruficapillus, Cassin, Pr. Acad. Phil. 1866, p. 17.

Cassin is quite right in separating this bird from the Brazilian *X. frontalis*, with which it has been generally confounded.

7. CYANOTIS AZARÆ (Licht.); Scl. C. A. B. p. 212.

Tachuri rey, Azara, Apunt. ii. p. 72. no. 161.

Two pairs of this species, which Mr. Hudson marks as a "summer bird frequenting swamps." Not mentioned by Burmeister.

8. HAPALOCERCUS FLAVIVENTRIS (Lafr. et D'Orb.); Burm. La Plata-Reise, ii. p. 456.

Tachuri vientre amarillo, Azara, Apunt. ii. p. 89. no. 171.

One example obtained in November 1867 and marked as a "summer bird." On comparing this with other specimens in Sclater's collection, including a typical Chilian example of *Arundinicola citreola*, Landbeck (Wiegm. Arch. 1864, p. 58), we find them all identical*. The latter name may therefore be regarded as a synonym of *Hapalocercus flaviventris*.

9. CERYLE AMERICANA (Linn.); Burm. *l. c.* p. 447.

One skin of a female of this Kingfisher.

10. ELANUS LEUCURUS (Vieill.); Burm. Syst. Ueb. ii. p. 113.

Alcon blanco, Azara, Apunt. i. p. 165.

Two specimens. Not included in Burmeister's list.

11. ROSTRHAMUS SOCIABILIS (Vieill.).

Gavilan de estero sociable, Azara, Apunt. i. p. 84. no. 16.
R. hamatus, Burm. La Plata-Reise, ii. p. 435.

One example of this species.

12. ARAMUS SCOLOPACEUS (Vieill.); Burm. *l. c.* p. 504.

Caráu, Azara, Apunt. iii. p. 202. no. 366.

"Caráu" or "Viuda loca."—W. H. H.

13. QUERQUEDULA CYANOPTERA (Vieill.); Burm. *l. c.* p. 516.

Pato alas azulas, Azara, Apunt. iii. p. 437. no. 434.

"Pato chocolate."—W. H. H.

14. DENDROCYGNA VIDUATA (Linn.); Burm. *l. c.* p. 515.

Pato cara blanca, Azara, Apunt. iii. p. 440. no. 435.

We have likewise lately examined a small collection of birds made near Buenos Ayres by Mr. Haslehust of that city. Out of forty-five species represented in it, the following ten have not been yet sent by Mr. Hudson:—

1. VIREOSYLVIA CHIVI.

Sylvia chivi, Vieill. N. D. xi. p. 174, et E. M. 437, ex Azara, no. 152.
Contramaestre gaviero, Apunt. ii. p. 34.
V. chivi, Baird, Rev. A. B. p. 337.

A single skin, which we are not able to separate from *V. agilis* of Brazil (*V. virescens* of Sclater's American Catalogue). But putting aside *virescens*, which Prof. Baird, perhaps rightly, considers to be a synonym of *V. olivacea*, *chivi* is the oldest name for this bird. This species is not mentioned by Burmeister.

* *Cf.* Sclater's remarks, P. Z. S. 1867, p. 326.

2. STEPHANOPHORUS LEUCOCEPHALUS (Vieill.).

Lindo azul cabeza blanca, Azara, Apunt. i. p. 375. no. 93.
Tanagra leucocephala, Vieill. N. D. xxxii. p. 408, et E. M. 774.

Several skins of this Tanager.

3. DONACOSPIZA ALBIFRONS (Vieill.); Cab. Mus. Hein. i. p. 136.

Poospiza albifrons, Burm. *l. c.* p. 484.
Cola aguda vientre de canela, Azara, Apunt. ii. p. 263. no. 234.
Poospiza oxyrhyncha, Sclater, P. Z. S. 1864, p. 168, ex MS. Natt.

On comparing the present specimen with Sclater's type of *Poospiza oxyrhyncha*, there remains no doubt of their identity. Natterer's specimen in Sclater's collection, which was obtained at Curytiba in Brazil, has the tail-feathers rather worn. The species is well figured in the 'Voyage of the Beagle' (t. 29) as *Ammodramus longicaudatus*.

4. SYCALIS CHLOROPSIS.

Crithagra chloropsis, Bp. Consp. i. p. 521.
Sycalis chloropis, Burm. Journ. f. O. 1860, p. 257, et La Plata-Reise, ii. p. 489.

A pair of what we suppose to be this *Sycalis*, which has not been very sufficiently described either by Bonaparte or Burmeister. It is most nearly allied to *S. brasiliensis*, but rather smaller, with the front less deeply orange, and the back strongly striated with fuscous.

5. STURNELLA DEFILIPPII, Bp.; Sclater, Cat. A. B. p. 138.

Trupialis militaris, Burm. *l. c.* p. 490.
Tordo degollado primero, Azara, Apunt. i. p. 304, no. 68.

Easily known from the true *S. militaris* (which is found near Mendoza and along the Cordilleras) by its black under wing-coverts.

6. AMBLYRHAMPHUS HOLOSERICEUS (Scop.); Sclater, Cat. A. B. p. 137.

A. ruber, Burm. *l. c.* p. 491.
Tordo negro cabeza roxa, Azara, Apunt. i. p. 316. no. 72.

7. PICOLAPTES ANGUSTIROSTRIS (Vieill.); Lafr. Rev. Zool. 1850, p. 151.

Trepador comun, Azara, Apunt. ii. p. 279, no. 242.

Nearest to *P. bivittatus*, as pointed out by Lafresnaye, but recognizable by the well-marked striæ below and the longer beak. Not mentioned by Burmeister.

8. MYIARCHUS SWAINSONI, Cab. et Heine, Mus. Hein. ii. p. 72.

Suiriri pardo amarillo menor, Azara, Apunt. ii. p. 138. no. 193.

We are inclined to think this form may be really distinguishable from *M. ferox*, although in some cases it is exceedingly difficult to say to which of the two species a particular skin should be referred. A Nattererian specimen of *Myiarchus cantans* (Pelzeln, Orn. Bras.

p. 117) in Sclater's collection agrees very well with the Buenos-Ayrean bird. Pelzeln unites *M. swainsoni* with *M. ferox*, and may thus have fallen into the error of describing his *M. cantans* as new. This species is not included in Burmeister's list.

9. PHYTOTOMA RUTILA (Vieill.); Burm. *l. c.* p. 452.

Dentudo, Azara, Apunt. i. p. 361. no. 91.

10. VANELLUS CAYANENSIS (Gm.); Burm. *l. c.* p. 502.

Terutéro ó Tetéu, Azara, Apunt. iii. p. 264. no. 386.

4. Observations on the Distribution of *Bulimus miltocheilus* in the Solomon's* Archipelago. By JOHN BRAZIER, of Sydney, New South Wales. (Communicated by the Secretary.)

BULIMUS MILTOCHEILUS.

Bulimus miltocheilus, Reeve, Conch. Icon. pl. 49. fig. 322; Deshayes in Fér. vol. ii. p. 105, pl. 154. figs. 3 & 4; Pfeiffer, Mon. Helic. vol. iii. p. 372, and vol. iv. p. 440; Chenu, Manuel de Conch. part. i. fig. 3216.

Aspastus miltocheilus, Albers, Heliceen, first edition, p. 149.

Otostomus miltocheilus, H. & A. Adams, Recent Mollusca, vol. ii. p. 151.

During my visit to the Solomon's archipelago in H.M.S. 'Curaçoa,' under the command of my esteemed friend Commodore Sir William Wiseman, C.B., in the months of August and September 1865, I found that *Bulimus miltocheilus* is not only met with at Port Makera, San Christoval Island, but also on two other islands in the archipelago. On the Island of Sesarga or Contraietés (situated 9° 48′ S. lat., 162° 8′ 10″ E. long.) I believe I was the first that ever landed in search of conchological specimens; and I was well rewarded by finding *B. miltocheilus* on a species of palm tree about twenty feet from the ground. The next island that we visited is one known by the name of Golfe Island; the native name is Ugi; here *B. miltocheilus* is found in thousands on the palm trees. The third place that we visited was Wanga Bay, San Christoval Island; here we found this *Bulimus* rather scarce, not getting more than thirty specimens. At this spot they are found on leaves of bushes and other small plants, quite vigorous and crawling about, where the land is very low and damp. The next place that we visited was Recherche Bay, San Christoval Island, where the land is very high on the coast. To obtain *B. miltocheilus* you must go three or four miles inland; here it is found on a broad-leaved tree, but

* Recent writers on the Mollusca of this archipelago (such as Pfeiffer and others) make use of the term "*Salomon*" Islands; it should be *Solomon's* Archipelago or Islands.

is rather rare. At Port Achard it is found in abundance, and is used by the natives to make necklaces of, or strung in clusters round their waist in their war-dances. It is always found in company with *Helix merziana* and *H. cleryi*. The most northern limit of it is Sesarga or Contraietés, the southern limit is San Christoval. Specimens vary much both in colour and in size.

5. On the Genus *Chætops*. By R. B. Sharpe.

(Plate XIV.)

The genus *Chætops* was founded by Swainson in 1831, and up to the present time contains only two species, viz. *C. frenatus* and *C. aurantius*. In a collection of birds formed in Damara-land by the late Mr. C. J. Andersson, I met with a species of *Chætops* which I have every reason to believe is new to science. On taking my specimen to the British Museum I discovered another in the national collection; and my friend Mr. George Robert Gray coincided in my opinion as to its novelty. He had, indeed, noted it as new, and intended to describe it himself shortly. I have therefore very great pleasure in naming this species

Chætops grayi, sp. n. (Plate XIV.)

C. *valde minor: gutture et pectore superiore albidis: pectoris lateribus nigro guttatis: long. tot.* 6·8 *unc., rostri* 0·7, *alæ* 2·8, *caudæ* 3·0, *tarsi* 0·85, *dig. med.* 0·7.

Hab. in terra Damarensi, in Afr. merid.

The above short diagnosis is quite sufficient to distinguish it from either of the species hitherto known; and the following diagnostic Table indicates the specific characters of the three species:—

A. Majores: gutture nigerrimo.
  a'. Abdomine intense castaneo ..... *C. frenatus.*
  b'. Abdomine aurantiaco ..... *C. aurantius.*
B. Minor: gutture albido ..... *C. grayi.*

1. Chætops frenatus.

Malurus frenatus, Temm. Pl. Col. 385 (1826).

Chætops frenatus, Gray, Gen. of Birds, i. p. 217 (c. 1844); Bonap. Consp. Gen. Av. i. p. 278 (1850); Layard, Birds of S. Afr. p. 125 (1867).

Chætops burchelli, Swains. Fauna Bor.-Am. p. 486 (1831); Classif. of Birds, ii. p. 233 (1837).

The following account of the habits of this rare bird is taken from Mr. Layard's work (*loc. cit.*):—

"This bird is, as far as I yet know, peculiar to the mountain-ranges between Caledon and Swellendam. It frequents the tops of the hills and high elevations on their stony sides, and seeks its food, consisting of insects, about stones and rocks. In habits it much resembles the Rock-Thrush, and, like it, is fond of perching upon the

summit of some conspicuous stone or ant-hill, from which it surveys the surrounding prospect, and seeks for safety by immediate flight on perceiving the approach of a foe. It progresses by a series of enormous hops, its powerful legs being well suited to this end; while its strong pointed claws enable it to traverse with ease the inclined surfaces of slippery rocks. It conceals itself readily in holes, and, if wounded, seeks such a retreat in which to die. Generally found in small families of three or four individuals."

2. CHÆTOPS AURANTIUS.

Chætops aurantius, Layard, Birds of S. Afr. p. 126 (1867).

This species was first recognized by my friend Mr. Layard; a single specimen is in the British Museum; and I agree with him in considering it to be distinct from *C. frenatus*. The following extract from his work sufficiently explains the reasons that induced him to separate the two birds.

"This handsome species was obtained by Mr. J. O'Reilly in some abundance in the mountains near Graaff-Reinet. He describes it as very wary and difficult of approach, and feeding on insects, for which it seeks among the low brushwood. It has also been received from Captain Bulger at Windvogelberg, and from Mrs. Barber."

Mr. J. O'Reilly writes as follows:—"Graaff-Reinet, January 2nd, 1863. Inhabits rocks in high mountain-ranges. Scarce; very shy and cunning, usually frequenting places assimilating to its plumage. Continually on the hop, and seldom takes wing; when it does so, flies but a short distance. Always on the watch, seldom showing much more than its head above the stones. Found about Graaff-Reinet all the year round, and in pairs. Food consists of small insects of any sort; drinks in the evening. Note, a sharp chirp, particularly when surprised. Breeds in December. Nest built of grass and rock-mosses, in crevices among rocks. Eggs three to four; green, with brown speckles."

"When this bird was sent home, Dr. Hartlaub and Mr. Sclater identified it as *C. frenatus*, Temm. Since then, specimens have been obtained corresponding entirely with Temminck's figure of that bird, and I am convinced that this species is distinct. I have male, female, and young birds of each; and Mr. O'Reilly describes the nest and eggs of the orange-bodied species which Dr. Hartlaub supposes to be the young of *C. frenatus*. *C. frenatus* breeds about Caledon; and our *C. aurantius* never appears there by any chance."

3. CHÆTOPS GRAYI.

The specimen in the British Museum is labelled as coming from South Africa. My bird was obtained by Mr. C. J. Andersson on the Omaruru River, Damara-land, October 30th, 1866. The present species cannot be mistaken for either of the others mentioned above, its much smaller size and white throat distinguishing it at a glance. I should add that the British-Museum specimen has more black spots on the sides of the breast than my bird.

6. Notes on the Families and Genera of Tortoises (*Testudinata*), and on the Characters afforded by the study of their Skulls. By Dr. JOHN EDWARD GRAY, F.R.S., V.P.Z.S., F.L.S.

(Plate XV.)

Papers on the skulls of *Chelydidæ* and on the skulls of the Asiatic and African species of *Trionychidæ* were read at meetings of this Society in 1867, and I was enabled to found on the study of their skulls what appeared to me to be more natural arrangements of the species into genera and larger groups. I wished to follow the same plan with regard to the other families of *Testudinata*, but I was stopped by want of material.

The British Museum has since then received some additional skulls and skeletons; and I hope that, with these and with the examination of the heads and mouths of the specimens in spirits and stuffed, I have been able to place the characters of the genera and to group the genera into sections on a firmer basis than that hitherto used, and thus to add to our knowledge of these neglected animals.

Anatomists have been content to study the osteology of the three or four larger groups of the Tortoises, and have paid very little attention to the skulls, much less to the skeletons, of the genera or other smaller groups; and very few skeletons or skulls have been figured.

To give some idea of the little attention hitherto paid to the subject and of the difficulty that existed of examining the skeletons and skulls of them, the Museum of the College of Surgeons, when Professor Owen printed his Catalogue of the osteological series in that collection, only contained the skulls or skeletons of five species of *Testudinidæ*, of one of the *Cistudinidæ*, of two *Emydidæ*, and of one of the *Chelydradæ*. I am glad to say that the collection has been lately increased by the addition of several other skeletons and skulls.

To remedy this evil, I have exerted myself to bring together the skeletons and skulls of as many specimens of Tortoises as I could procure for the British Museum collection; and there are now in that collection 78 complete skeletons, and 59 skulls, besides bones of parts of the body, belonging to 67 species, as follows:—

	Species.	Skeletons.	Skulls.
Testudinidæ	13	22	10
Cistudinidæ	3	5	—
Emydidæ	22	24	5
Chelydradæ	6	8	—
Chelydidæ	7	6	6
Trionychidæ	12	6	17
Cheloniadæ	3	6	15
Spargidæ.....	1	1	6

In my paper on the skulls of *Chelydidæ* (P. Z. S. 1864, p. 128) I divided them into two groups—one having the temporal muscles

almost entirely covered with a bony case formed of the dilated zygomatic arch, as in the Sea-Turtles (*Cheloniadæ*), and the other with those muscles only covered with skin, and protected externally by a broad band-like zygomatic arch, as in the Tortoises (*Testudinidæ* and *Trionychidæ*); and I observed that the same difference in the form of the skull was to be observed in the genera of the *Emydidæ*; but some genera, as *Geoemyda* and *Cistudo*, like several genera of *Chelydidæ*, are even without any zygomatic arch, the temporal muscles being only covered with skin between the orbit and the tympanic bone as on the temple and crown.

The families may be divided, according to the state of the temple, thus:—

	Temple bony.	Temple fleshy.
I. Feet clavate. Terrestrial	.....	*Testudinidæ*.
II. Feet palmate. Fluviatile.		
A. Thorax covered with bony plates.		
a. Pelvis free below; sternal shields 8 or 12	*Platysternidæ*.	*Cistudinidæ*. *Emydidæ*. *Chelydradæ*.
b. Pelvis attached to the sternum; sternal shields 13	*Podocephalidæ*.	*Chelydidæ*.
B. Thorax covered with skin	.....	*Trionychidæ*.
III. Feet fin-shaped	*Cheloniadæ*. *Sphargididæ*.	

The horny beak of these animals not only forms a cutting instrument for the separation of the food from the mass, but it also covers the chewing surface on the sides of the jaws, there being a more or less extended plate on the inside of the jaws for this purpose. In some the surface of the bone and the horny covering is smooth, as in *Malaclemys* and *Chelydra*. In general there are one or more ridges on the upper jaw fitting into grooves in the lower jaw. In the Tortoises and some of the more terrestrial *Emydidæ*, the ridge and groove are simple; in the more aquatic Terrapins (as *Pseudemys* and *Batagur*) they are more numerous and wider. Unfortunately, the form of the masticating surface is not to be usually seen in stuffed specimens; so that it is only known in a limited number of species. It must have great influence, or, rather, it shows that there is great variation in the habits of the animals, and ought to be studied for the natural arrangement of the groups. Indeed I can only regard the notes I am now making as the breaking of the sod, and consider that much has to be done before one can arrive at a satisfactory history of the habits and structure of these creatures, and form an arrangement of them consistent with their habits and manners and peculiarities.

I. LAND-TORTOISES—TESTUDINIDÆ.

Skull solid. Orbit complete, lateral, large, hinder edge moderate. Zygomatic arch strong, well developed, united to the ear-bone behind, with a large cavity for the temporal muscle above. Temporal muscles covered with skin or horny plates.

They may be divided into sections thus:—

Section I. Sternal shields 12, regularly arranged in pairs on each side of the central line. Pectoral plates large, like the others.

A. The inguinal plates moderate; the nostrils in a square fleshy nose, between the upper edge of the beak and the frontal plates; thorax solid. TESTUDININA.

1. TESTUDO. Gular plates separate. Claws 4 . 5. Alveolar plate with two ridges.

2. PELTASTES. Gular plates separate. Claws 4 . 5. Alveolar plate with an indistinct ridge.

3. HOMOPUS. Gular plates separate. Claws 4 . 4.

4. PYXIS. Gular plates separate. The front lobe of the sternum mobile.

5. CHERSINA. Gular plates united and produced.

B. The inguinal plates very large; the nostrils in a notch on each side of the upper edge of the beak; thorax, hinder part mobile. KINIXYINA.

6. KINIXYS.

Section II. Sternal shields 10, arranged in five pairs. The two pectoral shields small, short, triangular, far apart, on the sides at the hinder edge of the axillæ. MANOURINA.

7. MANOURIA. This genus, before the animal was known, was erroneously arranged in *Emydidæ*.

1. TESTUDO.

The skull has a well-developed zygomatic arch. The palate is deeply concave, especially in front; and there are three more or less distant, narrow, elevated, parallel longitudinal ribs on it behind the internal nostrils, which are placed in front of the palate. The alveolar margin of the upper jaw broad, with two ridges parallel to and as long as the outer margin of the beak. The central ridge is divided into conical teeth; the inner marginal ridge higher and with a more even edge. The nostrils are placed in a more or less square fleshy muffle, which is situated on the upper edge of the horny beak.

The genus may be divided into two sections by the form of the alveolar surface of the lower jaw:—

a. Lower jaw narrow, with a deep groove extending the whole length of the edge; front of upper jaw with a central notch and two slight prominences. TESTUDO.
Testudo indica, T. planiceps, T. tabulata, T. radiata.

b. Lower jaw narrow in front, with a short deep groove as long as the hinder half of the outer margin. SCAPIA.
T. (*Scapia*) *falconeri.*

The hinder part of the skull over and near the ethmoid bones varies considerably, and affords very good characters for the distinction of the species.

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1. TESTUDO INDICA, Gray.

Testudo indica, (skull figured) Cuvier Oss. Foss. v. t. f. ; copied, Wagler, N. Syst. Amph. t. 6. f. 51, 52, 53 ; Gray, Cat. Shield Reptiles in B. M. t. 35. fig. 1.

T. elephantopus, Owen, Cat. Osteol. Mus. Col. Surg. p. 194. no. 1011 (skeleton), 1058 (skull).

Skull—length 5¾ inches, width at zygomatic condyles 4½ ; the alveolar plate in the upper jaw broad, with a central and marginal ridge, and a groove in the lower jaw, the whole length of the margin.

There is a skeleton of a small adult specimen of this species in the British Museum.

2. TESTUDO PLANICEPS.

T. planiceps, (skull figured) Gray, Cat. Shield Reptiles in B. M. t. 34.

Skull—length 5¼ inches, width over zygomatic arches 4¼ ; the alveolar plate in the upper jaw narrower, with a central and marginal ridge, and a groove in the lower jaw, the whole length of the margin.

3. TESTUDO TABULATA.

T. tabulata, (skeleton) Wiedemann, Arch. Zool. ii. 181 ; Wagler, N. Syst. Amph. t. 6. f. 1–6 ; Owen, Cat. Osteol. Mus. Coll. Surg. p. 200. no. 1044 (skeleton with mutilated skull), 1046 (skull ?).

Var. *Testudo boiei*, Wagler, N. Syst. Amph. t. 6. f. 7–13.

Junior ? *T. denticulata*, Owen, Cat. Osteol. Mus. Coll. Surg. p. 201. no. 1045 (skull); not Green.

The upper jaw with a high triangular ridge, and the lower with a deep triangular groove with a very high inner edge, parallel to and nearly as long as the short-edged outer margin, only represented in the front of the upper jaw by the broad, deep, central, anterior pit. The upper jaw with a notch on each side of the centre, and the lower with a broad, compressed, conical projection. Palate very deep nearly the whole length, deeper on each side in front, with three laminar ridges, the middle one being the most distinct. The ethmoid bones smooth, without any distinctly raised ridge on each side.

There are a skeleton and two skulls appearing to belong to this species in the British Museum. Length of the skull of the skeleton, from nose to condyle, 2⅓ inches ; width at zygomatic arches 1⅔ inch. Length of largest separate skull 2 inches 5 lines, width 1¾ inch. There is also in the Museum the skeleton of a small but adult specimen of the variety, with very deeply sulcated shields. They differ from each other somewhat in the depth, and slightly in the form of the concavity in the palate, and in the strength of the margin on

the side of the hinder part of the palate within the temporal muscles. They all three vary in the form of the ethmoid bone: in one it is nearly square, with evenly truncated front edge; in the other two it is more elongated, and the middle of the front edge is more or less projecting in front.

Of the skeleton of a young specimen in the British Museum the skull is well formed; it has the symphysis between the two bones very narrow; the beak has the three anterior notches, and the alveolar ridges or grooves, as in the adult.

A half-grown specimen from Xeberos, obtained from Mr. Higgins, in spirit, has the head black, the crown and cheeks yellow-varied, the two oblong longitudinal shields on the nose and the small shield edging the upper part of the orbit pure white; a small spot on each temple and a large shield between the orbit and the upper edge of the tympanic cavity yellow.

4. TESTUDO RADIATA.

Testudo radiata, Cuv. Oss. Foss. v. 193, t. 12, 13; Wagler, N. Syst. Amph. t. 10. f. 37, 40, t. 11 (skeleton).

The skull of the skeleton in the British Museum is solid, heavy, rather longer than wide in the widest part; crown rather convex; nose erect; sides of face concave; orbit large; zygomatic arch strong, broad, convex, about as wide as the small oblong tympanic cavity. Palate very deeply concave in front, gradually shelving off to the ethmoid, with three narrow laminar longitudinal ridges near together in the centre of the concavity. Ethmoid bone narrow, with a narrow, linear, rather arched ridge on each side. Lower jaw with a deep narrow groove parallel to and as long as the short outer margin, and with a prominence in front. The skull is 2 inches long from the nose to the condyle, and 1⅜ inch wide over the zygomatic arches, which is the widest part. The mastoid bone, in the different species of Tortoises, differs greatly in shape; in this species it is short, with a shelving outer surface; it is always hollow, forming a tympanic cavity.

5. TESTUDO (SCAPIA) FALCONERI. B.M.

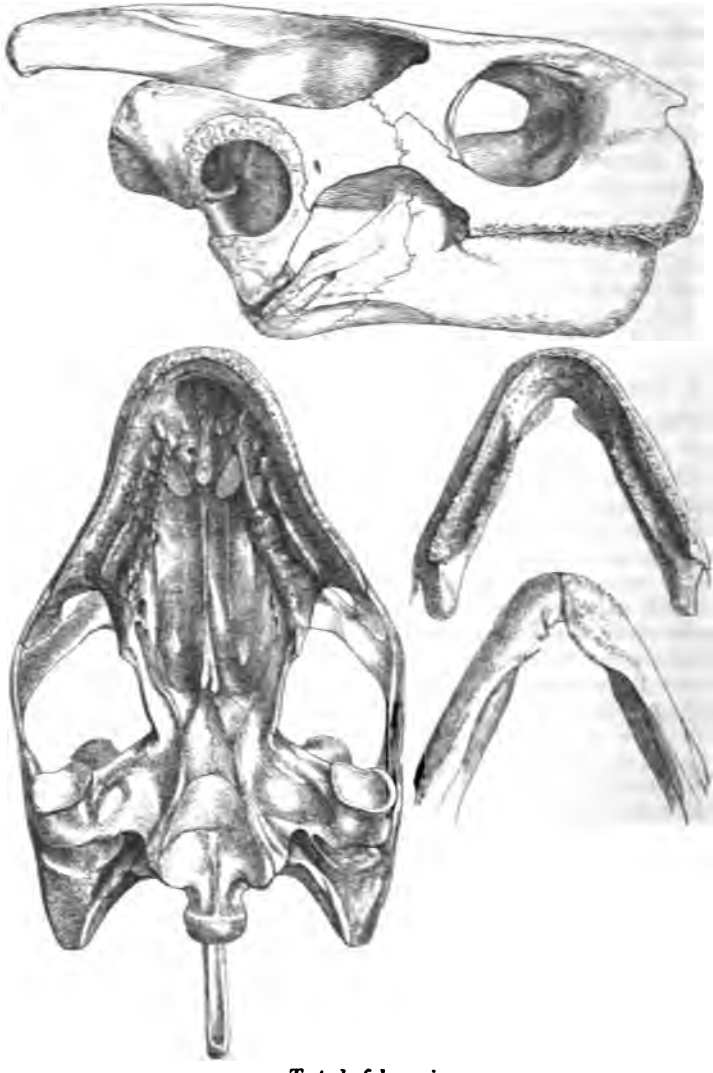
Skull solid, oblong; face broad, rounded in front. The groove on the palate very deep and wide. The upper jaw with three narrow ridges—one on each edge of the margin, and a short one intermediate between them; the outer margin high and without any teeth. Lower jaw with a sharp edge, a rather acute sharp edge in the front part, and with a sharp inner ridge rather more than half the length of the side, separated from the outer edge by a deep groove.

Hab. India?

Length of skull from nose to condyle 3⅛ inches; width 2 inches 5 lines, of forehead between orbits 2⅛ inches; length of outer edge of upper jaw 1 inch 8 lines.

The skull above described was received in Dr. Falconer's collection, which was presented to the British Museum by his brother on his

Fig. 1.



Testudo falconeri.

Note.—The figures are all of the natural size, except when otherwise stated.

death. It is most probably from India, and perhaps from the mountain-regions. It is evidently the skull of a very large species of the genus and very distinct from ***Testudo indica***, the skull of which was figured in the 'Catalogue of Shield Reptiles in the British

Museum,' t. 35. f. 1, and the larger *Testudo planiceps*, figured in the same work, t. 34, and only known from a skull in the Museum collection. From its size, it is most probably the skull of one of the Black Tortoises of Asia that have been called *Testudo indica*, which are found spread over all parts of the Asiatic region, also on the islands off the east coast of Africa, and in California and the Galapagos, and of which certain variations in form were regarded by the older writers as denoting distinct species. Modern writers on the subject have united these into a single species under the name of *Testudo indica*.

Testudo falconeri and *T. planiceps* having been described from skulls in museums, without any knowledge of the thoraces of the animals to which they belonged, I am not able to say if they are identical with any of the Tortoises which have been described from thoraces only, under the names of *Testudo elephantopus*, *T. nigra*, *T. dussumieri*, *T. gigantea*, *T. vosmaeri*, *T. nigrita*, *T. daudini*, *T. elephantina*, *T. perraultii*, and *T. peltastes*. This is one of those instances which ought to teach naturalists caution in determining species without the examination of all the parts of the animal, the skull as well as the thorax.

The Tortoises that have been called *T. indica* are found in India, Africa, and America, or rather on the islands of these two latter continents; and it has been supposed that they have been introduced to these places by ships, as they are sometimes collected and used as food aboard ship. Some say they were introduced into India, and the original habitat of the species is unknown. Perhaps the discovery that there are several species confounded under the name of *T. indica* may solve this problem.

There is a large species of Tortoise from India named *Manouria fusca*, the skull of which has somewhat the general form of that of *Testudo falconeri*; but the latter differs in having a broad, well-developed zygomatic arch, the arch in *Manouria fusca* being slender and weak.

2. Peltastes.

The alveolar margin of the upper jaw rather broad in the hinder part, interrupted in front by a broad concavity over the anterior internal nostril; the broad hinder part with a slightly raised ridge and a similar raised inner edge nearly parallel to the margin of the jaw; the front of the jaws has two slight prominences, separated by a slight notch. Lower jaw slender, with a short edge in front, and with a rather deep rounded groove with a very thin inner edge occupying the inner surface of the hinder half of the margin.

1. Peltastes elongatus.

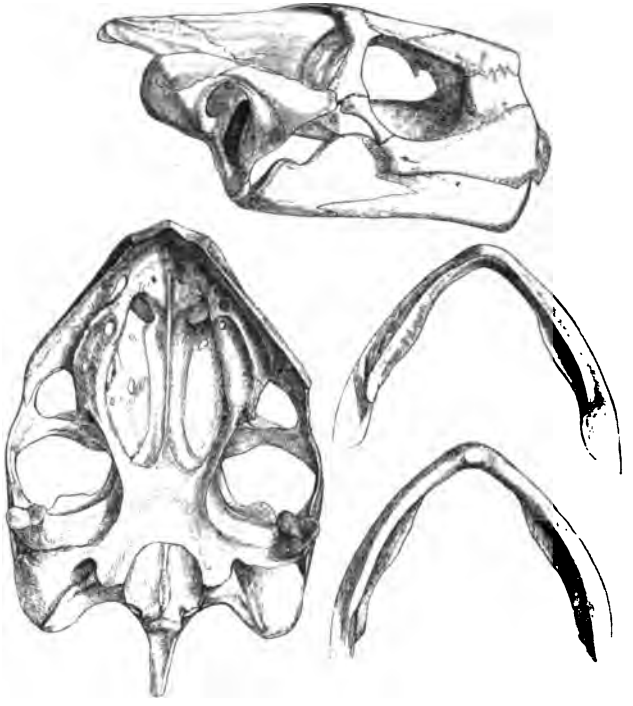
Testudo elongata, Gray, P. Z. S. 1861, p. 139.

Hab. India.

There are two skulls of this kind in the British Museum, the smaller sent by Professor Oldham with the thorax, which proves it to be the skull of *T. elongata*; the larger one was presented by the

brother of Dr. Falconer on the death of the Doctor. The larger skull (from Dr. Falconer) is $2\frac{1}{8}$ inches long, $1\frac{1}{8}$ inch wide; the other (from Professor Oldham) is 1 inch 11 lines long, and $1\frac{1}{2}$ inch wide.

Fig. 2.



Peltastes elongatus.

The thorax has all the characters of *Testudo*. Claws 5.4. The nostrils in a fleshy disk, with a slight notch in the upper edge of the beak, directly under and partly enclosing them. Palate deeply concave nearly the whole length, with three laminar longitudinal ridges in the centre of it. Ethmoid bone flat, with a more or less distinct raised marginal edge.

Young specimen in spirit, from Pegu, obtained from Mr. Theobald:—Thorax oblong, hemispherical, rather convex, dull brown; centre of dorsal shield blackish; sternum yellow, black in the centre; nuchal shield short, square; the four lateral hinder marginal shields produced into an acute point behind; the caudal shield broad, with a straight denticulated hinder edge, with a longer acute point at each end; legs and feet very dark olive.

Hab. Pegu (*Theobald*).

2. PELTASTES? SULCATUS.

Testudo sulcata, Miller, Gray, Cat. Shield Rept. B. M. p. 9.
Hab. Africa.

Skeleton in the British Museum. Skull imperfect, the nose and lower jaw having been crushed; but from what remains I suspect that it belongs to the genus *Peltastes*.

The skull is high and short, rather like the skull of *Testudo indica*. The central ridge on the palate is very high and laminar, much higher than the ridge on each side of it. Zygomatic arch broad and short and convex. Tympanic cavity imperfect behind; the mastoid bone is large and entirely hollow, forming a tympanic cavity. Length of skull from nose to condyle $2\frac{3}{4}$ inches, width at zygomatic arches 2 inches.

3. PELTASTES GRÆCUS.

Skeleton in the British Museum. Skull thin; the upper alveolar edge with a regular groove parallel to the margin, with a sharp ridge on the inner margin; the lower jaw with a regular triangular groove parallel to the whole of the lateral margin.

There is a very pretty specimen (young) of *P. græcus*, in spirit, in the British Museum, from the valley of the Minder, Asia Minor, presented by Mr. R. MacAndrew.

There are two skulls in the British Museum received from Mr. Yarrell as the skulls of *Testudo græca*. They are evidently of a very distinct species; they both belong to the genus *Peltastes*.

4. PELTASTES GEOGRAPHICUS?

Skull of a smaller species in the Museum of the College of Surgeons, without any number. From the size, probably the skull of *Testudo geographica*.

Skull short, broad, crown flat, broad, truncated in front; nose-hole very large, square; orbit large, lateral; zygomatic arch slender, rather convex; tympanic cavity oblong, erect; mastoid bone half-oval, hollow, labial edge even, with three slight teeth in front; the palate very concave; the alveolar surface very narrow in front, wider behind, with a very slight submarginal ridge on the hinder part of it. Lower jaw weaker; alveolar edge narrow, with a swollen dentary groove behind, about two-thirds of the length of the outer side of the bone, and with a very slightly raised point in front.

5. PELTASTES? MARGINATUS.

Skull figured as the *Caret*, Spix, Cephal. t. 4. f. 12–15.

4. PYXIS.

PYXIS ARACHNOIDEA, var. *oblonga*.

Skeleton in the British Museum, received from Leyden. It is exactly like the oblong specimens figured by Duméril and Bibron, Erp. Gén. t. 13. f. 2.

Skull small, thin; crown convex, arched; nose-hole very large, with a deep oblong notch in the upper edge; orbit very large; side of face shelving; the hinder edge of the orbit very thin; zygomatic arch very slender, short; tympanic cavity small, oblong, erect. Lower jaw slender. Beak of upper jaw with a smooth edge, and entire in front. The alveolar edges narrow, parallel, linear, simple; internal nostril like exterior. The thorax is very like that of some of the varieties of *Testudo stellata*, which is a very variable species both in size and surfaces; so that one might almost regard it as only a variety of it. The sternum is divided by a straight suture between the second and third pairs of plates; the second pair large, with a straight posterior edge. The abdominal or the fourth pair of plates very large; the first or gular plate small, narrower than the small anal ones.

5. Chersina.

Chersina angulata.

Testudo angulata, Owen, Cat. Osteol. M. C. S. p. 201. n. 1050 (skeleton), 1051 (skeleton of trunk and extremities).

Skeleton in the British Museum.

Back edge of the orbit thin; zygomatic arch short, rather slender from the middle part of the back edge of the orbit; tympanic cavity small; nose-hole large, square; nostril in a small granular disk; orbit large, lateral; upper beak with three anterior teeth, with a deep notch in the upper edge for the nose-disk. Lower jaw weak, the beak with a short central hook. The alveolar surface of the upper jaw linear, rather wider behind, with a very short central ridge. Lower jaw sharp-edged in front, rather wider on the hinder half of the margin, with a middle groove for the ridge on the upper jaw.

6. Kinixys.

Kinixys belliana.

Sheath of the upper jaw very high, with the nostril in a notch in its upper edge, between it and the front edge of the frontal shields; of lower jaw high, convex in front. Zygomatic arch (as seen through the skin in the stuffed specimen) convex, narrow from the back of the orbit to the upper front part of the oblong tympanic cavity.

7. Manouria.

Manouria fusca.

The stuffed specimen shows that the skull is oblong, forehead flat, face short; orbit large, lateral, rounded; zygomatic arch weak and thin, compared with the same bone in *Testudo*; the tympanic bone surrounding the ear is deep-seated; the mastoid is not prominent as is usually the case in Land-Tortoises.

II. The TERRAPINS or FRESHWATER TORTOISES.

After a patient examination of the skulls and skeletons and a revision of the specimens of the Freshwater Tortoises, or Terrapins,

in the British Museum, which have hitherto been referred to the family *Emydidæ* as defined in the 'Catalogue of Shield Reptiles in the British Museum,' published in 1855, I think they may be more conveniently divided into four very natural groups, which may be called families. These groups may be thus characterized:—

I. *The temporal muscle covered with skin, and generally protected by a narrow band-like zygomatic arch.*

1. CISTUDINIDÆ. The sternum united to the thorax by a cartilaginous lateral suture, and divided transversely into two moveable portions.

2. CHELYDRADÆ. The sternum united to the thorax by a bony symphysis, covered with from 7 to 11 shields; the middle portion fixed to the thorax; the front and hinder portions often separated from it by a transverse suture and moveable.

3. EMYDIDÆ. The sternum united to the thorax by a bony symphysis, solid, and covered with 12 shields.

II. *The temporal muscle covered with a bony hood formed by the extension of the zygomatic arch. Head very large. Sternal shields* 11.

4. PLATYSTERNIDÆ. Asiatic.

Fam. I. CISTUDINIDÆ or BOX-TORTOISES.

Head moderate, covered with a hard thin skin. Eyes lateral or subsuperior; pupil annular. Temporal muscle covered with the skin and (except in *Cistudo*) protected by a band-like zygomatic arch. Thorax covered with horny plates. Sternum very broad, attached to the thorax by a *ligamentous suture*, covered at the sides by the pectoral and abdominal shields, and divided across into two parts by a suture between the pectoral and abdominal plates. Sternal shields 12; the axillary and inguinal plates very small or wanting. The mastoid bone is excavated to form a tympanic cell.

I have little to add to my monograph of the species of the family printed in the 'Proceedings' of the Society for 1863, p. 173, except that the temporal muscle of the North-American genus *Cistudo* is only covered with skin, and the skull is destitute of any zygomatic arch between the orbit and the tympanic bone. In this respect, as well as in the position of the suture between the sternum and the thorax, this genus differs from the *Lutremys* of Europe and the genera found in Asia, all of which have a well-developed zygomatic arch for the protection of the temporal muscle.

The skull of *Lutremys* of Europe is figured by Cuvier, Bojanus, and Wagler. I am not aware that the skull of the very common *Cistudo clausa* has been figured or described. I have not seen any specimen of the Californian *Cistudo blondinsia*; but, judging from the figure of the animal in Holbrook's 'North-American Herpeto-

logy,' p. 39, t. 3, it appears to agree with the other American species. If it does, this is another reason why it should not be referred to the genus *Lutremys*, in which Agassiz has placed it in his 'Contributions.'

Tribe I. Cistudinina or North-American Box-Tortoises.

The temporal muscle only covered with skin. The skull without any zygomatic arch between the orbit and the ear-bones. Lobes of the sternum moveable at all ages, unequal; front shorter, almost free from the symphysis; the hind fixed, narrow, elongate.

1. Cistudo.

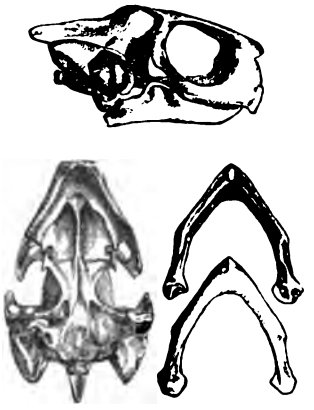
Cistudo clausa.

Skeleton in the British Museum.

Cistudo clausa, Owen, Cat. Mus. R. C. S. p. 192. n. 998 (skeleton), 1009 (skull of young).

Professor Owen describes a peculiarity in the neural arch of the atlas and the other vertebræ, and in the bones of the feet; but he does not notice the absence of the zygomatic arch in the skull.

Fig. 3.



Cistudo clausa.

Skull in College-of-Surgeons Museum, No. 999:—Nose-hole square, moderate; orbit excessively large; tympanic cavity oblong, erect; upper jaw with a straight lateral edge and a broad central part; palate flat, internal nasal apertures anterior, with a broad triangular concavity behind them with a central ridge; alveolar plate smooth, narrow in front, rather wider behind; alveolar surface of the lower jaw rather wide, concave.

Tribe II. LUTREMYINA or Old-World Cistudinidæ.

The temporal muscle protected by a well-developed band-like zygomatic arch. Sternal lobes more or less moveable, subequal; both lobes forming part of the lateral symphysis.

* *Lobes of the sternum moveable at all ages.*

2. PYXIDEA, Gray, P. Z. S. 1863, p. 175.

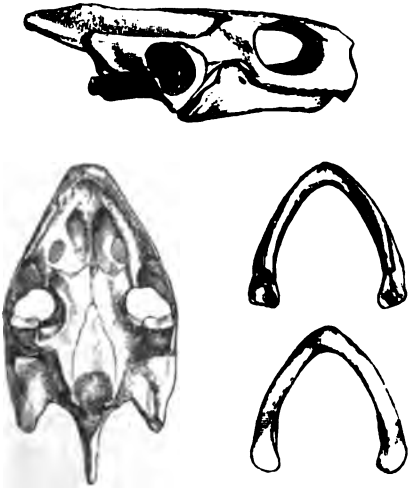
PYXIDIA MOUHOTII.

The skull (as seen through the skin in the preserved specimen) is trigonal, flat on the sides; the crown flat, triangular, short, scarcely produced behind the hinder edge of the orbit; truncate behind, rather more produced in the centre; zygomatic arch flat, weak, narrowed in the centre, much narrower than the orbit in front, and gradually dilating so as to be almost half as broad as the front edge of the tympanic cavity behind; orbit rather large, lateral; beak of the upper jaw entire, with a strong central hook.

3. CISTOCLEMMYS, Gray, P. Z. S. 1863, p. 175.

4. CUORA, Gray, P. Z. S. 1855, p. 198; 1863, p. 176.

Fig. 4.



Cuora amboinensis.

CUORA AMBOINENSIS.

Skeleton in the British Museum.

Skull rather elongate, rhombic, ovate; crown flat; nose erect; nose-cavity square, moderate; orbit large, oblong, transverse, lateral;

zygomatic arch complete, broad in front, narrowed behind and attached to the upper front part of the tympanic cavity; mastoid bone acute behind, keeled on the outer upper side, hollow; palate flat; internal nostrils anterior, with a short, oblong, slightly sunken concavity behind, each separated from the other by a blunt ridge; alveolar plate very narrow, linear, with a slight ridge on the inner margin; upper beak with a smooth edge and an entire, recurved, sharp tip. Lower jaw moderately strong, rounded below in front; lower beak with a simple sharp edge, rather produced and acute in front, with a slightly concave linear inner margin.

5. Pyxiclemmys, Gray, P. Z. S. 1863.

6. Lutremys, Gray, P. Z. S. 1855 & 1863.

The anatomy of the animal is well described by Bojanus. The skull is figured by Cuvier (Oss. Foss. v. t. 11. f. 13–16) and Wagler (in N. Syst. Amph. t. 5. f. xv.–xviii.). There is a skeleton in the British Museum; it has a well-developed zygomatic arch.

7. Notochelys, Gray, P. Z. S. 1863.

** *Lobes of the sternum moveable in the young state, often becoming anchylosed.*

8. Cyclemys, Gray, P. Z. S. 1855, p. 198, 1863, p. 177.

The thorax convex or depressed. The sternum flat or slightly convex, with the lateral symphyses well marked, truncated before and notched behind; the cross suture indistinctly marked and narrow, more or less obliterated in the adult, covered with the produced front edge of the ventral shields. The legs covered with large, band-like thin plates in front. The toes banded above, the front one short, webbed. The hind feet flattened, with the toes broadly webbed; the hinder edge keeled and angularly produced.

Cyclemys orbiculata.

Skeleton in the British Museum, from Java.

Skull elongate; zygomatic arch rather narrow, distinct. The alveolar surface of the upper jaw is narrow, with a well-marked longitudinal groove the whole length of the outer edge, and with a raised internal margin. Edge of the upper jaw rather arched on the side, with a small central tooth. The lower jaw with a simple, short edge shelving inwards in the centre, and with a rather concave surface on the inner side, and a sharp, produced central anterior process.

Fam. II. Chelydradæ.

Head large, covered with a thin, hard skin, or hard bony plates; temporal muscle large, covered with the skin, and protected on the edge by a well-developed band-like zygomatic arch. Eyes lateral or

superior, often rather close together. Thorax covered with horny plates. Sternum attached to the thorax by a bony symphysis, generally small (compared with the size of the thorax) and cross-like, sometimes large (nearly as big as the thorax); sternal shields variable in number from 7 to 11, never 12. Toes short, spreading, webbed to the claws, shielded above.

Skull with a well-developed zygomatic arch, extending from the orbit to the tympanic cavity, leaving a large wide space for the temporal muscles. Palate flat; internal nostrils anterior. Alveolar plate narrow, simple. Iris annular, without any spot on the sides.

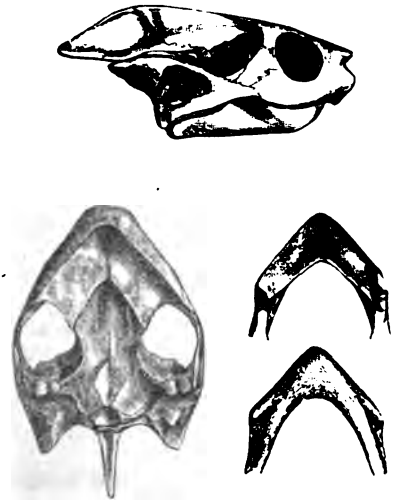
Section I. CRUCISTERNA. The sternum small, cross-like, narrow at the ends. Head and tail large.

Tribe I. CHELYDRAINA. Sternum solid, cross-like, acute before; sternal plates 10, with a broad one (the displaced abdominal plate) on each side over the produced sides of the sternum. Palate flat; internal nostrils anterior. Alveolar plate flat, rather broad.

1. MACROCHELYS, Gray, P. Z. S. 1855, p. 200 = *Gypsochelys*, Agassiz; (skull figured) Gray, Catalogue of Shield Reptiles, t. 38, 39, 40. The alveolar plate very broad. Eyes lateral, distant.

2. CHELYDRA, (skull figured) Gray, Cat. Shield Reptiles, t. 38 & 40. f. 2. Alveolar plate moderate. Eyes superior, rather close together.

Fig. 5.



Staurotypus salvinii.

Tribe II. STAUROTYPINA. Sternum cross-like, middle portion narrow, covered by the abdominal plates, and extended to the thorax; the front and hinder lobes often moveable on the central fixed one. Axillary and inguinal plates large; sternal plates 7; the gular, humeral, and pectoral plates of each side united; the femoral and anal small, united into one large ventral shield.

3. STAUROTYPUS, Wagler; Gray, P. Z. S. 1864, p. 127.

STAUROTYPUS SALVINII. (Fig. 5, p. 179.)

4. STAUREMYS, Gray, P. Z. S. 1864, p. 127.

Tribe III. AROMOCHELYINA. Sternum truncated in front, nicked behind; sternal shields 11; gular pair united into a narrow linear shield. Head large; zygomatic arch very broad, strong, arched.

5. AROMOCHELYS, Gray, P. Z. S. 1855, p. 199, = *Goniochelys* and *Omotheca*, Agassiz, 1857.

Section II. KINOSTERNA or Double-flapped Box-Tortoises. Sternum broad; sternal shields 8 or 11; the short process that unites the sternum to the thorax covered with the elongated axillary and inguinal plates; front and hinder lobes of the sternum generally moveable on the fixed central portion. Internal nostrils anterior. Alveolar plate flat.

Tribe IV. KINOSTERNINA.

7. SWANKA, Gray, Cat. Shield Reptiles.

8. KINOSTERNON, Fitzinger; Gray, P. Z. S. 1855, p. 398, = *Thyrosternon* and *Platythyra*, Agassiz, 1857.

CHELYDRA SERPENTINA, Gray, Cat. Shield Reptiles, t. 40. f. 2. B.M.

Skull depressed, very broad behind, crown rhombic, sides of the face shelving outwards; orbit very large, anterior, subsuperior on the shelving side of the face; the cavity for the temporal muscle very wide; the zygomatic arch very broad, broader than the orbit and much broader than the oblong erect tympanic cavity. The palate flat, internal nostrils in the front of the palate, the outer edge sharp, with a central anterior bony hook, and with a broad, flat, smooth alveolar plate parallel to the outer edges. The lower jaw moderately strong, narrow in front, with a conical central bony process, and with a smooth, shelving, rather concave band inside the sharp margin.

A young specimen in spirits, which was brought from North America, and presented by Mr. Arthur Russell, F.Z.S., is very beautifully painted on the sternum and underside of the margin of the

thorax. The sternum is black, with symmetrical variously shaped white spots, most abundant near the outer edge; the underside of the margin of the thorax is yellow, varied with dark edges to the shields. The animal is pale brown and more or less yellow-spotted. There is a series of triangular yellow spots on the lower edge of the lower beak.

AROMOCHELYS ODORATA.

An adult specimen, in spirits, in the British Museum, from North America, presented by Odo Russell, Esq.

Head large; nose produced, conical, acute, shelving to the mouth below; nostrils surrounded by a very small fleshy margin. Head dark olive, punctulated, with a narrow white streak from the upper and the lower edge of the nose, the upper streak edging the crown over the orbit to the nape; the lower diverging under the eye and tympanum and crossing the beak. The lower beak with a streak on each side of the centre in front, diverging to the chin on the lower edge of the horny sheath. Neck with streak of roundish confluent spots.

SWANKA.

The sternal lobes as broad, or nearly as broad, as the opening of the thorax, rounded in front, and rounded or very slightly truncated behind.

a. *The sterno-costal suture and the abdominal shields as long as the front sternal lobe; hinder lobe rounded at the ends. Thorax three-keeled. Vertebral plate elongate.*

1. SWANKA SCORPOIDES.

Kinosternon scorpoides, Gray, Cat. Shield Reptiles, p. 44.

Cinosternon scorpoides, Wagler, N. Syst. Amphib. t. 5. f. xxxi.–xxxvii. (skull); Owen, Cat. Osteol. Mus. C. S. p. 191. n. 992 (skeleton).

Skeleton in the College of Surgeons, No. 992. Skull thin, light; nose rather produced; crown rhombic, flat; sides of face flat; orbit moderate, lateral; zygomatic arch very broad, strong, nearly flat. Palate flat. The alveolar edge smooth, rather wider behind. Internal nostrils close, anterior between the fronts of the alveolar plates. Lower jaw rather strong, broad, and convex, in front more slender than the sides; the upper edge broad, rather concave, with an acute central process.

The two small specimens from M. Sallé both with rather rough and worn dorsal shields. One of them is keeled the whole length of the back, and the other only keeled over the hinder part of the back. They both have the front lobe of the sternum very nearly of the same length as the rather long abdominal shield. I cannot take on myself to say if they are of two species or only varieties of the same without having more information respecting them and the development of the animals.

b. *The sterno-costal suture and the abdominal shields not so long as the front lobe of the sternum; hinder lobe rounded behind. Thorax not keeled. Vertebral plate longer than broad.*

2. SWANKA MACULATA.

The sides of the head, neck, and throat grey, with a few indistinct dark-edged subcylindrical spots, largest on the front of the chin; fore legs with three cartilaginous ridges. Thorax dark olive. Sternum-ridges and lower side of margin yellow, with dark spots on areoles of shields. The fore and hinder ends of sternum regularly rounded. Vertebral shields longer than broad.

Hab. Mexico (*Sallé*); Vera Paz (*Salvin*).

A specimen in spirit, collected by M. Sallé in Mexico. The sternum and underside of the margin pale yellow; the areola of the third and fourth pairs of sternal plates, which are situated on the outer side of the anterior transverse suture, is surrounded by an irregular-shaped brown ring. A more or less obscure indication of such a ring is to be seen surrounding the areola of the other sternal plates. The areola is on the outer hinder side of all the sternal shields, except of the fourth or abdominal pair, where it is on the front outer angle.

Two large specimens in spirit, from the Lower Forest of Vera Paz, received from Mr. O. Salvin. They are like those from Mexico, but darker below. The head is large, very hard, and the beak and temporal muscles very strong. The two beards are in front of the chin, quite near the hinder edge of the lower beak. The zygomatic arch is wide, strong, and rather convex. Toes very strong, short, with a few bands above near the ends, with narrow webs to the claws. The fore legs with the skin smooth, and three oblique, arched, sharp-edged horny cross ridges just above the feet, the lower one the shortest.

In the band over the orbit this species agrees with *Kinosternon hippocrepis*, figured from a young specimen, Gray, Cat. Shield Rept. t. 20 c. f. 3, 4; but the sternum is much broader than in that species, and more completely closes the cavity of the thorax. Thorax about 4 inches long.

A large well-grown specimen in spirit in the British Museum, received from M. Brandt of Hamburg as from North America. The skull is pale olive, speckled with darker brown; thorax pale bright brown, the underside of the margin of the thorax being uniform blackish brown.

Four specimens in spirit, obtained by M. Sallé at Papalco Apoia; but it is not stated that they were from the same district. If they were, it will go to prove that the height of the front lobe, as compared with the length of the abdominal shield, is probably a character of age and not of specific distinction. They each have a speckled or mottled neck, and are without any head-streak. The two larger specimens vary in other particulars, but probably from local circumstances, as one has a good smooth shield, and of the other the shield is rugose and covered with mud and algæ, and the whole specimen

looks as if it had lived in dirty water. They both have the front lobe of the sternum about one-fourth of its length longer than the abdominal shields, which are short.

c. *The sterno-costal suture and the abdominal shields not so long as the front lobe of the sternum; the hinder lobe of the sternum slightly truncated behind. Thorax not keeled. Vertebral plates as broad as long.*

3. SWANKA FASCIATA.

Head olive, with a dark-edged pale streak from the nostril, over the eye, to the upper part of the tympanum (it is narrow before, and wider behind the eyes), and with a streak from the lower edge of the orbit, over the angle of the jaw on the side of the neck; occiput and back of neck white-spotted. The lobes of the sternum are rather narrower than the opening of the thorax.

Hab. —— ? (from *M. Brandt*).

KINOSTERNON.

1. KINOSTERNON PENNSYLVANICUM.

The skull in the British Museum is depressed, ovate triangular, crown rhombic, narrow behind, short, only slightly produced behind the orbits; orbit lateral, large; zygomatic arch broad, rather convex and prominent behind, including the whole front edge of the small tympanic cavity; palate deeply concave in the centre, with three longitudinal ridges on each side of the central line, very narrow behind; upper jaw with a broad intermediate ledge edged with a slightly raised ridge; lower jaw with a shelving edge to the back, and hooked in front.

2. KINOSTERNON HIRTIPES, Wagler, N. Syst. Amph.

The skull is figured by Wagler in N. Syst. Amph. t. 5. f. xxxi.–xxxviii. The figure is very like the skull of *Chelydra*.

Fam. III. EMYDIDÆ or TRUE TERRAPINS.

When my two papers on the skulls of Chelydradæ and Trionychidæ were published, I hoped that some of the American zoologists, who have so many species of one group (Emydidæ) living in their country, and consequently at their command, would take up the subject. But they have not done so; and as the British Museum has received a few more specimens, I have determined to do the best I can with the specimens at my command, and the figures of the specimens that have been published by Wagler and others.

It is to be regretted that Agassiz, in his notes on the American Terrapins in his 'Contributions,' has confined his attention so completely to the external characters, and the development of the young animal. He does make some observations on the form of the jaws; but they are so indistinct and general that they afford very little information.

The family Emydidæ, as now restricted, may be thus divided:—

Section I. AMPHIBIOCLEMMYS. The alveolar surface of the upper and lower jaws linear, narrow, with a sharp outer edge. Internal nostrils in front of the palate. Toes short, strong, erect, and included in the skin to the claws, or more or less expanded and united by a narrow scaly webb to the claws. These species are amphibious, and some of them more or less terrestrial.

Subsection 1. *The temporal muscle only covered with skin, without being protected by any band-like zygomatic arch in the skull uniting the orbit to the ear-cavity of the temporal bone. Eyes lateral. Toes short, strong, conical, free or very slightly webbed. Legs covered with short triangular scales.*

Tribe I. GEOEMYDINA.

1. GEOEMYDA. The alveolar surface of the jaws has not been examined.

2. MELANOCHELYS.

Subsection 2. *The temporal muscle protected on the outer side by a distinctly band-like zygomatic arch extending between the orbit and the tympanic cavity.*

Tribe II. GEOCLEMMYDINA. Toes short, enclosed in the skin to the claws. Legs covered with thick, hard, triangular scales. Eyes lateral (or subsuperior); pupil annular. Jaws with a narrow alveolar plate. Internal nostrils in front of the palate.

* *Eyes lateral.*

3. GEOCLEMMYS, Gray, Cat. Shield Rept. p. 17.

** *Eyes subsuperior, on the margin of the crown.*

4. NICORIA, Gray, Cat. Shield Rept. p. 17.

5. RHINOCLEMMYS, Fitzinger.

Tribe III. EMYDINA. Toes strong, short, spreading, covered above with bands of transverse shields, united by a narrow web to the claws. Jaws with a narrow alveolar surface. Internal nostrils in the front of the palate. Head covered with a thin, hard skin. Eyes subsuperior, with a dark spot on each side of the pupil.

6. EMYS.

7. CLEMMYS.

8. CHRYSEMYS, Gray, Cat. Shield Rept. p. 32.

9. GRAPTEMYS, Agassiz. *Emys* §§, Gray, Cat. Shield Rept. 29.

10. CALLICHELYS, Gray, Ann. and Mag. N. H. xii. 1863, p. 176.

11. DEIROCHELYS, Agassiz.

I have not been able to examine the alveolar edge of the last three genera; they may belong to the next tribe,

Section II. HYDROCLEMMYS. The alveolar surface of the upper and lower jaws broad, expanded, covering more or less of the sides of the front of the palate, so that the internal nostrils open near the middle of the palate. Lower jaw strong. Toes webbed.

Tribe IV. MALACLEMMYDINA. The alveolar surface smooth. Toes strong, spreading, covered with a soft skin. Eyes subsuperior; pupils annular, without any lateral spot.

I. *The upper or alveolar surface of the under jaw broad, concave, rather narrower on the hinder part of the side. Internal nostrils subposterior, behind the middle of the alveolar surface.*

* *Front of the palate, before the internal nostrils, with a broad central groove. Eyes subsuperior* (Estuarian).

12. MALACLEMMYS, Gray, Cat. Shield Rept. p. 37.

** *Front of the palate, before the interior nostrils, simple. Eyes lateral.*

13. DAMONIA.

II. *The upper or alveolar surface of the under jaw wide, angular, concave in front, narrow and sharp-edged on the sides behind. Internal nostrils subanterior.*

14. GLYPTEMYS.

III. *The upper or alveolar surface of the lower jaw narrow, sharp-edged in front, wider and flattened on the hinder part of the sides. Internal nostrils subanterior.*

15. BELLIA. Skin of neck and limbs with very minute granular scales.

Tribe V. BATAGURINA. Head large, nose rather produced; angles of the mouth covered with minute scales. The alveolar surface of the jaws very broad, with one or two strong ridges or grooves. Internal nostrils subposterior. Toes elongate, weak, expanded, covered with small scales, united by broad webs to the claws; hind feet fringed. The cavity of the thorax much contracted on each side at each end by broad, erect, internal, bony lateral plates. Asia.

A. *Claws* 4 . 4. *Head covered with a soft skin, divided into small shields on the crown and temple. Nose conical, produced. The chin with a series of distinct shields at the under edge of the beak. The alveolar surface of the jaws very wide, with two well-marked subparallel ridges. Gular shield short, band-like.*

16. TETRAONYX. *Batagur*, Gray, Cat. Shield Rept. p. 35.

B. *Claws* 5 . 4. *Head covered with a thin skin. Nose subconical, more or less produced. Alveolar surface of the jaws with a single well-marked angular ridge. Gular shields triangular, moderate.*

a. *The alveolar surface of the jaws very wide and well-developed, with a denticulated ridge parallel to the outer edge. The internal edge of the alveolar surface, which edges the internal nostrils, is denticulated; it must not be confounded with the second ridge in the genus* Tetraonyx.

17. KACHUGA, Gray, Cat. Shield Rept. p. 35.

b. *The alveolar surface narrower, with a single well-marked acute ridge. Back of the thorax high, subangular; keels subnodose. The sternum high, keeled on each side.*

18. PANGSHURA.

Tribe VI. PSEUDEMYDINA. The alveolar surface of the jaws very broad, with one or two strong ridges or grooves. Internal nostrils subposterior. Toes elongate, slender, covered with a few small bands, united by broad webs to the claws. Hind feet fringed. The cavity of the thorax simple, not much contracted at the ends. America.

* *Sternal costal suture simple, normal.*

19. PSEUDEMYS, Gray, Cat. Shield Rept. p. 33.

20. TRACHEMYS, Agassiz.

** *Sterno-costal suture with four sterno-lateral shields.*

21. DERMATEMYS, Gray, Cat. Shield Rept. p. 49.

Tribe I. GEOEMYDINA.

1. GEOEMYDA.

GEOEMYDA GRANDIS. The skull (as seen through the skin) in a very large old and a younger stuffed specimen, like the skull of *Cistudo*, is destitute of any zygomatic arch uniting the orbit to the ear-cavity of the temporal bone, the temple and temporal muscles behind the orbit being only covered with a skin protected by thin, small, tessellated plates.

A second half-grown specimen agrees with the very large old specimen above noticed in the absence of the zygoma.

2. Melanochelys.

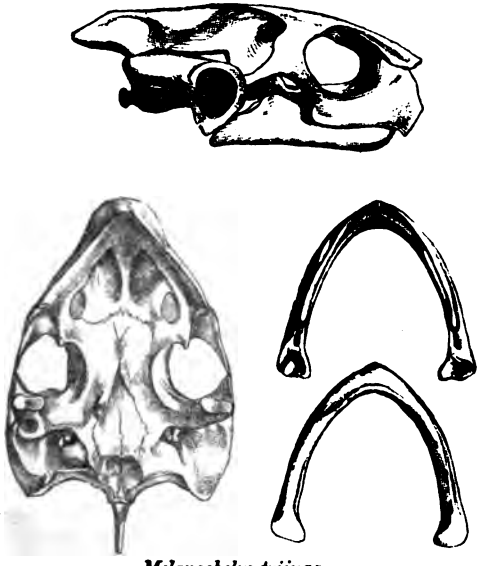
The thorax oblong, three-keeled. Vertebral plates broad, six-sided. Skull rather depressed; zygomatic arch imperfect, tapering behind, and not reaching the tympanic bone; lower jaw weak; the alveolar surface narrow, linear. Toes strong, webbed to the claws.

Melanochelys trijuga.

Emys trijuga, Gray, Cat. Shield Reptiles in B.M. t. 37. f. 2 ("*E. subtrijuga*," not good, zygomatic arch too broad and extending to the ear-bone).

Skull (as seen through the skin in the stuffed specimen) ovate, elongate, triangular in front; sides of the face nearly erect; orbit lateral, subsuperior, large; nose rather narrow; crown rather convex, elongate rhombic, narrowed and produced behind; from the

Fig. 6.



Melanochelys trijuga.

hinder point to the back edge of the orbit more than once and one-half the distance of the latter from the end of the nose; zygomatic arch rudimentary, very slender, linear, extending from the middle of the back edge of the orbit to the upper part of the front edge of the large tympanic cavity, which has a narrow, rounded edge; sheath of the upper jaw with a simple straight edge, without any

central hook; the lower jaw moderately strong, covered in front with a convex horny sheath. Toes strong, included in the skin to the claws, covered above with band-like shields.

A skull received from Mr. Oldham, which appears to belong to this species, may be thus described:—Skull depressed, nose nearly erect from upper lip; crown rather convex, tapering behind; orbit large, circular, lateral, subsuperior; zygomatic arch *imperfect*, rather broad in front, about half as broad as the back edge of the orbit, and tapering off behind just before it reaches the upper edge of the small circular tympanic cavity; palate flat, broad, with a short shallow concavity behind each internal nostril; the lateral edge of the upper jaw nearly straight, with a slightly produced broad central beak, and with a narrow alveolar plate having a slight groove parallel to the short outer edge for the greater part of its length; lower jaw weak, erect on the side, shelving in front, with a central conical prominence in front, and with a straight, thin, sharp edge, without any dilatation of any kind.

Tribe II. Geoclemmydina.

3. Geoclemmys.

1. Geoclemmys guttata.

A beautiful skeleton is in the British Museum, and a skeleton without lower jaw in the Museum of the College of Surgeons, no. 977*a*.

Skull thin, crown slightly arched, nose erect; orbit lateral, very large; zygomatic arch broad, short; palate flat behind; lower jaw slender; side edges of the upper jaw slightly arched, and with a notch in front; alveolar groove very narrow, even; mastoid bone conical, produced, hollow. Toes short, strong.

2. Geoclemmys sebæ.

Specimen in spirit in the British Museum. Nose rather produced, shelving to the lip below, triangular, soft, in a notch on the upper edge of the upper beak; alveolar process linear, marginal; upper beak with a straight edge and a very slight acute central notch, lower hooked and acute in front. Toes short, included in the skin to the base, but slightly separate, conical, with a central series of narrow six-sided scales above; web very slight, if any.

3. Geoclemmys muhlenbergii.

An adult specimen in spirit, from North America, with the yellow spots on the occiput well-marked. The beaks have an even lateral edge and an acute notch in the centre in front; the lower beak convex and rounded below; crown rather convex, dark olive, with black spots. Toes united in the skin to the claws, with a few band-shaped shields above. The upper alveolar surfaces rather broadly linear, with a submarginal internal ridge; the lower with a continuous submarginal groove, rather broad, and produced, with a sharp edge, in front.

4. GEOCLEMMYS CALLOCEPHALUS, Gray, P. Z. S. 1863, p. 254.

The upper beak with an acute central notch; the alveolar surface linear, with a submarginal ridge on the upper, and a narrow groove in the lower jaw.

4. NICORIA.

NICORIA SPENGLERI.

Skull (as seen through the skin in the stuffed specimen) narrow, rather acute in front, flat on the sides; orbit very large, lateral; zygomatic arch broad, flat, as wide as the back edge of the orbit, as wide behind as the rather small tympanic cavity; lower jaw rather weak, with a large inferior space, rather rounded in front. The sheath of the upper jaw is strongly and acutely hooked at the tip, and entire on the edge. Palate ——? The toes enclosed in the skin to the claws, covered with band-like shields.

5. RHINOCLEMMYS, Fitz.

This genus may be divided thus:—

* *The sternum flat longitudinally, and very slightly elevated at the sides under the sterno-costal symphyses.*

1. RHINOCLEMMYS ANNULATA.

** *The sternum slightly arched longitudinally, and much elevated at the sides under the sterno-costal symphyses.*

2. RHINOCLEMMYS SCABRA.

Crown flat, with a spot before each eye, and an oblong band on the crown, over back part of orbits.

Skeleton in the British Museum received from the Utrecht Museum. Skull elongate, rather solid; nose erect, shelving beneath; crown rather convex; orbit large, circular, lateral; sides of the face nearly erect; zygomatic arch very broad, forming part of the temple above, slightly convex on sides; mastoid bone rather elongate; edge of upper beak straight, with a slight central notch. Palate flat; internal nostrils anterior, with a short, rather deep oblong concavity behind each, separated by a strong central ridge. Alveolar surface narrow, linear, with a slight sunken groove, edged internally by a slightly raised sharp edge. Lower jaw wider; upper surface slightly prominent in front, with a sharp edge having a slightly concave linear depression on the inner side. Toes short, strong.

Specimen in spirit in the British Museum. Skull ovate rhombic, rather elongate, sides of the face flat, erect; nose short; orbit large, subsuperior, on the outer edge of the crown; crown rhombic, produced, and acute behind; rather longer from the hinder edge to the hinder edge of the orbit than from that part to the end of the nose; zygomatic arch thin, flat, dilated, forming part of the crown in front, narrow and only attached to the upper front part of the small subtrigonal tympanic cavity; upper jaw with a narrow double edge, the edges parallel and separated by a rather deep narrow groove; lower

jaw moderate, nearly erect and with a narrow simple edge rather produced into an acute point in front. Palate flat, broad, with a triangular flat plate over the interior nostrils in front, and with a slight central keel with a slight concavity on each side just behind the openings of the internal nostrils. Toes short, imbedded in the skin to the base of the claws.

Tribe III. Emydina.

6. Emys.

1. Emys japonica.

An adult specimen from Japan, in spirit. Thorax oblong; dorsal shields broad, six-sided, with a well-marked large central areola of the same shape and with a few concentric ridges, and more or less distinct radiating grooves and some rather nodulose radiating ridges, dark-brown or black varied with orange rays or lines, the areola of the marginal plate near the outer hinder edge; sternum and lower side of the margin uniform black. Legs and tail uniform black. Head ovate rhombic, longer than broad, crown and sides olive-black. Neck with longitudinal ridges and conical short spine-like scales, those on the back of the neck being the largest. Crown flat; eyes lateral, subsuperior; nose truncated, rounded in front; edge of the beak even, without any central notch; lower beak weak. Alveolar surface narrow, linear, with a submarginal ridge on the upper, and a groove on the lower jaw; lower jaw scarcely thick, with the edge produced into a sharp point in front. Tail conical, elongate, flat above, with a pale streak on each side of the upper surface. Front legs covered with rather large scales; the hind legs and feet spinulose.

2. Emys tristrami.

Head oblong trigonal, half as long again as wide (to the end of crown-ridge); eyes subsuperior; temple and jaws with a few dark-edged pale sinuous lines; temple, between orbit and the wide zygomatic arch, short, flat; lower jaw strong; alveolar surface of both jaws linear, marginal; internal nostrils subanterior.

Hab. Holy Land.

See also *Emys* undetermined, Gray, Cat. Shield Rept. in B. M. t. 35. f. 3 (skull).

7. Clemmys.

Clemmys caspica.

Clemmys caspica, Wagler, Nat. Syst. Amph. t. 5. f. iv., v. (skull figured).

A specimen in spirit (from Arabia Petræa?), purchased of the Rev. H. Tristram. Thorax oblong; nuchal plate broad. The upper surface of each marginal plate with a subcentral darker-edged cross streak, sometimes dilated and extended into a streak along the upper edge of the plate. Back pale olive, with indistinct paler yellowish reticulated lines edged with black; sternum and underside of the margin black, with irregular-sized subtriangular yellow spots on the

outer side of each sternal shield and a pale blotch on the outer edge of the inguinal shield. Head and neck olive, sides of the neck and throat with numerous black-edged pale parallel streaks. Legs with irregular rather broad black-edged pale streaks. Beaks olive, rounded in front; upper with a slight acute central notch with a slight tooth on each side of it.

8. Chrysemys.

Chrysemys picta.

Emys picta, Owen, Cat. Osteol. Mus. C. S. p. 189. no. 964 (skull and thorax).

Skull in the Museum of the College of Surgeons, no. 964. Skull rather solid, crown very flat; orbits large, oblong, forming part of the crown-edge; nose-hole moderate, labial edge even, with two small close teeth quite in front; zygomatic arch broad, strong, convex externally; palate flat; internal nostrils quite anterior, with a concavity in front between, and with a slight oblong concavity behind each, separated by a slight raised central ridge; lower jaw depressed, rather broad in front and on the sides, rather convex externally (the jaws are fastened together).

There is also a skull of a smaller specimen, no. 967. The alveolar surface of the upper jaw linear, with a slight narrow raised ridge parallel to the outer edge, and occupying the middle, half its length. Lower jaw depressed; alveolar surface linear, with a well-marked groove with a sharp raised edge on each side for the greater part of its length, except in front, where the jaw is thinner, simple, and acute.

11. Deirochelys.

? Deirochelys reticulata, Agassiz.

A young specimen in spirits, received from Mr. Arthur Russell, from North America, under this name. It is most beautifully ornamented, both on the back and sternum, with dark-edged rings and irregular marks; the beaks are most beautifully ornamented with regular black-edged yellow streaks diverging from the nose across the lower beak, so as to form the lines on the throat; the underside of the lower beak is convex. The alveolar surface of the upper and lower jaw rather wide; the upper with a very slightly raised narrow submarginal ridge; the lower jaw with a regular well-marked continuous submarginal groove.

Tribe IV. Malaclemmydina.

12. Malaclemmys.

Malaclemmys concentrica.

Two skeletons in the British Museum. Skull broad, ovate trigonal, rather depressed, sides of the face rounded; crown flat, rhombic, hinder end narrow, extended into a crest, as long from the hinder edge of the orbit as that part is from the end of the nose;

orbit lateral, superior, on the outer edge of the crown; zygomatic arch strong, broad, convex, rather wider than the orbit in front, so much so that the circular tympanic cavity behind is rather contracted in the middle. The palate flat; internal nostrils near the centre of the palate, from under a rather convex plate in front, and with a central keel in the wide sunken space behind them. The alveolar surface of the upper jaw very wide, quite simple, occupying all the front of the palate but a central triangular space, without any internal ridge. The lower jaw very strong, flattened out in front and on the sides of the front, without any gonyx, the upper edge simple, with a very broad, shelving, concave inner aveolar surface and an acute central point. Toes rather elongate, webbed to the claws, with band-like shields above.

Fig. 7.

Malaclemmys concentrica.

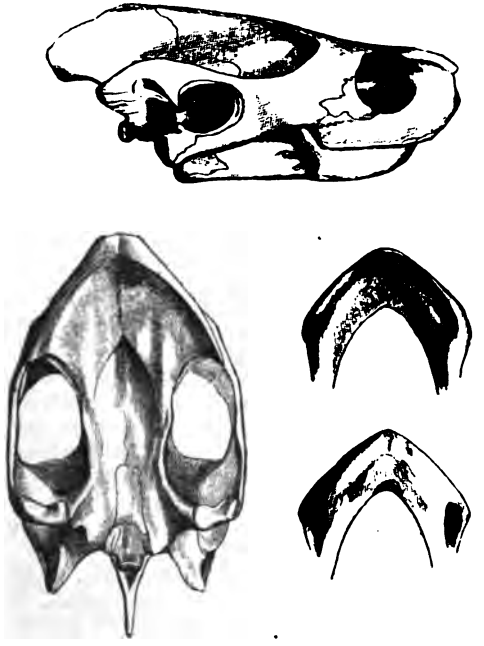
Skull in the Museum of the College of Surgeons, no. 1057, without horny sheath. The palate flat; the aveolar process very wide, smooth, rather convex on the front part of the inner edge. The part of the palate behind the internal nostrils broad, slightly sunken,

flat, with three rather thick ridges, the central one long, the side ones short. The lower jaw very strong, thick, bent up in the centre in front and acute; the alveolar surface very broad, slightly concave the whole length of the sides. Length 1 inch 7½ lines, width 1 inch 5 lines.

13. Damonia.

Head very large, covered with a hard thin skin. Nose high, truncated; nostrils in a small disk notched out on the upper edge of the very high convex upper beak. Eyes lateral, subsuperior. Sides of the face shelving outwards below. Zygomatic arch strong, wide. The labial edges of the upper beak slightly arched, bent inwards. Lower jaw very strong, convex and rounded in front below, with a strong, sharp-edged, broad central tip. The alveolar disk of the upper and lower jaws very broad, the upper flat, and the lower

Fig. 8.



Damonia macrocephala.

concave. The internal nostrils subcentral, with a short oblong sunken space behind each. The thorax oblong, more or less distinctly three-keeled; the vertebral shields six-sided, as broad behind as before; marginal plates dilated over the hinder limbs. Sternal

plates regular. Toes strong, covered with band-like shields, united, to the claws, by a very narrow web covered with scales; hind toes longest. Asiatic.

The skull and palate similar to those of *Malaclemmys*, but the feet, shell, and head different.

1. DAMONIA MACROCEPHALA.

Geoclemmys macrocephala, Gray, P. Z. S. 1859, p. 479, t. XXI., 1861, p. 139.

Emys trijuga, Mus. Utrecht.

Hab. Siam and Cambogia.

The skull (as seen through the skin in the stuffed specimen) has a very broad, strong, rather convex zygomatic arch between the orbit and the ear-cavity; crown broad, flat, trigonal, broader and truncated behind.

Skeleton in the British Museum. Skull large; nose rather produced, conical; crown flat, rhombic, short; orbit lateral, very large; zygomatic arch very broad, short; palate slightly concave; internal nostrils near the middle of the palate; alveolar surface of the upper jaw rather arched, very convex. The lower jaw curved upwards and acute at the tip, with a very broad, rather concave alveolar surface the whole of the length, broader and most concave in front.

There is a second skeleton, of a small specimen, of this species, which, from the bad state of the shell, must have been kept in confinement for a long time.

2. DAMONIA REEVESII.

Emys reevesii, Gray, Syn. Rept. 73.

Geoclemys reevesii, Gray, Cat. Shield Rept. p. 18.

Skull (as seen through the skin in the stuffed specimen) small, ovate trigonal; crown rhomboid, rather convex, produced in the centre behind, about as long from the back edge of the orbit as from the nose to that part of the skull; orbit rather large, lateral; zygomatic arch short, broad, wider than the back of the orbit, and confluent with the crown above, not quite so wide as the front edge of the tympanic cavity behind. Sheath of the upper jaw simple, without any central hook. Lower jaw strong, convex in front, and with a convex horny sheath. Toes enclosed in the skin nearly to the claws, covered above with band-like shields.

An adult specimen in spirit, obtained from Mr. Blyth, most probably from India, but received without any habitat. Head large, strong; crown flat and short, not so long as wide; nose high, rather shelving to the mouth; eyes lateral; cheek flat; temple and zygomatic process convex. Upper beak very large and thick, with a straight edge without any central notch; the lower curved and acute in front, convex beneath. The alveolar processes very broad; upper rather convex and rugose; lower rather concave and broad the whole length of the side of the jaw. Neck and feet lead-coloured, without any streak. The thorax solid, thick, oblong, with three very ob-

scure keels, the central one broad, and the lateral ones narrower, about one-fourth of the width of the shield from the upper edge. The back dull olive, the chest black, the underside of the margin pale yellowish. Toes strong, united in the skin to the claws, with a few shields above; claws acute, black. Tail moderate, conical, tapering at the end. The 1st vertebral plate rather longer than wide, narrowed behind, with a concave hinder edge; the 2nd, 3rd, and 4th vertebrals as wide as long, with a rounded front and an arched hinder edge, the 2nd and 3rd wider behind than in front, and the 4th wider in front than behind.

This specimen chiefly differs from typical *D. reevesii* in the larger size, the larger head, and a difference in the form of the dorsal shield; but all this may depend on age and nourishment; and what were considered adult *D. reevesii* may have been young animals.

3. DAMONIA HAMILTONII.

Geoclemys hamiltonii, Gray, Cat. Shield Rept. p. 17.

Skull (as seen through the skin in the stuffed specimen) ovate trigonal, sides flattened; orbit lateral, rather large; crown rhombic, rather convex in the middle, concave over the orbits, produced behind, about once and a half as long from the back edge of the orbit as from that point to the tip of the nose; zygomatic arch very short, broad, confluent with the crown above, and much wider than the orbit in front, as wide as the tympanic cavity behind; sheath of the upper jaw simple, without any central hook; lower jaw strong, convex, and covered with a horny sheath in front; toes enclosed in the skin to the claws, with band-like shields above, claws small.

A specimen in spirits in the British Museum. The head moderate; nose with each nostril in an oblong soft space; the upper beak with a simple short edge, rounded in front; lower beak with an acute produced centre. Alveolar surface of the upper jaw wide, linear, convex and rugose on the sides; alveolar surface of the front of the lower jaw broad, rugose, concave in the upper surface, narrow on the sides. Toes broadly webbed, crenulated on the edges, with a series of hexangular larger scales on the upper surface.

This animal has the feet of *Batagur*; but the cavity of the skull is not contracted at the ends as in that group.

4. DAMONIA NIGRICANS.

Emys nigricans, Gray, Cat. Shield Rept. p. 20, t. 6.

Skull (as seen through the skin of the stuffed specimen) oblong triangular, sides of face flattish; orbit lateral, rather large; crown nearly flat, with an arched hinder edge, which is about as far behind the hinder edge of the orbit as that part is from the end of the nose; zygomatic arch flat, as wide in front as the back edge of the orbit, and as the front edge of the tympanic cavity behind; the sheath of the upper jaw rather notched at the tip, with a simple edge; lower jaw broad, convex, and covered with a broad horny sheath in front. Toes slightly webbed to the claws.

14. GLYPTEMYS.

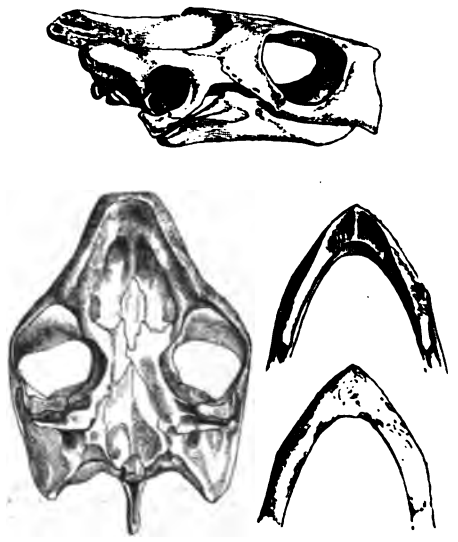
GLYPTEMYS PULCHELLA, Agassiz.

Geoclemys pulchella, Gray, Cat. Shield Rept. p. 18.

The skeleton of a large specimen which had been in confinement, with the bones separate, in the British Museum, prepared by Dr. Günther. The skull with a broad, very flat forehead, and high, square nose; the latter granular, the lower half sunk in a deep wide notch in the upper edge of the upper beak. Upper beak high, with an acute central notch. Lower jaw strong, thick and convex in front. Zygomatic arch strong, convex. Orbit large, quite lateral, with a narrow lower hinder edge. Palate concave in front, flat behind; internal nostrils large, anterior. The alveolar surface of the upper jaw rather broad, smooth, with a slight concavity in front; of the lower jaw broad in front, narrower on the sides, regularly concave.

The broad front of the alveolar surface of the lower jaw separates these animals from the genus *Geoclemmys*; and therefore I have adopted Agassiz's generic name.

Fig. 9.



Glyptemys pulchella.

A large specimen in spirit in the British Museum. Skull rather thin, ovate rhombic, sides flat; orbit very large, subsuperior, in the upper margin of the crown; crown rhomboid, produced into an acute point behind, the hinder end as far from the hinder edge of the orbit as that part is from the end of the nose; zygomatic arch short, broad, rather broader in front than the back edge of the orbit,

about as large as the small circular tympanic cavity behind, but attached to the temple rather below the upper margin of the tympanic cavity. The upper jaw (with the sheath on) has a sharp edge with a broad internal groove edged on the inner side by a slight ridge. Palate rather concave, especially in front. The sheath of the upper jaw with a slightly bidentate notch in front, and simple straight sides. The lower jaw strong, erect on the sides, shelving, convex, and rounded in front, covered with a horny sheath, and with a central acute point.

15. Bellia.

Head very large, short, covered with a thin and hard skin, over the orbit and other fleshy parts covered with very small granular scales. Nose high, truncated in front; nostrils in the upper edge of the horny beak. Beak of the upper jaw high, convex, with broadly arched dependent sides and a central notch. Lower jaw strong, convex in front, with a central acute sharp-edged point. Thorax oblong; back three-keeled; vertebral plates elongate subtrigonal, areola of discal shields with a narrow longitudinal ridge. Toes strong, expanded, with transverse band-like shields, united, to the claws, by a narrow scaly web. Asiatic.

Skull solid. Nose-hole square; the front and sides of the upper lips shelving inwards. Orbit large, oblong, subquadrangular, lateral. Palate flat, internal nostrils anterior, with a short oblong concavity behind each. Alveolar plates moderate, band-like, rather wider behind, rather concave. Lower jaw short, strong, convex in front, and wide and thick behind, with a conical central prominence and a broad flat alveolar edge that is broader behind and with a very slightly raised outer margin.

Bellia has the large head, with dependent lips, of *Damonia*; but the alveolar surface of the upper jaw is not so wide, and the inner nostrils are anterior.

Bellia crassicollis.

Emys crassicollis, Bell; Gray, Cat. Shield Rept. B. M. p. 20.

Skull (as seen through the skin of the stuffed specimen) broad, depressed, ovate, sides shelving outwards; orbit subsuperior, on the lateral edge of the crown; crown flat, rhomboid, broader in front, rather produced and narrow in the middle of the hinder edge, which is almost as far from the back edge of the orbit as that part from the end of the nose; zygomatic arch short, broad, convex, forming part of the crown, and wider than the back edge of the orbit in front, not quite so wide as the front edge of the tympanic cavity behind; edge of tympanic cavity rounded; sheath of the upper jaw very strong, and high in front and on the sides, lower margin truncated in the middle, and larger and arched on the sides; the lower jaw strong, short, broad in front, covered with a broad horny sheath. Toes strong, short, webbed to the claws, covered with band-like shields. Feet like those of the American *Emydidæ*.

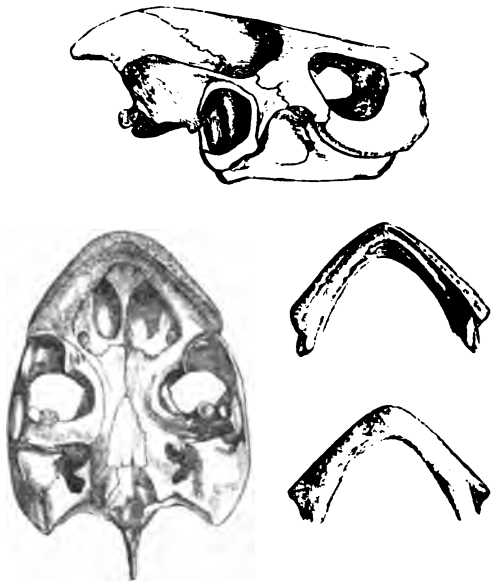
Skeleton of a half-grown specimen in the British Museum, re-

ceived from Holland as "*Clemmys sprengleri*." The head of the younger specimens is rather more slender and thinner than that of the adult.

A young specimen in spirit, sent with an adult and a half-grown specimen from Borneo, and presented by Mr. Dillwyn. The head is black, with an elongated yellowish white spot over each orbit, extended towards the nostrils, and a large round opake pure-white spot on each temple over the zygomatic arch, a triangular white spot on each side of the lower jaw, and a small white spot on the side of the head under the tympanum.

The head of the adult specimen has not these distinct spots; but the region of the orbit and temple is varied with white. Unfortunately, however, the older specimens are not in such a good state as the young one.

Fig. 10.

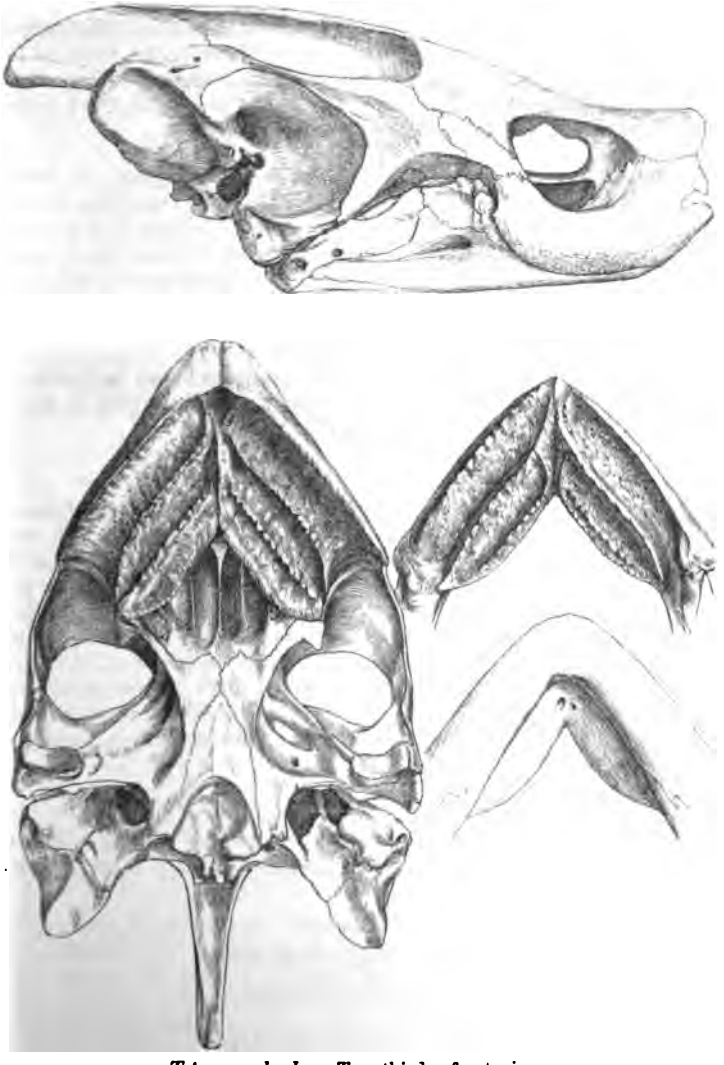


Bellia crassicollis.

Two skulls in the Museum, sent by Prof. Oldham, are very solid; nose rather produced, conical; nose-hole in front large, four-sided; cheeks shelving outwards; crown flat, rhombic, narrow and acute behind; zygomatic process moderately broad, from back of orbit to the upper front half of the oblong tympanic cavity; orbit oblong, large. The labial edge of the upper jaw arched on each side and overlapping. The palate nearly flat, with a concavity in front behind each internal nostril. The alveolar plate broad, flat, smooth, broader behind, and with a slight oblong central pit and a larger

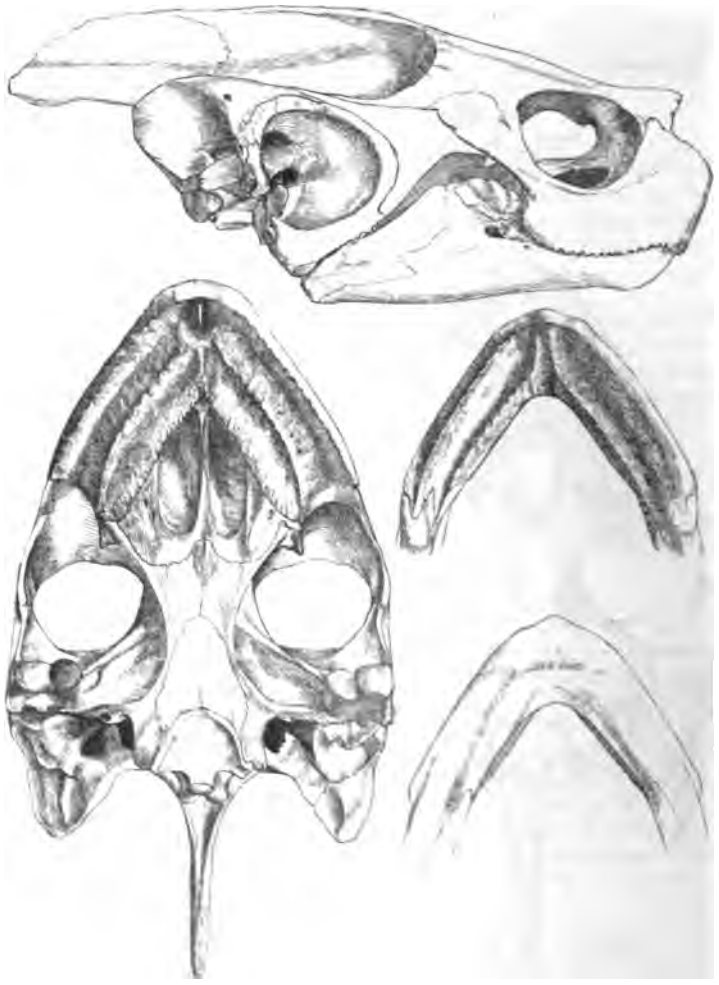
central concavity behind it. Lower jaw very strong, short, with a narrow erect front edge ending in a central conical prominence; broad and flattened out behind, especially just before the condyle. The tympanic concavity opens into the larger cavity that occupies the whole of the mastoid bone.

Fig. 11.



Tetraonyx baska. Two-thirds of nat. size.

Fig. 13.



Kachuga trilineata. Two-thirds nat. size.

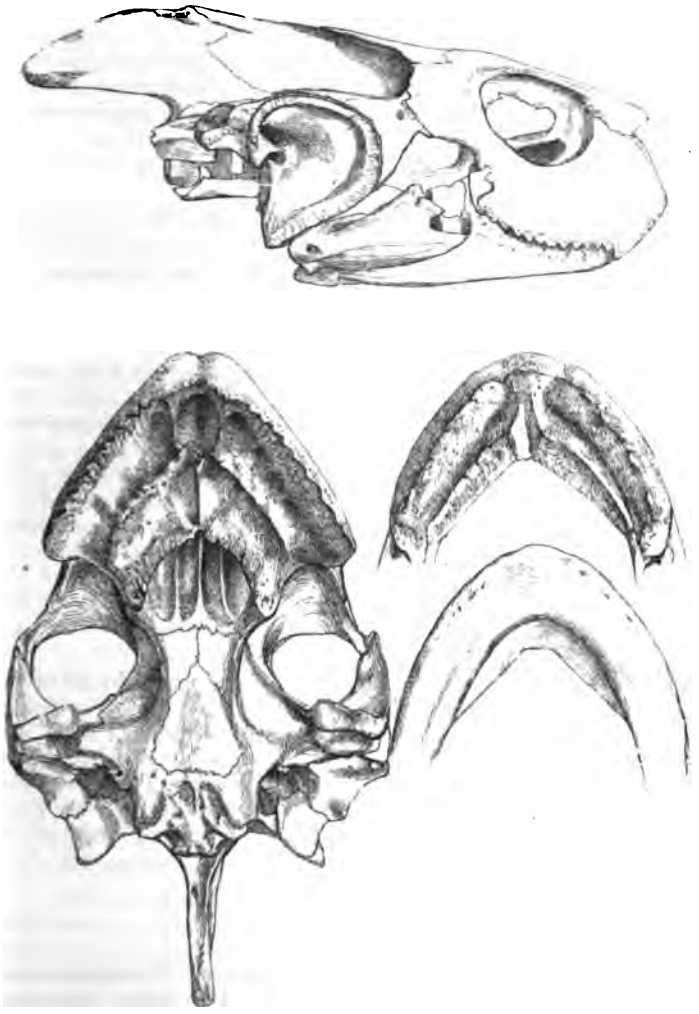
concavity behind each internal nostril. The orbit regular oblong, longer than high. DONGOKA.

4. KACHUGA HARDWICKII.

Batagur dongoka, Gray, Cat. Shield Rept. in B. M. t. 36. f. 1 (skull).

Hab. Nepal (*B. H. Hodgson, Esq.*).

Fig. 14.



Kachuga oldhami. Nat. size.

5. KACHUGA AFFINIS.

A specimen of the young animal in spirit, from Penang, from the Cantor Collection, named *Tetraonyx junior* by Dr. Cantor. It has five distinct claws on the fore, and five on the hind feet. The shell is nearly circular, and the sides of the sternum are very sharply and strongly keeled. The upper beak is straight-edged, with two small

acute teeth in the centre in front. The alveolar surfaces rather broad, the upper with a single triangular ridge separated by a central concavity; the lower with a single ridge parallel to the edge. The vertebral shield rugulose, with a broad flat-topped keel; the costal shields with an indistinct central keel more prominent behind, the part above the keel rugulose, that below it smooth; inguinal shields very wide.

6. KACHUGA BERDMOOREI.

There are two specimens in spirit, purchased of Mr. Theobald, in the British Museum. The alveolar surfaces of the upper and lower jaws very wide, as wide behind as before, rugulose, tubercular; the upper one with a very strong triangular submarginal ridge ending short of the centre and in front sharply turned towards the outer margin; the central part concave in front, and flat behind; the portion behind the ridge very broad. Lower jaw with a very strong triangular ridge stopping short of the centre, which is concave. The upper beak even on the side, with a broad triangular central nick with a slight tooth on each side; the lower with a short conical centre; the whole surface of the upper and the outer surface of the lower grooved and rugose. The nostrils small, circular, pierced in a horny plate that edges the nose and with a lower process produced downwards, on the upper edge of the beak.

Hab. ——?

18. PANGSHURA, Gray.

Pangshura, Gray, Cat. Shield Rept. p. 36.

The beaks of *Pangshura tecta*, in a specimen in spirit, are unlike the beaks of *Tetraonyx*; the gape is scaly, but the lower beak is broad in front, with a rather curved hinder edge, and there is a series of more or less distinctly separate long trigonal shields below the outer margin on the hinder part of the beak. The skin on the crown is continuous, without any grooves; the skin over the tympanum is soft, with some very obscure concentric wrinkles or grooves.

1. PANGSHURA TECTA.

Emys nomadicus, Theobald.

A specimen in spirit in the British Museum. The alveolar process wide on the upper and lower jaws. The upper jaw with a subcentral acute ridge interrupted in front by a central longitudinal ridge, and with an acute ridge on the inner margin which is continuous in the centre. Alveolar process in the lower jaw broad, with a strong triangular ridge parallel to the margin, and with a short central longitudinal ridge. Labial edge of the upper beak simple, of the lower beak acute and bent up in the middle.

Skull (as seen through the skin in the stuffed specimen) ovate rhombic, rather high in front, nearly erect on the sides; crown rhombic, produced and acute behind, rather longer from the pos-

terior end to the back edge of the orbit than from that part to the end of the nose; eyes lateral, eyebrows rather convex; zygomatic arch short, narrow, from the middle of the hinder edge of the orbit to the upper part of the front margin of the tympanic cavity, which is only furnished with a narrow edge. Sheath of the upper jaw with straight, closely denticulated edges; lower jaw strong, very convex, and covered with a horny sheath in front. Toes slender, with a few hexangular shields above, very broadly webbed; claws small.

2. PANGSHURA TENTORIUM.

Skull (as seen through the skin of the preserved specimen) very like that of *P. tecta*, but the crown is rather more produced behind, or rather the orbits are more in front of the head; the bony temple is broader behind the eyes; and the zygomatic arch is broader, being as wide as the upper half of the front edge of the tympanic cavity. The horny sheath of the upper jaw is rather sinuous, distinctly but closely denticulated. Toes slender, very widely webbed to the claws; claws small.

3. PANGSHURA DURA.

Skull (as seen through the skin of the stuffed specimen) ovate triangular, sides erect; orbit very large, subsuperior; crown rhombic, produced and acute behind, twice as long from the hinder end to the back edge of the orbit as the length from that part to the end of the nose; zygomatic arch short, convex, the front end forming part of the crown, and wider than the orbit, and the hinder part narrower and only attached to the upper part of the edge of the tympanic cavity. Sheath of the upper jaw broad, high, with a straight simple edge; lower jaw strong, covered with a convex horny sheath in front. Toes slender, broadly webbed to the claws.

Tribe VI. PSEUDEMYDINA.

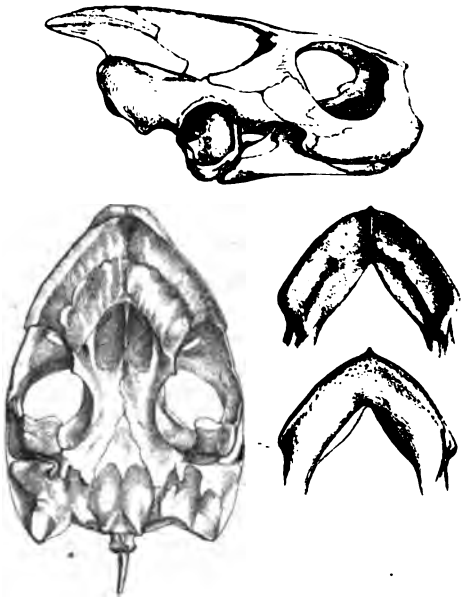
19. PSEUDEMYS.

1. PSEUDEMYS SERRATA.

A mounted skeleton in the British Museum, from North America. Skull solid, crown flat, produced and narrow behind, very broad, square, high in front, shelving to the mouth below; the labial edge nearly straight, with a notch in front, and minutely denticulated on the margin. The zygomatic arch very broad, slightly convex externally; the mastoid bone produced horizontally, flat above externally, and keeled above, with a moderate-sized internal cavity. Palate concave behind the internal nostrils. The alveolar surface of the upper jaw flat, wide, rather produced behind; inner or palatine edge simple, and armed in front with a large tooth on each side of the centre, which is produced into a longitudinal sharp-edged irregular ridge parallel to the outer margin and nearer to it than to the inner edge of the alveolar surface. The lower jaw strong, much depressed and wide in front, and quite flat on the lower surface;

the alveolar surface broad, expanded, nearly as broad behind as in front, the centre of the outer edge produced and acute, with a large concavity on each side behind it, and with an irregular sharp-edged ridge nearer the inner edge than the outer margin, with a conical compressed prominence in front; the labial margin with a series of conical teeth.

Fig. 15.



Pseudemys serrata.

A second skull depressed, ovate, sides of the face shelving; nasal aperture very large; orbits very large, superior, separated by a very narrow space; crown rhombic, produced behind; zygomatic arch very broad, convex, nearly as wide as the back edge of the orbit and the front edge of the oval tympanic cavity. Upper jaw with a well-marked irregularly dentated ridge parallel with the outer edge, and a broad flat space behind it; there is a conical tooth on the front end of the ridge, and a deep conical pit on the front of the upper jaw. Hinder nasal opening arched in front, near the middle of the palate. The lower jaw strong, broad, expanded; lower surface flat; upper surface with a short denticulated marginal edge, and a conical central prominence in front, with a central longitudinal ridge and a stronger arched ridge parallel with the outer margin. Toes long, slender, broadly webbed.

2. PSEUDEMYS DECUSSATA.

Pseudemys decussata, Gray, Ann. & Mag. N. H. xii. p. 183.

Emys decussata, Bell; Gray, Cat. Shield Rept. in B. M. t. 36. f. 2 (skull).

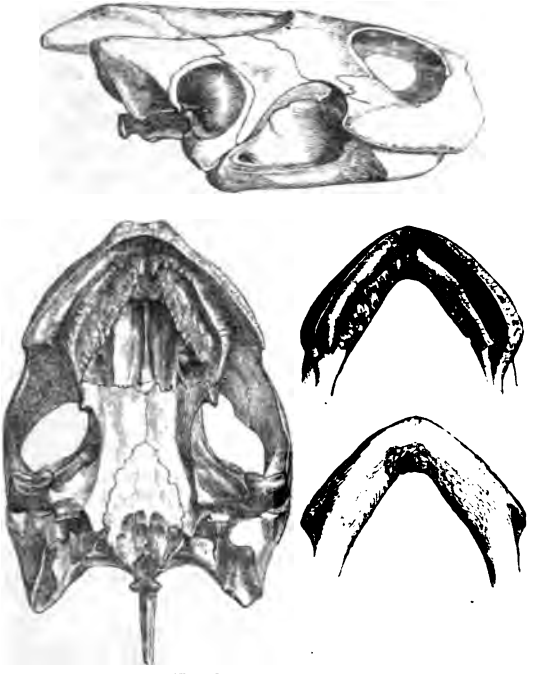
Skull in British Museum. The internal nostrils subanterior, between the converging alveolar plates; lower jaw with a short groove.

20. Trachemys.

Trachemys holbrookii.

Trachemys holbrookii, Gray, Ann. & Mag. N. H. xii. p. 181.
Emys cumberlandensis, Holbrook.

Fig. 16.



Trachemys holbrookii.

Skeleton (in separate bones) in the British Museum, prepared by Dr. Günther. Skull ovate, solid, crown quite flat, sides of face shelving outwards; nose rather produced beyond the mouth; orbit very large, lateral, subsuperior, upper hinder edge narrow; zygomatic arch very broad, convex; tympanic cavity subcircular. The edge of the jaws swollen, convex, labial edge rather arched, entire in front. The palate flat; internal nostrils large, subanterior, with an elongated broad slight concavity behind them. The alveolar

surface broad, divided just over the internal nostrils by a large, thick central ridge parallel with the outer side, having a broad space on each side of it. Lower jaw strong, rather short, front and sides convex and rounded beneath; alveolar surface broad, with a short outer edge of an irregular narrow subcentral ridge parallel with the outer margin.

21. Dermatemys.

Dermatemys, Gray, Cat. Shield Reptiles in B. M. p. 49.

Skull figured by M. Aug. Duméril in the 'Archives du Muséum,' vi. p. 223, t. 15. "The alveolar surfaces are broad, with distinct dentated ridges, like those of the genera *Pseudemys* and *Batagur*." *Gray, P. Z. S.* 1864.

This genus was arranged, in the 'Catalogue of Shield Reptiles,' in the *Chelydradæ*, near *Chelydra*, on account of the additional shield on the suture; but at that time the thorax only was known. The animal, like the skull, is very like *Pseudemys* and *Batagur*. The specimen in spirit of the animal in the British Museum, received from Mr. Salvin, has very small gular shields, for the greater part of their length united, which gives them much the appearance of a single shield. This union and their small size give the animal at first sight the appearance of an *Hydraspis*, the gular shields being regarded as the intergular of that genus.

Fam. IV. Platysternidæ.

Head very large, covered with a thick, hard, bony case; upper jaw with a strong short-edged central hook. Skull thick, hard; zygomatic arch much dilated posteriorly and forming a bony covering over the temporal muscles. Toes 5.4, short, free at the ends; the three middle ones of the fore foot and the two middle ones of the hind foot longest; claws compressed, acute. Tail cylindrical, elongated, covered with rings of square shields. Thorax thin. Sternum solid, broad, attached to the thorax by a bony extension covered with the ends of the pectoral and abdominal plates; not transversely divided, separated from the marginal shields by a longitudinal series of small shields.

Emydidæ, *b*, Gray, Cat. Shield Reptiles, p. 49.

Emydidæ, § B, Gray, Cat. Tortoises in B. M. p. 13.

Platysternon.

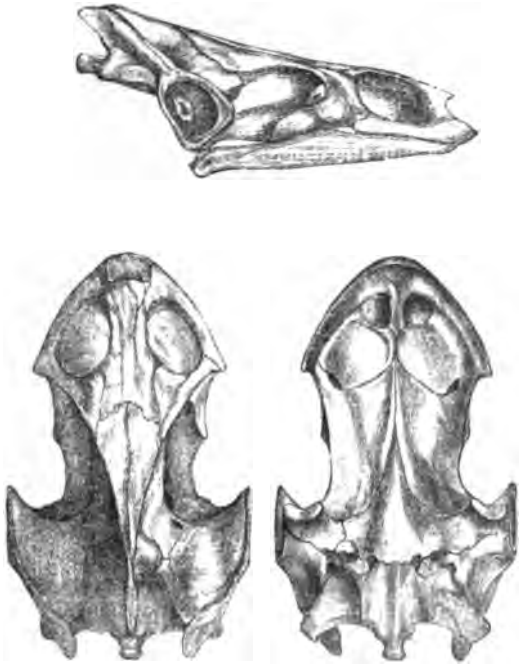
Platysternon, Gray, Cat. Shield Rept. p. 49.

Fam. Chelydidæ.

In the 'Proceedings' of the Society for 1864, p. 128, I proposed an arrangement of the genera of this family founded on the examination of the skull of the genera which I then knew, and I figured some of them.

I have since obtained the skull of *Chelodina colliei*. It does not render necessary any alterations in the system; but I would propose that the place of the genus (*Chelodina*) in the series should be rather altered: instead of following *Hydraspis* in *Hydraspidina*, I think that it had better be arranged before it in that tribe, as the skull is more depressed and has a more slender lower jaw, and many other characters render it intermediate in form between the genera *Hydraspis* and *Chelys*.

Fig. 17.



Chelodina colliei.

Fam. TRIONYCHIDÆ.

When my "Revision of the Species of *Trionychidæ*" was read, on the 23rd February, 1864 (see P. Z. S. 1864, p. 76), I was in doubt whether the alveolar surface of the jaws of these animals did not change in form as the animal increased in age, this doubt being caused by receiving from West Africa skulls from the same locality which chiefly differed in size and in the form of the alveolar surface. The British Museum has since received other specimens from West Africa; and after examining them I am satisfied that the skulls referred to belonged to two species, and that the difference of form and structure above mentioned is permanent, and found in young speci-

mens as well as old of the two species; and the examination of the jaws of the young specimens of other species in the Museum collection has convinced me that very little, if any, change of form occurs in the alveolar surface of the soft Mud-Turtles of the same species from youth to old age, and that the various forms of the alveolar surface afford excellent characters for the distinction of the species and genera of the group, and are also in conformity with their habits and food. Extending the examination to the mouth of old and young specimens of Tortoises of other families, I find that these characters are equally permanent in them.

When the above-mentioned essay was prepared, as we had only a limited number of skeletons, I was obliged to leave in it a number of species doubtful as to the genera to which they ought to be referred. Having discovered that the characters afforded by the alveolar process were the same in the young specimens as in the older ones, I was induced to examine the mouths of all the young specimens which we had in spirit in the British Museum; and finding that, by very careful preparation and manipulation, I could open the mouths of the stuffed specimens in the same collection without in the least degree injuring them, I have examined the mouth and alveolar surfaces in all of them, and thus satisfied myself of the permanence of the characters that these afford, and have been able to determine with certainty the systematic position of some species, which was before doubtful.

This reexamination has also shown me the permanence and the importance, as a specific character, of the manner in which the odd bone in front of the bony dorsal disk is developed, and whether it is in an early or late stage of its development that it becomes pitted like the rest of the bones of the disk, and when it becomes united to the front bone of it.

These additions to my knowledge of the structure and development of the animals induce me to propose the following amended arrangement of them. A natural arrangement of the genera can only be prepared by taking account of all the changes of the animal during growth, and deriving the characters from it in its perfect state. The young specimens are required in order to know the coloration of the species, the adult to know the perfect development of the sternal callosities, and those of intermediate ages to give the manner the odd bone in front of the dorsal disk is developed, and when and how it becomes fitted like the other bones of the back-shield; but this has rendered it impossible to interpolate in their proper place in the system those specimens in the Museum which are only in a young or imperfect state of development, not showing the sternal callosities or the true form of the dorsal disk.

The Mud-Turtles with depressed head and thin depressed skull have a very short face, and the eyes only a very short distance from the end of the nose; all the genera which have a higher, strong, hard skull have a short face and a convex rounded forehead, except *Tyrse*, which has an elongate conical face, and the eyes considerably further back.

The genera of the latter group may be arranged according to the number of the sternal callosities, thus :—

I. Sternal callosities two, lateral: *Aspilus, Rafetus, Dogania.*
II. Sternal callosities four, lateral and anal: *Trionyx, Potamochelys, Pelochelys, Chitra, Tetrathyra, Platypeltis.*
III. Sternal callosities six, lateral, anal, and pectoral; the latter transverse and developed late: *Landemania.*
IV. Sternal callosities seven: *Heptathyra.*
V. Sternal callosities nine (or ten): *Emyda.*
VI. Sternal callosities fifteen, and often some subsidiary ones: *Cyclanosteus* and *Baikiea.*

The development of the pittings on the surface of the odd bone in front of the bony dorsal disk affords good generic characters.

1. It is smooth to a comparatively later period, even after the sternal callosities are developed in *Aspilus.*

2. It is pitted in the centre in very young, and gradually becomes more covered with pits in young specimens in *Trionyx, Potamochelys,* and *Tyrse.*

The Mud-Turtles with a depressed thin skull and very short face have a broad flat palate and scarcely any indication of a central groove in front of the internal nostrils, and only a slight depression, if any, behind them; whereas in the more or less oblong, thick, solid skulls the palate is more or less concave, and almost always has a central groove in front and two more or less deep concavities behind the internal nostrils. The extent and form of the depressions afford very good generic characters.

The skulls of the *Trionychidæ* may be arranged in sections thus :—

1. The central groove in front of the internal nostrils narrow and—
   a. Deep: *Landemania, Sarbieria, Potamochelys,* ? *Platypeltis, Callinia,* ? *Emyda.*
   b. Very shallow: *Aspilus.*
2. Central groove in front of the internal nostrils short, triangular, narrow in front: *Cyclanosteus, Baikiea, Tetrathyra.*
3. Central groove in front of the internal nostrils wide and shallow, but well marked: *Trionyx, Rafetus, Dogania, Tyrse.*

The form of and the extent of the development on the edge of the jaws afford excellent characters, and show the differences in the habits of these animals. In the Mud-Turtles with depressed, thin, light skull, and short face, the alveolar edges of the jaws are thin and linear. In those which have a more or less high, solid, strong skull, the edge of the lower jaw and the surface of the upper one that meets it offer several variations. The genera may be arranged by the different forms of the alveolar surface, thus :—

1. The edge of the lower jaw flattened and broad in front and on the sides: *Trionyx, Aspilus, Rafetus, Baikiea.*

2. The front edge of the lower jaw narrow; the inner surface of the front part of the jaw shelving inwards.

a. In some of these the hinder part of the sides of the edge is more or less expanded and flattened out into an alveolar disk: *Dogania, Potamochelys, Cyclanosteus.*

b. In others the sides of the edge are as narrow as the front part: *Tyrse, Platypeltis, Callinia.*

The genera of the family may be thus arranged:—

Section I. *The head ovate or oblong, face moderate. Skull strong, thick, solid.*

A. *The sternum contracted behind, without any flaps over the hind legs.*

a. Nostrils small, far apart, on the sides of the end of the proboscis.

1. AMYDA. *A. mutica.*

b. Nostrils moderate, circular, close together in the middle of the end of the proboscis, with a small lobe on the inner side.

* *Head short, forehead convex. The front and sides of the lower jaw with a broad, expanded, flat or slightly concave alveolar surface. Anterior palatine groove deep.*

α. Sternal callosities six.

2. LANDEMANIA. *L. irrorata.*

β. Sternal callosities four.

3. TRIONYX. Head short, forehead convex. Anterior palatine groove broad, shallow. Alveolar surface of the lower jaw broad, as wide in front as on the sides, rather concave, with a central longitudinal ridge in front. *Hab.* Asia. *T. gangetica.*

4. FORDIA. Head short, forehead convex. Anterior palatine groove narrow, linear, deep. Alveolar surface of the lower jaw very broad, as wide in front as on the sides, flat, granular. *Hab.* Africa. *F. africana.*

5. SARBIERIA. Head rather elongate. Anterior palatine groove (in beak) narrow, deep, gradually becoming wider behind (in skull). Alveolar surface (of beak) in lower jaw regularly concave and smooth in front, and slightly concave on the sides. Odd anterior bone of dorsal disk free and smooth in the young specimens. *S. frenata.*

γ. Sternal callosities two, lateral.

6. ASPILUS. Head oblong, elongate. Alveolar surface of the upper jaw wider behind; of the lower jaw broad, rather wider in front

than on the sides, flat, with a slight concavity on the outer and convexity on the inner side behind. Central anterior palatine groove in the beak narrow, linear, deep, in the skull narrow, elongate, but very slightly marked; the front of the palate is very deeply concave to the front edge of the internal nostrils, and then bent up on the sides of them. Internal nostrils oblong. *A. cariniferus*, P. Z. S. 1864, p. 83, f. 4–6.

7. RAFETUS. Head broad, forehead convex. Skull rather longer than broad at the ears. Anterior central palatine groove broad and shallow, rather broader behind than in front. Alveolar surface of the jaws narrow, linear, in the upper jaw scarcely wider in front than behind, in the lower jaw rather wider in front, smooth, slightly concave on the sides, with an oblong slight concavity on each side; the concavity behind the internal nostrils deep, and rather narrower behind. Internal nostrils large, circular. *R. euphraticus*, P. Z. S. 1864, p. 81.

** *The front of the lower jaw with a shelving inner surface and a narrow sharp alveolar edge, and with a more or less dilated concave alveolar surface on the sides, rather narrow behind.*

a. *Face short, rounded; forehead convex; anterior central longitudinal palatine groove narrow, deep, short. Sternal callosities four.*

8. POTAMOCHELYS. The alveolar surface of the upper jaw convex, shelving outwards, elongate, only slightly wider behind; of lower jaw rather wide, concave, and shelving inwards in front, rather dilated on the hinder half of the sides, with a slightly shelving oblong concave surface. The upper jaw bent down in front. The palate flat behind; the central anterior palatine groove narrow, deep, short; internal nostrils oblong, anterior, in a deep cavity, partly hooded by the alveolar surfaces of the upper jaw, and with an elongate deep concavity behind each. *P. stellatus*, P. Z. S. 1864, p. 85, f. 7, 8.

β. *Face tapering on sides, narrow in front; forehead shelving. Anterior central palatine groove broad and shallow; internal nostrils oblong, large.*

9. DOGANIA. Head broad; face very short, narrow in front. Skull depressed, broad; underside of skull straight, not bent down in front. Anterior central palatine groove shallow, broad, rounded in front, very slightly narrowed behind. Alveolar surface of the upper jaw flat, broader behind, of lower jaw moderately broad, with a shelving upper surface, and a sharp, simple alveolar edge, rather expanded and flattened out behind and slightly concave on the surface. Internal nostrils oblong, large,

obliquely longitudinal, with a short concavity behind each. Sternal callosities two, lateral, narrow. *D. subplana.*

10. PLATYPELTIS. Head oblong, rather depressed; face moderate, rounded in front. Front of the palate with a very wide, shallow concavity, which is rather narrowed and rounded in front, and gradually dilated behind. Alveolar surface of the jaws flat, rather wider behind, of the upper jaw flat in front, rather wider on the hinder part of the sides, with a raised longitudinal subcentral ridge; of the lower jaw broad, flat in front, with a sharp front edge, narrow in the front part and rather dilated on the hinder part of the sides, with a deep central longitudinal groove. Sternal callosities four; the lateral ones twice as wide on the inner as on the outer side; the hinder triangular, front edge sinuous and wider than the length of the straight inner sides. *P. ferox.* (From Pennant's specimen.)

11. TYRSE. Head elongate, face elongate, conical, narrow in front; forehead shelving. Skull, underside scarcely bent down in front. Palate nearly flat; central longitudinal concavity in front of the internal nostrils wide, much wider behind; internal nostrils small, rounded, with a short concavity behind each. The alveolar process of the upper jaw linear, elongate, scarcely wider behind. Lower jaw rather broad, with a shelving concavity on the upper surface in front, with a sharp alveolar edge which is rather wider and has a linear elongate concavity on the upper surface of the hinder half of the sides. Sternal callosities four, lateral and anal; anal triangular, rather broader than long. The hinder costal bones short, forming together a semicircle which is about two-fifths of the width of the costal pieces before them. *T. nilotica.*

12. CALLINIA. Head small, face short, tapering in front. Anterior palatine groove (in head with beak) narrow, linear, deep. Alveolar edge of the beak and upper jaw narrow, linear, tapering behind; of the lower jaw rather wide, shelving inwards, with a sharp edge in front, and narrow, short, and tapering to a point behind. Sternal callosities four, lateral and anal. *C. microcephala* and *C. spicifera.*

B. *Sternum dilated behind, with a flap on each side covering the hind legs.*

* *Margin of dorsal disk cartilaginous, without marginal bones. Anterior central palatine groove short, triangular, broader behind.* African.

13. CYCLANOSTEUS. Sternal callosities 15. Alveolar surface thin in front, broad on the sides. *C. senegalensis.*

Baikiea. Sternal callosities 15 or more. Alveolar surface broad in front and on the sides. *B. elegans.*

** *Dorsal disk with marginal bones.* Asiatic.

Emyda. Sternal callosities 9 or 10. *E. punctata.*

Section II. *Head depressed, broad, face very short; eyes anterior. Skull depressed, thin and weak. Alveolar edge of the jaws thin. Palate flat.*

a. *Sternum dilated behind into flaps on each side covering the hind legs. Sternal callosities odd.*

16. Heptathyra. Sternal callosities seven. *H. frenata.*

b. *Sternum contracted behind, without any flaps over the hind legs. Sternal callosities in pairs.*

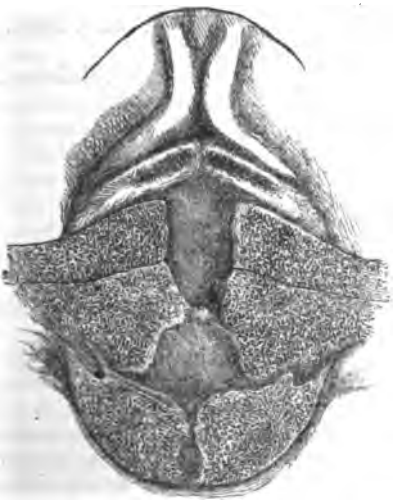
17. Pelochelys. *P. cantorii.*

18. Chitra. *C. indica.*

2. Landemania.

Head elongate; the odd bone in front of the dorsal shield in adult specimens pitted, and united to the first costal by a straight suture.

Fig. 18.



Landemania irrorata. Sternum.

Sternal callosities six—two sternal, two lateral, and two anal; the sternal pair narrow, transverse, and not developed until the animal

is nearly adult. Jaws strong; alveolar surface broad in front and on the sides, rather broader on the sides behind, that of the lower jaw shelving inwards. The anterior central palatine groove deep, narrow in front, and wider behind.

1. LANDEMANIA IRRORATA.

Head and body closely speckled with minute white dots; the chin and underside of the throat with rather larger but similar white spots.

Trionyx peroculatus, Günther, MS. in B. M.

A specimen (which had been allowed to get dry) now in spirit, from Shanghai. Head black (face without any diverging lines), with very small white speckles very close together, and most of the same size and form, of underside (if any difference) very slightly larger; the skin of the back similarly and equally minutely white-dotted. Sternal callosities six; the anterior pair narrow, band-like, transverse, in the centre of the front of the sternum; lateral callosities narrow in the middle, very broad at the inner end; the anal broad, subtrigonal, united in the middle line by a truly dentated suture.

2. LANDEMANIA? PEROCELLATA.

Head olive, with diverging brown lines from the eyes and across the forehead; chin and throat with large white spots.

Trionyx perocellatus, Gray, Cat. Tort. B. M. p. 48; Cat. Shield Rept. p. 65, t. 31.

Potamochelys? perocellatus, Gray, P. Z. S. 1864, p. 86.

Hab. China and Chusan.

A specimen in spirit, received from Mr. Swinhoe, from Formosa. The front of the lower jaw with a flat triangular alveolar surface; the central groove in the palate before the internal nostrils narrow, deep, wider (sublunate) quite in front. Forehead with a narrow interrupted dark line from the front canthus of one eye to the other. Face with five diverging brown lines from the underside of the eye—the three front to the lower lip, the two hinder from the hinder canthus of the eye across the temple. Sternal callosities four; the hinder pair subtrigonal, with the angles rounded, and well separated. Sides of lower jaw, chin, and throat with large, symmetrical, but different-shaped white spots.

A stuffed half-grown specimen in the British Museum, from China. The bony dorsal disk oblong; the front odd bone united to the first costal by a straight edge, and rugose like it, with a very small pit on each side of the middle of the hind edge; the front edge with a few tubercles in the centre; the hinder flap with roundish tubercles. Sternal callosities four; lateral narrow on the sides, much wider in the middle; the hinder callosities ovate, oblique, with short convex sides and rounded ends. Head moderate; alveolar surface of the jaws broad, rather broader behind; the anterior central palatine groove deep, wide, and rather wider behind.

3. Trionyx.

The odd bone of the dorsal disk covered with a pitted coat in the young animals. The genus may be divided into sections thus:—

* *Head short, broad (about as long as broad at the ear-bone), rounded in front. The alveolar surface of the lower jaw concave, with sharp raised inner and outer margins, and an indistinct short central ridge on the inner side of the front. The central palatine groove in front of the internal nostrils very wide, as wide in front as behind.*

1. Trionyx gangeticus.

** *The head rather elongate (rather longer than the breadth at the ears), rather tapering in front. The alveolar surface of the lower jaw as wide in front as on the sides, slightly concave, with a central longitudinal ridge across the front, and with a slight concavity on each side. The central anterior palatine groove shallow, narrow in front and wide behind.*

2. Trionyx jeudi. (Fig. 19, p. 218.)

Hab. Java? From the Museum of Prof. Lidth de Jeude.

This species is described from a fine adult skull received from the Utrecht Museum, which, no doubt, was obtained from some of the Dutch colonies. It is most distinct from the Indian species. I have named it after the Professor who formed the Museum. The front longitudinal ridge is very distinct in the jawbone, almost more so than in the horny beak of the jaw. The front of the jaw of the *T. gangeticus* is simply concave, without any indication of a ridge, but only a slight prominence on the inner part of the inner edge; and the alveolar surface on the sides of the lower jaw is flat and with a deep oblong concavity on each side.

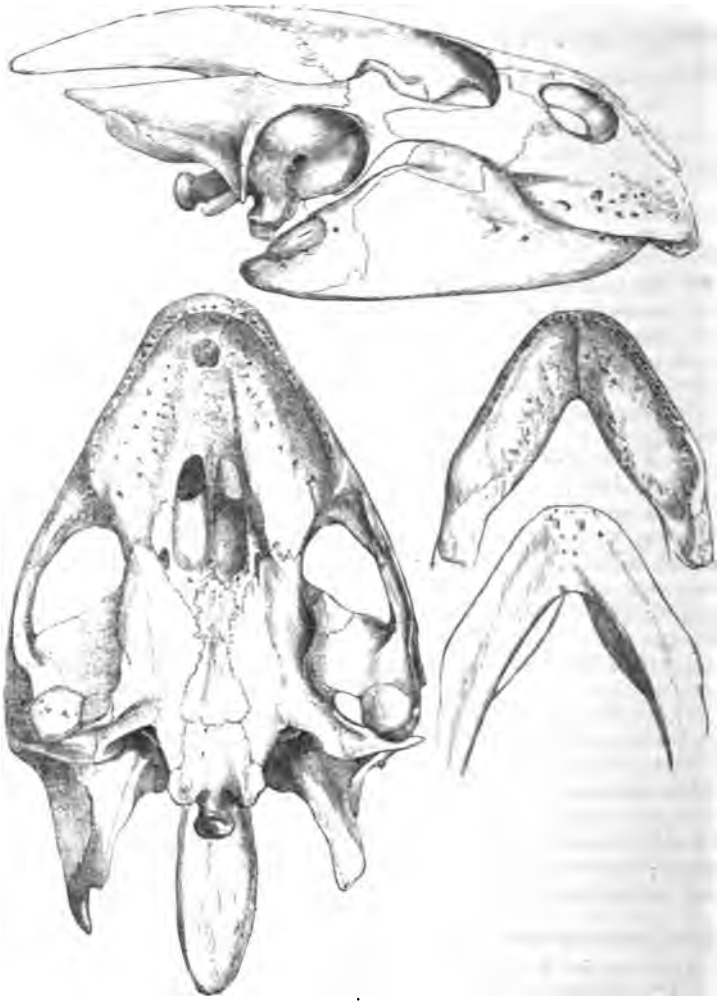
In the British Museum there is the head of an adult animal in spirit that was purchased of Mr. Theobald, who obtained it in Pegu. It has the narrow central anterior palatine groove, and the cylindrical ridge across the front of the lower beak, of this section of the genus; but the ridge is only slightly raised and very different from that in the skull from Utrecht.

3. Trionyx formosus. (Plate XV. fig. 1.)

This species is described from a young specimen in spirit, procured by Mr. Theobald from Pegu.

The back shield olive, with four very large black-eyed spots, the central spot circular, black, with a narrow white margin, and a dark brown ring close to it, which is surrounded by a larger pale brown ring, separated from the inner one by a broad olive space. The outer ring forms part of a regular series of netted dark lines, which are symmetrical on the two sides of the keel, forming a large open space in the middle of the back, and a smaller one near the margin and on the hinder part of the disk. The underside of the margin of the disk sooty grey, paler in part, with a white edge on the margin

Fig. 19.



Trionyx jeudi.

of the shield. The upperside of the limbs olive, with small white spots. The head and back of the neck olive, varied with black-edged white spots, which are of various sizes, but symmetrically disposed on the two sides. There is a small oblong white spot on each temple, and an irregular larger white spot just before the angle of the mouth, and a large white spot below on each side, and a larger spot in centre of the hinder part of the gullet, and a series of small white

spots on the flap of the upper lip. The hinder part of the head is encircled by a broad black-edged white band or collar, which is interrupted by a small olive spot in the middle of the back of the neck. The collar is broader and more diffused on the sides of the throat; it gives off a horizontal streak from its hinder side nearly as broad as itself, which is extended for a short distance on the sides of the neck. The alveolar surface of the lower jaw broad and slightly concave.

Hab. Pegu.

In its young state this *Trionyx* is one of the most ornamental species, the dorsal shield being decorated with four large eyed spots, each surrounded by several concentric rings of different width, and the white interrupted collar on the neck is very striking. It has the four large spots on the dorsal shield so common with the young state of *Trionyx gangeticus*, figured in that state in my 'Illustrations of Indian Zoology' as *Trionyx ocellatus*, which is copied from Dr. Buchanan Hamilton's drawing of *Testudo ocellatus*. But in this species and in the more advanced state of the young animal figured in my 'Indian Zoology' as *Trionyx hurum*, from another of Dr. Buchanan Hamilton's drawings, there is a yellow spot on each temple just behind the eyes; while in *T. ornatus* the temples are olive, and the white collar is much further back—as far from the back edge of the eyes as the eyes are from the tip of the nose.

The upper part of the head is olive, very closely and minutely dotted with black; the underside is uniform greyish white. The nostrils are very close together, with a slight lobe on the inner side of each. This may be the species indicated as a *Trionyx phayrei* by Mr. Theobald (Journ. Proc. Linn. Soc. vol. x. p. 18), but so indistinctly described as not to be recognizable.

4. Fordia.

Head short, broad; face short, forehead convex. Anterior palatine groove narrow, linear, deep. Alveolar surface of the beak of the upper jaw very wide, flat; of the beak of the lower jaw very broad, as wide in front as on the sides, acute, flat, granular, with a very indistinct indication of a longitudinal central ridge. The hinder pair of costals about half as broad as the pair of costals before them. Skull ——? *Hab.* Africa.

Known from *Trionyx* by the flatness and width of the alveolar surface of the beaks. I have named this genus after Mr. Ford, who has illustrated so many of my papers.

Fordia africana.

The head and neck (and most likely the other parts of the body, limbs, and dorsal shield) olive, minutely and regularly speckled with small white spots. The hinder sternal callosities triangular, rather longer than wide, straight in front and on the inner side, very acute behind.

Hab. Upper Nile, Chartoum (*Petherick*, adult male and female in the B. M.).

These specimens are those referred to as having been sent from Chartoum by Mr. Petherick in the account of *Tyrse nilotica* in the P. Z. S. 1864, p. 88, where they were regarded as being specimens of the common Nilotic Mud-Tortoise; but the examination of the alveolar surface of the jaws at once showed that they had no affinity with that genus, but must be more allied to the Gangetic *Trionyx*; and then I observed that they had the shorter face of that group, which character had been previously overlooked. The alveolar surface of both jaws is very wide, nearly flat (not concave in front as in *Trionyx gangeticus*). The species is, no doubt, peculiar to the Upper Nile, and had not been before observed.

The examination of the alveolar surface of Du Chaillu's specimen, which had been named *Aspidonectes aspilus* by Mr. Cope, showed that it was (as I had previously determined it to be) identical with *Tyrse nilotica* of the Lower Nile. The head and neck of this large specimen, when the skin was wet, showed that it was speckled with white like the true Nilotic Mud-Tortoise *Tyrse nilotica*. The sternal callosities rather differ in form from those of *T. nilotica*; the hinder ones are larger, and more acute behind. The last of the ribs are also wider, compared with the others, than in that species.

A young specimen in spirit, from the Upper Nile, obtained from Mr. Petherick, probably belongs to this species. The head, neck, feet, and dorsal disk covered with close, small, dark-edged, annular white spots, those on the sides of the head and, especially, on the chin and throat being rather the largest.

5. Sarbieria.

Head rather large; eyes lateral, subsuperior. Jaws strong; alveolar surface (of beak) broad, broader and more dilated behind, surface shelving inwards,—of lower jaw deeply concave, smooth, and with a sharp edge in front, and slightly concave on the sides. The central anterior palatine groove narrow and deep, with a short slight dilatation in front and with rather diverging sides behind. Dorsal disk small. Costal bones separate. Front odd bone in the young and half-grown specimens separate, broad, transverse, and with a smooth upper surface. Sternal callosities four; lateral narrow on the outer side; anal ——?

This genus is in many respects allied to *Dogania*; but it appears to have four callosities, and the upper surface of the back is concave; it is narrow in front, and wider behind. But it is difficult to compare a head with the beak on with a prepared skull without a beak.

Sarbieria frenata.

Trionyx frenatus, Gray, Cat. Shield Rept. p. 67.
Potamochelys? frenatus, Gray, P. Z. S. 1864, p. 87.
Hab. Singapore (*Wallace*).

A stuffed specimen in the British Museum, "of a young female with full-sized eggs," from Mr. Wallace. The odd bone in front of the dorsal disk entirely covered with the skin, and smooth. The

sternal callosities are scarcely developed, only showing a slight roughness on the surface. Head olive, with a black central streak from the snout to between the eyes, which divides behind into three diverging streaks on the crown and nape; a streak from the nose, through the eye, and continued on the temple, to the side of the neck. The alveolar surface of the upper and lower jaws very broad the whole length of the outer edges; the alveolar surface of the upper jaw is so large as to cover the greater part of the palate, much more so than in *Trionyx gangeticus*; in the lower jaw it is very broad, as broad behind as before, and slightly concave. The central palatine groove in front of the internal nostrils narrow, deep. The bones of the dorsal shield are distinctly marked and separate; the vertebral plates are very narrow, nearly twice as long as broad; the costal ones are linear, scarcely broader at the outer ends, the last one being the least and narrow at the outer end. The odd bone in front is quite separate from the granular buckler, covered with skin, and quite smooth. The lateral sternal callosities are scarcely developed, only showing a slight roughness on the surface. The hinder pair of sternal bones are broad at the inner end and united together in front of the inner edges by two broad lobes.

Very like the figure in Cuvier's 'Ossemens Fossiles,' v. t. 23. f. 5.

6. Aspilus.

The odd bone in front of the dorsal shield in the younger specimen is separate, and smooth on the upper surface, and it becomes pitted and united to the costal by a straight suture in the adult animal.

8. Potamochelys.

The odd anterior bone of the dorsal disk in the young animal is pitted on the surface and separate, but in the older ones it is united to the dorsal disk by a straight suture. The skull resembles that of *Cyclanosteus*.

12. Callinia.

Head small, elongate; face narrow, tapering; eyes lateral, superior. The jaws weak; the alveolar plates narrow at the hinder part, triangular and broader in front. The lower jaw slender, narrower at the hinder part of the sides. The central palatal groove in front of the internal nostrils rather wide and deep. The dorsal disk oblong, broad. The odd bone in front of the dorsal shield separate, transverse, and pitted in the young animal; in the older one it is united to the front costal bones by a straight edge with two round perforations, one on each side of the central part. The vertebral callosities narrow. The costal callosities scarcely broader at the outer edge, except the fifth and sixth pairs; the hinder pair short, and narrow at the outer ends. Sternal callosities four; the lateral pair broad on the inner side; the hinder or anal pair oblong triangular, oblique, with a straight inner edge.

Aspidonectes, sp., Agassiz, not Wagler.

1. CALLINIA MICROCEPHALA.

Potamochelys? microcephalus, Gray, P. Z. S. 1864, p. 87.
Hab. Sarawak (Wallace).

2. CALLINIA SPICIFERA.

Trionyx spiciferus, Lesueur, Mém. Mus. xv. p. 258, t. 15.
Trionyx ferus, Holbrook, Herp. N. A. ii. t. 1.
Tyrse argus, Gray, Knowsley Menag. t.
Hab. North America.

14. BAIKIEA.

In the "Revision of the species of *Trionychidæ*," in the P. Z. S. 1864, p. 95, I figured the skull of an African Trionychid with a very broadly dilated concave alveolar surface to the jaws, which I considered might perhaps be the adult state of the jaws of *Cyclanosteus senegalensis*. In my paper on the genus *Tetrathyra*, in the Society's 'Proceedings' for 1865, I thought that it might perhaps be the skull of the Trionychid which I then described under the name of *Tetrathyra*. Since that time I have been able to examine the skull of a young Trionychid from Africa, which has the broadly expanded alveolar surface of the adult skull that I figured. This shows that the form of the alveolar surface does not depend on the age of the specimen, and that it is the character of an additional genus, which I have named after Dr. Balfour Baikie, from whom we have received so many species from Central and Western Africa.

Unfortunately there are only skulls of adult and a specimen in spirit of a young animal of this species; so that we do not know the form and number of the sternal callosities, especially those of the adult form. I suspect that the thorax in the British Museum, received with the jaws, may be that of an adult animal; but there is no material to show that this is the case. If it is, the sternal callosities are as in *Cyclanosteus* with some smaller additional ones in front, as in the specimen figured as *Cyclanosteus senegalensis*, var. *callosa*, Gray, P. Z. S. 1865, p. 424, f. 1.

BAIKIEA ELEGANS. (Plate XV. fig. 2.)

The young specimen in spirit has the back of the thorax dark olive-brown with large yellow spots, which are somewhat similar but not quite symmetrical on the two sides of the central keel; and there is a series of large but smaller square or roundish yellow spots on the margin. The sternum and under surface of the margin blackish, with yellow spots, and a narrow yellow edge to the lobes of the sternum. The underside of the shield is varied with yellow on the edges. Head grey-brown, white-spotted. Thorax white.

The young specimens of *Cyclanosteus senegalensis* in spirit are known from those of *Baikiea elegans* by having the white spots on the crown and sides of the head nearly of the same size; in *B. ele-*

genus the spots on the crown are small and those on the sides of the head are larger and unequal-sized.

III. THE SEA-TURTLES—CHELONIA.

The common Turtle, covered with horny plates, has a skull as different from that of the coriaceous Turtle, which has the bones of the body covered with a soft skin, as the two animals are different in external appearance. I formerly regarded the coriaceous and the scale-bearing Turtles as forming two distinct families (Annals of Philosophy, 1825, vol. x. p. 212); but having received from Mr. Collie, as stated in the 'Catalogue of Shield Reptiles,' a skull of a true Chelonian as that of a coriaceous Turtle (*Sphargis*), and finding they were so much alike, I was induced to reconsider the question and to unite *Sphargis* and *Chelonia* in the same family, regarding them as distinct tribes characterized by the nature of the surface. Such a mistake was excusable, as I am not aware that the skull of the adult *Sphargis* is in any European collection, or has ever been figured, and I had overlooked the figure of the skull of the very young specimen that is given in Prof. John Wagler's 'New System of Amphibia,' t. 5. f. 1. In that work the skulls of the young *Chelonia* and young *Sphargis* are figured side by side; therefore the distinction can be easily seen. The great peculiarity of the skull of the genus *Sphargis* consists of the opening to the nose being in the upper part of the head, the nose-cavity being carried up by the elongated erect form of the intermaxillary bone; the orbits are also exceedingly large.

Fam. I. CHELONIADÆ.

Cheloniadæ, Gray, Ann. Phil. 1825, x. p. 212.

The thorax covered with distinct horny plates; the sterno-costal suture covered with a longitudinal series of sterno-lateral plates. *Nose* anterior, erect; the nostrils anterior, at the upper edge of the nose. Upper jaw simple, or rather hooked in front. Eyes moderate.

Skull oblong, crown flat behind; orbit moderate, nose truncate, erect; nostrils anterior, on the upper part of the nose. The intermaxillary bone small, narrow, short, erect.

The study of the skulls of these animals first led me to observe the importance of the alveolar chewing-surface of the jaws for distinguishing the genera. The Turtles may be divided into two groups thus:—

* *The alveolar surface of the upper jaw concave, broad, narrower behind, with a single linear central ridge. Lower concave, with a rather strong ridge on the inner side.* Carnivorous.

1. CARETTA.

[redacted]

Sphargis mercurialis.

Mr. K. Gerrard has prepared a beautiful skeleton of a very young specimen of this genus, about 4 inches long. It is a most curious preparation, with its odd-shaped head with very large nasal cavities and orbits, extremely large fore fins with extremely slender fingers,

and a short hind foot like the skeleton of a human hand, with the short metatarsi and thumb springing from one side of the base of them, as if it might be opposable.

The fingers and toes five; the fingers long, slender, the second, third, and fourth very long, of four joints, lower large, the last joint small and short; the first and third toes of three joints, the first strongest, the fifth shortest. The hind feet much like the human hand. The toes short; the thumb short, stroug, from the base of the metatarsus, the other four toes longer, subequal, the third or middle toe being rather shorter, the second and fourth subequal, and the fifth rather the shortest and most slender. Sternal bone very narrow, only forming a large, oblong, elongated ring.

See also Wagler, N. Syst. Amph. t. 5.

DESCRIPTION OF PLATE XV.

Fig. 1. *Trionyx formosus*, p. 217.
2. *Baikiea elegans*, p. 222.

7. On the Incisor Teeth of the African Rhinoceros. By Dr. J. E. Gray, F.R.S.

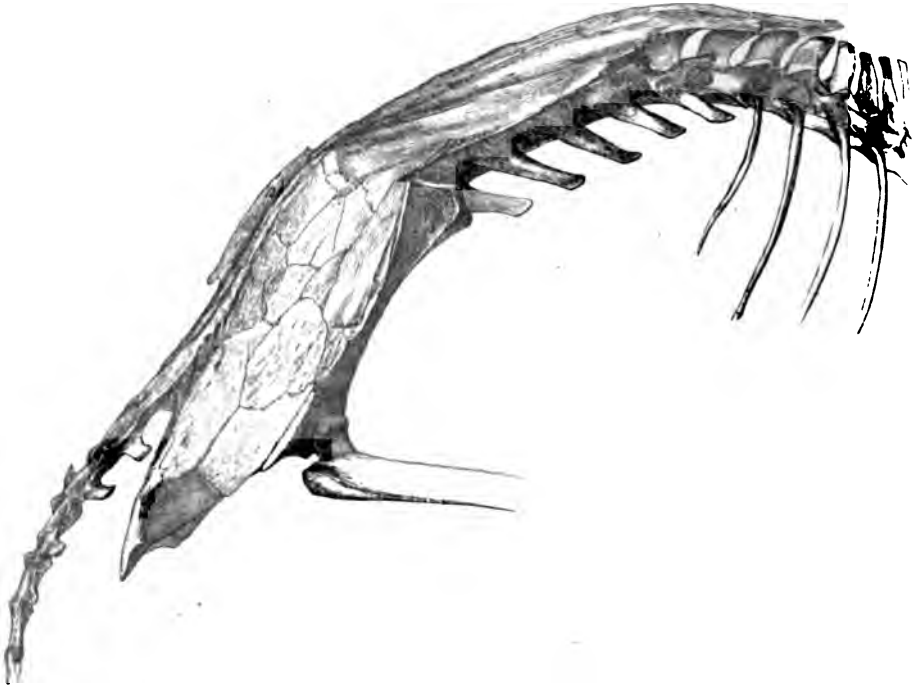
The skull of the nearly adult female specimen of ***Rhinaster keitloa*** in the British Museum killed by Mr. Jesse in Abyssinia has the small intermaxillary bones well preserved. They are not united together in front; the dental edge has unfortunately been injured in the carriage from Abyssinia; but they each exhibit small cylindrical blunt rudimentary incisor teeth. The intermaxillary of the right side has a large tooth on the hinder part; the intermaxillary on the left side has a middle-sized tooth in the middle of the dental surface, and a very small rudimentary tooth behind it near the hinder edge of the bone. These teeth would induce one to believe that in the perfect state there are two, or perhaps three, incisors in each intermaxillary; for close to the symphysis is a small alveolus in the front part of the dental margin on each intermaxillary; but these do not now contain any rudimentary teeth. Professor Vrolik has described the lower incisor teeth in the skull of the young African Rhinoceros (see Ann. d. Sci. 1837, p. 20, t. 1 B); but I believe that they have not before been observed in the adult animal.

If the observations of MM. Lefebvre, Petit, and Dillon, in the 'Voyage en Abyssinie,' Paris, are to be relied on, there must be other Rhinoceroses in Abyssinia than those we have yet seen. They state, "Il y a plusieurs espèces de Rhinoceros en Abyssinie. Il y en a qui ont deux, trois et quatre cornes: cela est certain; il l'est moins qu'il y en ait à cinq et six, mais on l'assure. Sur l'animal vivant elle est toujours mobile, sans os à l'intérieur" (pp. 26, 27).

8. On the Bony Dorsal Shield of the Male *Tragulus kanchil*. By Dr. J. E. Gray, F.R.S.

Mr. Edward Gerrard the younger has prepared for the British Museum a beautiful skeleton of the male *Tragulus kanchil* which lately died in the Society's Gardens.

The skeleton is very like that of other ruminants; but it has the remarkable peculiarity of the lumbar vertebræ and pelvis being covered with an expanded thin bony plate, or, rather, a series of small irregular-shaped plates united together by a dentated suture into a dorsal and lumbar disk, apparently formed by the ossification of the lumbar fascia. This lies immediately on the upper surface of the dorsal muscles, and between them and the skin. The plate is attached by the whole length of the central line, and extends on each side considerably beyond the sides of the lumbar vertebræ and the pelvis.



Bony dorsal shield of *Tragulus kanchil*.

Mr. Gerrard informs me that it did not occur in a female *T. kanchil* that he had examined; so that it may be peculiar to the male sex.

M. Alphonse Milne-Edwards has figured a somewhat similar expansion covering the pelvis in the skeleton of *Tragulus napu* (see

Ann. des Sci. Nat. 1864, t. 4. f. 2). It appears to be common to the species of the genus *Tragulus*, but, I believe, does not occur in the genus *Meminna*. M. Alphonse Milne-Edwards (*loc. cit.* t. 10. f. 7) figures the pelvis of that animal without any bony disk.

April 8, 1869.

Dr. E. Hamilton, V.P., in the Chair.

A communication was read from Dr. George Bennett, F.Z.S., dated Sydney, January 26th, enclosing a copy of an article upon the Tuatera Lizard (*Sphenodon punctatum**) of New Zealand, contributed by him to the 'Sydney Herald' of January 19th, which was read to the Meeting. It appeared from this article that so recently as December 1851 this Lizard was abundant in one of the islands in the Bay of Plenty, in New Zealand. The island in question was stated to be one of four small volcanic islands, distant about eight miles from the coast and situated opposite to the mouth of the Wakatane river. The party of officers who visited it upon the occasion in question are stated to have collected in half an hour nearly forty of these Lizards of different sizes, varying from two feet long to three inches. They stated that the island seemed to be swarming with them and with another Lizard called the Moko-moko (*Tiliqua zeelandica*). In the daytime these Lizards are seen basking themselves in the sun on the bare rocks. Noon is therefore the best time to visit the island. It was stated that there were four small islands, on two of which Tuateras are found. They are called Rurima and Montoki. The largest is about half a mile in circumference at high water. They are all of volcanic origin, and are scantily covered with soil, but it is sufficient to grow a few of the most hardy New-Zealand shrubs and creepers, among the latter of which was observed the delicate flower of the Pohne or Panapa (*Calystegia sepium*), the long fleshy root of which was formerly a source of food to the New Zealander. There was no fresh water on the island but what was contained in the crevices of rocks from rain.

The following papers were read:—

1. Note on *Pachybatrachus robustus*.

By St. George Mivart, F.Z.S. &c.

I had the honour to read before the Zoological Society on the 12th of November, 1868, a paper which was published in the

* Olim *Hatteria punctata*. Cf. Gray, Ann. Nat. Hist. 4th ser. vol. iii. p. 167 (1869).—P. L. S.

Society's 'Proceedings' for the same year (page 557). In that paper I described a new Frog, which I proposed to name *Pachybatrachus robustus*. I now find that, by a singular coincidence, the very same generic term was applied about the same time by Professor W. Keferstein, M.D., of Göttingen, to another new Batrachian. This appears in the third number of the 'Archiv für Naturgeschichte' for 1868, where, at page 273, Professor Keferstein has published a description of his *Pachybatrachus*. I therefore beg leave to withdraw the name which I before gave, and to substitute for it the more appropriate term *Clinotarsus*. I propose therefore that my new Frog should bear the name CLINOTARSUS ROBUSTUS.

2. Observations on *Lepus americanus*, especially with reference to the Modifications in the Fur consequent on the rotation of the Seasons, and the Change of Colour on the advent of Winter; based on Specimens obtained in the province of New Brunswick, North America. By FRANCIS H. WELCH, Assistant-Surgeon, 1st Battalion, 22nd Regiment*.

This species is the sole representative of the *Leporidæ* in the province of New Brunswick. In the List of Mammalia of the Portland Natural-History Society it is called the "White Hare," and in the 'New York Fauna,' by De Kay, the "Northern Hare." It is also termed the "American Varying Hare," and was for a long time confounded with the *L. variabilis* of Europe. Its geographical range appears as yet undetermined. According to Sir John Richardson it "is found as far north as 64° 30', Fort Enterprise, forming the staple food and clothing of the Hare Indians on the banks of the Mackenzie River." Its southerly limits are given by De Kay as "the northern parts of Pennsylvania and the mountain-tops of the northern part of Virginia." Of the many species of *Leporidæ* inhabiting the North-American continent, it appears to be the only one that undergoes a complete change of colour during the winter†,—the Greenland Hare remaining white during the whole year, *L. nanus* becoming of a lighter hue, and occasionally iron grey, during the winter months, and *L. glacialis* assuming occasionally in the adult a greyish tint during the summer, limited to the points of the hair, the deeper parts remaining white permanently, the young, however, being born grey, and changing to white on the advent of winter‡. Its weight varies—in its southernmost limits reaching 6½ lbs.; in New Brunswick averaging 3 lbs.; in Hudson's Bay Territory 4 lbs.

* Communicated by Mr. G. Busk, F.R.S.

† *i. e.* provided the *L. campestris* be only a variety of *L. americanus*, as stated by Sir J. Richardson, but denied by Baird.

‡ Fauna Boreali-Americana.

This Rodent is described in the 'New York Fauna' by De Kay; but I believe, up to the present time, no detailed account of the fur-changes in sequence to the seasons has appeared. Its representative among the European species is *L. variabilis*, the process of change in which is summed up in the 'Naturalists' Library' (vol vii.) as follows:—"From the examination of individuals at different periods of the year, I have inferred that in this species the hair is almost always changing; that in April and May there is a general but gradual shedding, after which the summer colours are seen in perfection; that towards the middle of autumn many new white hairs have been substituted for coloured ones; and that by degrees all the hairs and under-fur are shed and renewed before the end of December, when the fur is in the perfection of its winter condition, being closer, fuller, and longer than in summer." In the 'Edinburgh Philosophical Journal' (vol. xi. p. 191) the conclusion arrived at is that "during the whole of this remarkable change in the fur no hair falls from the animal; hence it appears that the hair actually changes its colour, and that there is no renewal of it." Thus, in the former article the change is attributed to an autumnal shedding and new winter growth; in the latter to a change of colour only in the existent hair. I propose in the following remarks to enter fully into the details of the process, as illustrated by *Lepus americanus*.

In order to appreciate fully the cycle of changes in the coat of this Rodent in sequence to the rotation of the seasons, it seems best to take the summer dress as our starting-point, and inquire into the varieties of hair entering into the composition of the fur at this period, for the better elucidation of the part each individually plays in the subsequent phases; for in scientifically inquiring into the change of colour in the fur-bearing animals, it is essentially necessary to make a clear distinction between that resulting from alteration of colour in the already existent coat, and that consequent on a fresh under-growth, which by gradual increase may eventually obscure the summer and autumnal hues. Each portion also of the skin must be separately examined, and individual peculiarities noted. The summer dress may be described as follows:—Back and sides of a glistening fawn-colour, interspersed with black, especially over the vertebral ridge; tail white; face and ears reddish brown, sparsely variegated by black hairs; edges of ears externally black or dark brown, increasing towards the tips; internally whitish, especially posteriorly; whiskers and eyebrows black; margin of lids dark brown or black, pupil the same, iris yellow; underparts white; anterior surface of feet light brown, the treading surface dirty white with hair very wiry. On examination, the components of this coat will be found to vary according to the portion of the animal examined; consequently it is necessary to enter somewhat into details.

In the fur are to be distinguished the external firm hairs constituting the pile and determining the colour, and the soft woolly undergrowth constituting the thickness of the coat and mainly instrumental in the retention of the animal heat. On the back the pile is made up of firm, straight, pointed hairs of diminished thickness

at their insertion into the skin, divisible into two varieties as to length and colour,—the one, in the minority, entirely black, average length $1\frac{2}{10}$ inch; the other, black at extreme tip, succeeded downwards in the shaft by a well-defined tawny band again merging into black, which fades into light brown at the attached extremity, average length $\frac{9}{10}$ inch. The delicate, wavy, flocculent undergrowth is of a slaty hue, passing into reddish brown at the free extremity, and of an average length of $\frac{1}{2}$ inch; the commingling of the hairs *in situ* produces five zones of colour in the coat, viz. (proceeding from within outwards) slaty blue, reddish brown, brownish black, tawny, black. On the underparts the components of the fur are the same, of finer texture; the pile being entirely white lightens the hue of the undergrowth, which is slaty blue. No undergrowth is present on the ears, except at the base, and is very slight on the head and feet, especially on the treading-surface; here the hairs are of the same length, wavy in outline, and wiry in character. On the head, ears, and feet the pile is made up only of the shorter coloured hairs; at the nape of the neck only the undergrowth is present.

The autumnal coat is characterized by an increase in length of the outer hairs and undergrowth, generally over the whole body, and more appreciable as winter approaches.

About the commencement of October the first indications of the hybernal change are to be detected: the nose and lips assume an iron-grey hue, from the presence of white hairs; many of the whiskers are white at the tip or some portion of the shaft; a patch of white hairs, twenty to thirty in number, of the size of a split-pea, forms on the centre of the forehead*; white hairs become apparent on the edges of the ears outside and at their junction with the neck, while on the inside a crop of downy white fluff springs up; a few of the longer hairs of the pile of the back, especially towards the tail, are observed to be blanched wholly, or only at the tips, while the greater part of the smaller kind are brown at the tip, with the tawny band of the shaft much lighter in colour or even white; the anterior surface of the feet, especially of the hind ones, is mottled with white.

Thus far the most careful examination fails to elicit any addition to the autumnal coat, the change being superficial and entirely dependent on an alteration of colour in existent hairs; the hind feet are the most advanced, then the ears and muzzle, lastly the back. During November this surface-change gradually deepens in intensity, especially around the tail, and on the feet, ears, and face (on the latter by a white streak extending from nose to eyes and upwards to the ears), and is accompanied by a deeper one of a much more potent character; for on separating the fur a thick crop of white stiff hairs (first apparent at the root of the tail) is to be detected springing up over the back and sides. These hairs, at first extremely minute and entirely of a new growth, rapidly increase in length, accompanied by an advance in the superficial changes above mentioned; soon they are

* "Fancy Rabbits have often a white star on the forehead, and so has the young of *L. americanus*, like the English Hare" (Darwin, Animals and Plants under Domestication, vol. i. p. 140).

on an equality with the pile of the autumnal coat on the sides, forming a mottled whity-brown band from ears to tail, contrasting strongly with the centre of the back, at present comparatively unchanged; anon they outstrip this, reducing the mottling on the sides to a pure white, and, gradually implicating the centre of the back in the same process (through the varying hue-phases, according as the rapidly advancing white growth appears through and finally overwhelms the variegated changing autumnal coat), they clothe the animal in a thick white outer garment, generally assumed about the first week of December. As soon as the new growth renders itself superficially evident, the change of colour in the old hair, which on the back up to this time has been slow in progress, advances with great rapidity, so that in a few days only a few coloured hairs, generally remaining unchanged throughout the whole winter, are to be detected. The feet and ears, the first to show indications of change, are the last in completing the winter hue: generally the head and ears have no hybernal fresh growth; but occasionally it is to be met with. During this period, and especially when the new hybernal growth of white hair renders itself conspicuous on the surface of the autumnal coat, an extremely handsome fur is produced; every degree of variation may be met with, and each step of the process can be traced with accuracy and clearness. Modifications of the progressive changes enumerated above often occur in individuals, from an anticipation or retardation of change in one part relatively to the whole; these, however, are of a temporary nature—mere individual peculiarities, and finally merge into the all but universal midwinter clothing, which may be described as under. A white, with a leaden tinge, from a few long black hairs undergoing no change, pervades the entire skin, with the exception of the edges of the ears, eyelids, and legs; a narrow rim of black hair, $\frac{1}{8}$ inch wide, is present at the tip of the ear externally and $1\frac{1}{2}$ inch downwards on each side of the cartilage, which is thrown into strong relief by the thick white woolly coat now existent on the inside; a narrow rim, also black, on the free edge of the eyelids; the whiskers white entirely, or interspersed with some not changed, the shaft of hair white only at tip, or with alternating white and black bands; the anterior surface of the feet mottled reddish white,—the colour of the ears and eyelids being the resultant of no change in these situations, that of the feet and whiskers from a non-completion of the process. However, although this is the general rule, yet it is not difficult to find specimens where the length of the hybernal growth on the ears and around the eyes conceals the normal black, and the absolute completion of change elsewhere obliterates these peculiarities, leaving the animal snowy white, broken only by the glistening dark-brown pupil of the eye and yellowish iris.

Contrasting the winter with the summer and autumnal coat we find a colour-change with a great increase in the length and thickness of the fur; let us inquire minutely into the process and its local modifications. On the back is to be distinguished the pile and undergrowth. The former is made up of straight pointed hairs, slightly varying in length, the average $1\frac{8}{10}$ inch, and white throughout the entire shaft, mingled with a few isolated black hairs and

reddish-brown ones with white tips: these latter are evidently unaltered or partially changed summer varieties; but the mass of the pile, trebly increased in number and at least half an inch in length, is the produce of the hybernal growth superadded to the elongated and blanched autumnal coat. The under-fur has increased $\frac{4}{10}$ inch in length, but is unaltered in thickness or colour. A crop of white hair has sprung up on the inside of the ear, on the outside and on the face the hairs have increased in length, and the shaft is partially or wholly whitened from the tip downwards. In most specimens no new hybernal growth is perceptible in these localities, in some there is a slight addition, in a very few it is as complete as on the back. However, where no increase in number ensues, compensation is effected by an extra augmented growth in the existent fur. On the legs the change is limited to a lengthening and bleaching of the outer hair; often this is limited to the tips of the shaft; and an occasional absence of change in spots leaves an irregular fawn-coloured mottling and streaking, especially on the front paws; the hair on the treading surface is lengthened and dirty white. On the underparts there is no addition beyond an increase of length of the fur; occasionally the whiskers and eyebrows remain black. Thus the winter hue would appear to be brought about by a change of colour in the pile of the autumnal coat combined with a new hybernal white crop, the latter undoubtedly playing no small part in the colouring process and in the thickening of the fur. There is no indication of shedding. An increase in length ensues over the whole body. On the underparts the change is limited to this, but elsewhere it is associated with a bleaching of the pile, generally commencing at the tip of the hair and involving part or the whole of the shaft. On the feet, and generally on the outside of the ears and face, no additional growth is perceptible; but on the inside of the ears, and over the whole back and sides, a thick crop of white hair springs up as the winter advances, and, blending with the changed surface, materially increases the thickness of the fur, protects the animal against the inclemency of winter, and assimilates it in colour to external nature. The process may be summed up as a combination of colour-change (except in the underparts) of the lengthened outer hairs of the autumnal coat, with an additional hybernal growth; the former universal over the body, the latter limited to certain portions.

The shaft of the hair of the new growth is invariably white, a circumstance which renders it easily distinguished from the autumnal hair in process of change. Careful examination of a great number of these latter hairs will render it evident that, although the blanching process commences, perhaps, most frequently at the tip and proceeds downwards, involving the whole or a part only of the shaft, yet it is easy to obtain specimens (especially among the shorter variety of the pile) demonstrating its commencement at the centre, and occasionally at the attached extremity. The whiskers, which apparently do not lengthen but merely alter in colour, will demonstrate each variety.

Microscopically examined, the hair of this Rodent, circular in outline, is composed of oval or irregular shaped cells placed end to

end and arranged in linear series in the long axis of the shaft, covered externally by a delicate tissue of elongated flattened epithelium (fig. 2). The shaft of the under-fur (fig. 1) averages $\frac{1}{2000}$ inch in thickness, has one series of cells in its structure; the pile, $\frac{1}{600}$ inch in diameter (fig. 3), four or more, according to the varying thickness of the shaft,

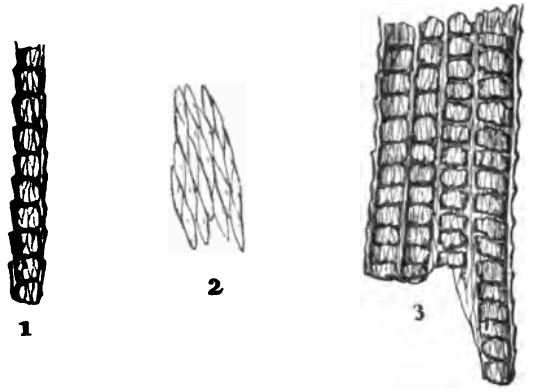


Fig. 1. Microscopic aspect of shaft of under-fur.
2. Epithelial covering of shaft.
3. Shaft of pile.

one series only at the tip, and the number gradually augmenting to the greatest circumference—the cells varying in colour according to the portion examined, but when white to the naked eye then colourless microscopically. The increase in the length of the autumnal hairs has been already noted; to this must be added that the blanching shaft, in the majority of cases, has also augmented in thickness, the average $\frac{1}{330}$ inch in diameter (corresponding to the new growth), the increase being consequent upon a more than usual number of series of cells entering into its composition. In some hairs where the centre of the shaft has changed, bounded on each side by an unchanged portion, it will be noted that at the altered segment the shaft bulges out, increasing in diameter from $\frac{1}{600}$ to $\frac{1}{400}$ of an inch by the addition of one or more series of colourless cells, and that at the unaltered portion, both above and below, it is contracted to the former size, contrasting strongly both in the number of series of cells and in the absence of colour in the changed parts. If also we examine one of the long black hairs bleaching at the tip, the addition of the colourless cells, as contrasted with the same portion of an unchanged hair, is very marked. Again, a comparison of changed hairs with unchanged ones of almost equivalent length, from the same vicinity, gives frequently a double thickness to the former over the latter. The increase of series to the shaft of the hair in process of change seems the rule, the absence of colour invariable; but in the whiskers, which in their structure approach rather the human hair with its fibrous cylinder and cellular centre, the former is not so apparent.

What is the *rationale* of the process in virtue of which to the naked eye the colour of the hair is changed from black or tawny to white? Is it dependent on an abstraction of pigment, an alteration, or new deposition? and must we regard it in the light of some general condition of the animal frame modifying the whole capillary pigmentary secretion, or, on the other hand, interrogate the hair itself for the solution of the problem? The gradual character of the process, the immunity of some hairs from all change whatever, the irregularity of its course in involving different hairs in the same portion of the body, the all but invariable commencement of change in any other part of the shaft than that first to be influenced by altered secretions, the temporary localization of the process to some one part of the shaft, entirely limited to this or gradually implicating the rest, and the freedom from all change in colour in the under-fur, incline the balance of evidence to the latter opinion, and, moreover, indicate a capability of action of one portion of the shaft of the hair independently of any general change affecting the whole, and derived from the organism within. It would seem that the rapid development of new hairs, varying in no appreciable respect except colour from the pile, called forth by the increasing rigours of climate for the protection of the animal frame, involves the autumnal outer fur in the same process, leading to an increased length and thickness in the shaft of the hair by the superposition of layers of the same colourless cells entering into the structure of the new growth—perhaps combined also with an arrested production of pigmentary matter.

Although, as a general rule, it may be stated that the hybernal change commences about the first week in October, and is finished the first week in December, thus occupying two months, yet departures from it are not at all uncommon, both as regards the comparison of one individual with another at the same period of time, and as regards the modifications consequent on yearly climatic variations. For example, a specimen shot in December 1866 was only beginning to turn white. On November 6th, 1867, a skin (before the first fall of snow) had a head piebald, feet white, back with a scattered white hair, no undergrowth. On November 18th (after the first fall), two Hares were shot in the same vicinity, one changing, the other not. On the 22nd, from a high ground, one was perfectly white on head and feet, and on each side and around the tail deeply patched of the same colour; the other showed only slight superficial changes, but on separating the fur the new growth was easily detected, $\frac{1}{5}$ inch in length, hidden under the autumnal coat. Again, on the 21st one was in the same state as the preceding, while another from the same vicinity presented a dark streak along the centre of the back gradually fading into the white sides; change elsewhere accomplished except on centre of forehead. On the 28th one was pure white. In the first week in December 1868 one was complete in the change; another was still very brown along the spine. On the 11th December 1868 three were examined,—one, ears not whitened at all in front, feet very reddish, body changed; another, feet changed, side of face mottled, centre of back not yet implicated; the third, complete except a patch on each side

of the face. Although the examples quoted demonstrate how individual peculiarities, apart from age, sex, or habitation, may modify a general law, there can be no doubt that the change is essentially dependent on the season, and is hastened or retarded by its severity or otherwise. On the seaboard it is postponed in comparison with inland districts in the same latitudes. Sir J. Richardson remarked the early change of *L. americanus* in the Hudson's Bay Territory, as well as the carrying of its winter coat until June. He also especially mentions "the absence of change of dress in the winter time in the southern parts of the United States"*. I am informed that one kept in confinement at St. John's, N. B., in a warm barn, retained the summer colours. Respecting the popular idea of the white fur coinciding with the first fall of snow, careful observation does not corroborate it. The change is essentially gradual, and spread over some seven weeks; but the rapidity with which the new white growth, when it first renders itself apparent externally, involves the entire surface of the back may somewhat explain the popular belief on the subject, although at least seven days must be taken up in this part of the process.

The winter's coat is generally carried in New Brunswick until the middle of May, when it is gradually shed, so that in June the animal may be said to have assumed its summer fur. Thus five months may be regarded as the period during which in this province *L. americanus* is clothed in white—from December to April; two months are occupied by the autumnal change, and one by the vernal. We have seen how in the Arctic regions the duration of the winter coat is extended, and its absence in southern latitudes. Considering the increased duration of the winter coat over the summer one in proportion to the seasons, as well as its importance to the animal in assimilating it to the natural features of the country for the greater part of the year, and as a protection against cold and its numerous enemies, it would be rational to regard the winter fur as the ordinary coat of this Hare in New Brunswick and northern climes, and the summer change its modification; the opposite would hold good in more southern latitudes, in sequence to the relative length of the seasons.

The dimensions of this Rodent, as met with in New Brunswick, are as follows:—

	ft.	in.
Length from nose to end of tail	1	6
——— from ear to end of hind leg stretched	2	5
——— of ears	0	3
——— of head	0	3·75
Fore leg, from middle toe to ulna extremity	0	6
—— —, from wrist-joint to middle claw	0	2·9
Hind leg, from middle claw to hip-articulation	0	12
—— foot, from middle toe to calcis	0	6
—— ——, breadth posteriorly	0	$0\frac{3}{4}$
—— ——, breadth anteriorly	0	$1\frac{3}{4}$
—— ——, ,, ,, when expanded	0	4

Average weight, 3 lb.

* Appendix to Parry's Arctic Expedition. *L. americanus.*

Thus the peculiarity of *L. americanus* consists in the development of the feet relatively to the body generally, as contrasted with other species. Although only weighing 3 lb. in New Brunswick, against 6½ lb. in southern districts, with a corresponding diminution in the dimensions of the body, the feet yet retain fully as great development in one as the other. *L. timidus*, with an average weight of 8 lb., and length 26 inches, has a hind foot only 5½ inches long; whilst *L. variabilis*, with an average length of body of 23 inches, has also 5½ inches. *L. glacialis*, found in common with the American, 7 lb. weight, and 22·6 inches long, has dimensions as follows:—from wrist-joint to end of claw 2 inches 9 lines, heel to point of middle claw 5 inches 9 lines. Not only is the foot of *L. americanus* proportionately lengthened, but a remarkable degree of lateral extension is allowed between the metacarpal and metatarsal bones, with great laxity of the web membrane. Inhabiting the woody districts, where the snow remains deep and soft during the greater part of the winter, the advantage of such a modification in the feet, especially when combined with the lengthened stiff winter hair on the treading-surface, is apparent, allowing it to pass over the softest snow with the slightest impress, and thus giving it the power of eluding by swiftness its numerous enemies. A recent impress of these natural snow-shoes gave the following shape and dimensions:—Fore feet oval, each 3½ inches long by 2 inches broad. Hind feet egg-shaped (large end anteriorly), each 6 inches long by 3 inches in front and 1½ inch behind.

The average snow-shoes adapted to an ordinary-sized man have a superficial area 5½ inches for each pound in weight, which is extended in this Rodent to 11·4 inches. In the Hudson's Bay Territory *L. glacialis* and *L. americanus* exist in the same district, the one inhabiting the open barrens, the other the soft snowy woodlands.

It appears much to be desired that the modifications in the feet and winter coat of this Rodent, under different latitudes and variations of natural conditions, should be accurately traced out, inasmuch as the indications are that, both in the one and the other, they fully illustrate the capability of external circumstances to call forth structural changes, placing the animal frame in harmony with the surrounding natural features, and allowing it to compete advantageously with its numerous and powerful enemies in the great struggle for existence.

3. Notes on the Habits of the Collared Plain Wanderer (*Pedionomus torquatus*, Gould). By W. Vincent Legge, F.Z.S.

Mr. Gould says this bird is not uncommon in South Australia, where it inhabits the plains of the interior; but I think he does not record its presence in Victoria. It makes its appearance in

the vicinity of Melbourne in the summer, coming down from the interior along with *Coturnix pectoralis*, probably for the purpose of breeding, and departing northward, I should say, about April.

Much of the country round Melbourne, including the district called the Keilor Plains, is in features suited to the habits of the "Collared Plain Wanderer;" and one or two individuals fall every season to the gun of the sportsman, as it is found in the same localities as the Pectoral Quail. It was in the vicinity of the Keilor Plains that I met last January with this singular bird; and as the locality I found it in was a field of short English grass, I had, fortunately, ample opportunity of observing minutely for some time its actions and deportment. In these it has every resemblance to a grallatorial, and, as far as can be seen from short observation, very little to a rasorial bird. It runs at a medium pace hither and thither, checking itself and pausing at times, at the same time twisting about its high-carried head like a member of the Plover family. When in a state of quiescence, it holds itself erect with its head raised. Its mode of flight, however, is entirely peculiar to the bird itself; it rises suddenly, and for a little space proceeds with a dipping Finch-like motion, and then settles down into a steady fluttering flight, reminding one somewhat of a young Lark. A very peculiar feature was exemplified in a second individual (the mate of the bird the actions of which I have just described), which, after I had flushed it several times, flew off and perched on the lower rail of a "post-and-rail" fence; it remained in this position for a couple of minutes, and then again took flight.

What I would wish here to call particular attention to is the egg of *Pedionomus torquatus*, which I took perfect in shape and coloration out of the specimen now before me. It was very large for the bird and was Plover-like, being pyriform and of the exact shape and dimensions of the egg of *Charadrius hiaticula*. It was of a greenish white ground-colour, blotted and speckled, principally at the larger end, and faintly streaked throughout, with umber-brown and lilac-grey. In form, then, the egg resembles that of a Wader, though the coloration is somewhat peculiar.

As some authors arrange this bird in the family of the *Turnicidæ*, while Bonaparte regards it as belonging to *Coturnix* (solely on account of the presence of the hallux, I suppose), it seems a disputed point where to place it exactly. To the mind of the inquiring though inexperienced naturalist the subject presents some difficulties, as the bird appears intermediate between the rasorial and grallatorial orders, and to belong to a separate group. Its habits and actions, the shape of its head and bill (which latter is longer than that of other members of the Bustard-quail family), its length of leg (especially that of the tibial joint, so much of which is bare), the delicate structure of the leg, moreover, and its feet, its Bustard-like upper plumage, and chiefly its egg place it somewhat near the Grallatores; while its diminutive size, the contour of its body, and the Quail-like tail show its affinities to the rasorial birds.

The following are a few of the exact measurements, taken from the specimen in my collection:—

	inch.
Bill, from gape to tip of upper mandible	$\frac{3}{4}$
Tibia	$1\frac{1}{2}$
Bare portion of tibia, from tarsal joint	$\frac{1}{2}$
Tarsus	1
Middle toe	1

Is it not probable that other members of a group in which this bird might be placed may in future be found in the unknown north-western districts of the continent? The fact of representation of species between the north and south is true with regard to most forms of the Australian avifauna.

4. Report of a second Collection of Fishes made at St. Helena by J. C. Melliss, Esq. By Dr. Albert Günther, F.R.S., F.Z.S., &c.

(Plate XVI.)

The British Museum received in the month of June of last year a second collection of fishes made at St. Helena by J. C. Melliss, Esq. With regard to the preservation and number of the specimens it proved to be as valuable as the first, of which an account is given in the 'Proceedings' of this Society (1868, pp. 225–228). I have now also examined the Eels, which are evidently very well represented in that part of the ocean. Their descriptions will be found in the eighth volume of the 'Catalogue of Fishes;' but I may mention that the new genus *Myroconger* is of great interest, being a *Muræna* with pectoral fins. The following list contains twenty-one species, which raise the total number of fishes collected by Mr. Melliss to fifty-six. As in my former paper, I have marked the localities from which the species were previously known, thereby indicating the affinity of this fauna to that of other parts of the Atlantic:—

1. *Polymixia nobilis*, Lowe. Madeira.
2. *Myripristis jacobus*, C. & V. West Indies, Brazil.
3. *Chætodon dichrous*, sp. n.
4. *Auxis rochei*, Risso. Tropical seas.
5. *Caranx crumenophthalmus*, Bl. Tropical seas.
6. *Caranx hippos*, L. Tropical seas.
7. *Antennarius pinniceps*, C. & V. Tropical seas.
8. *Antennarius multiocellatus*, var. β, Gthr. Caribbean Sea.
9. *Acanthurus chirurgus*, Bl. Atlantic coasts of Tropical America and Africa.
10. *Heliastes marginatus*, Castel. Coasts of Brazil and California.
11. *Saurus atlanticus*, Johnson. Madeira, Zanzibar.
12. *Saurus myops*, Forst. Tropical seas.

13. *Exocœtus cyanopterus*, C. & V. Brazil.
14. *Conger vulgaris*, Cuv., var. *nigra*. Europe, South America, East Ind. archipel., Japan, Tasmania.
15. *Congromuræna mellissii*, sp. n.
16. *Ophichthys regius*, Shaw. St. Helena.
17. *Myroconger compressus*, g. et sp. n.
18. *Muræna flavopicta*, Kaup. Tropical Atlantic.
19. *Muræna sanctæ helenæ*, sp. n.
20. *Muræna moringa*, Cuv. Tropical Atlantic.
21. *Muræna unicolor*, De la Roche. Mediterr., Madeira.

The new *Chætodon* may be described as follows:—

CHÆTODON DICHROUS. (Plate XVI.)

D. $\frac{12}{20}$. A. $\frac{3}{15}$. L. lat. 53.

Snout rather produced, a little longer than the eye, with the upper profile concave; præoperculum slightly serrated. Dorsal spines strong, the third and fourth the longest, two-thirds of the length of the head; the soft portion of the dorsal and anal fins low, rounded. Body bicoloured—the anterior parts to the fourth dorsal spine and the lower half of the fish being uniform brown, the remainder (tail and caudal fins included) pinkish white. The scales of the lateral line silvery.

There is only one example of this remarkable species in the collection; it is 5 inches long.

5. Further Contributions to the Ichthyology of Zanzibar. By Lieut.-Col. R. L. PLAYFAIR, H.B.M. Consul-General in Algeria. With a Note by Dr. A. GÜNTHER.

A large cask of fishes was lately sent to me by Dr. Kirk from Zanzibar; but, for want of adequate accommodation for examining so extensive a collection, I was compelled, after a single cursory inspection, to close the cask again and send it to the British Museum. I, however, kept a few small specimens; and amongst these I find one new species, and two others which I had not before observed on the east coast of Africa. They are:—

ANTENNARIUS NIGROMACULATUS, sp. n.

D. 3|12. A. 7. P. 10.

It is not without considerable reluctance that I venture to describe a new species of *Antennarius* with the limited means of identification at my disposal in Algeria; but this specimen differs so distinctly from all I have observed at Zanzibar and Seychelles, and from all that I can find recorded, that I am inclined to regard it as an undescribed species.

Diagnosis.—Cleft of mouth subvertical and ascending in an oblique line, slightly inclined backwards. Length of maxillary bone one-

sixth that of the body. Anterior dorsal spine filiform, terminating in a lanceolate trifid (or fringed?) lobe; its length is more than twice that of the second spine, which is about one-half that of the third. The third is remote from the soft dorsal, but connected with it by a low cutaneous fold. The end of the soft dorsal is remote from the base of the caudal; it is quite unconnected with it, and the last ray does not reach so far if laid backwards; anal not half the length of the soft dorsal. There are a few very minute tentacles on the lower jaw, but none on the body. A cutaneous fold runs along the sides a little distance below and parallel to the base of the soft dorsal, than which it is somewhat shorter. Skin rough, covered with minute spines.

Colour.—Ground-colour brownish, a large black patch extending over the whole of the abdominal region; other smaller mass-like patches below chin, on sides of head, on upper part of body, soft dorsal, anal, and across the tail; these sometimes anamostose and enclose spots of the ground-colour; several round ocelli above base of pectorals and on base of dorsal; all the patches and ocelli have light edges, as also have the pectoral and ventral fins.

Length 4 inches.

DIAGRAMMA ORIENTALE.

Anthias orientalis, Bl. t. 326. f. 3.

Serranus orientalis, Cuv. & Val. ii. p. 318.

Diagramma orientale, Cuv. & Val. v. p. 299, pl. 124; Günth. Fish. i. p. 326.

D. sibbaldii, Benn. Proc. Zool. Soc. 1832, p. 182.

Zanzibar. Seas of Ceylon and Bali.

PROSOPODASYS LEUCOGASTER.

Prosopodasys leucogaster, Richardson, Voy. Samarang, Zool. Fish. pl. 5. f. 1, 2; Günth. Fish. ii. p. 141.

Height of body less than length of head, and one-fourth of total. Lower jaw slightly prominent, cleft of mouth oblique; maxillary reaches slightly beyond centre of eye. Interorbital space much less than orbit. Præorbital with two spines, of which the first is rather small, and the second very long. Infraorbital with bony ridges, but no distinct spine. Præoperculum with five spines; the interoperculum with one, and the operculum with two bony ridges. The first dorsal spine is situated before the posterior of orbit; it and the two succeeding ones are contiguous with, but rather remote from, the remainder; the third is the longest; the fourth is situated above the opercular margin. Caudal acutely rounded. Ventrals reaching to the vent, and pectorals much beyond it. Head and body naked.

Colour brownish, marbled with darker and lighter. Upper part of head black; a black spot on spinous dorsal between fifth and eighth spine.

Length 2¼ inches.

Zanzibar.

Addendum. By Dr. A. GÜNTHER.

Col. Playfair has sent to the British Museum, besides the fishes described in the preceding paper, an example of a small Labroid fish, which he regarded as a new species of *Labrichthys*, requesting me to examine it also. It proves to be identical with *Labrichthys cyanotænia* of Bleeker; but it would have been difficult to recognize it from Bleeker's description, as he has omitted to say that the ground-colour of examples preserved in spirits changes into black. Beside an example sent by Dr. Bleeker as *L. cyanotænia*, the British Museum possesses an example of *Thysanochilus ornatus* of Kner. This I find is identical with the Zanzibar fish, although it appears really to be the type of a distinct genus closely allied to *Labroides*, for which the name proposed by Kner ought to be retained. The synonymy is:—

THYSANOCHILUS CYANOTÆNIA.

Labrichthys cyanotænia, Blkr.
Thysanochilus ornatus, Kner.
Samoa Islands, Flores, Zanzibar.

Specimens in the British Museum:—
a. 6½ inches long. Samoa Islands. Type of *Th. ornatus*.
b. 3¾ inches long. Flores? (*L. cyanotænia*.)
c. 3¾ inches long. Zanzibar.

6. Notes on the Common Grey Hornbill of India (*Meniceros bicornis*). By C. HORNE, F.Z.S.

Dr. Jerdon, in his 'Birds of India' (vol. i. p. 244), has briefly sketched the habits of the Hōmrai, or Great Hornbill, and allusion is there made to its curious custom of building-up its mate in the hole of a tree for the purposes of incubation; and I observe that Mr. Wallace, in an interesting article in the 'Intellectual Observer' (June 1863), states that a similar habit has been observed in at least three species, including that under notice.

Dr. Jerdon also quotes Major S. R. Tickell as having "seen this with his own eyes."

The number of observers must of necessity have been very small who have had the opportunity of watching the process of nidification; and as I only last year was so fortunate, I have deemed the subject worthy of a note.

The beak, neck, and tail of this bird being long, and the wings comparatively short, its flight is rather undulating, accompanied by frequent flapping of the wings, as the bird traverses the short distance from grove to grove in search of its favourite food, the fig of the Peepul tree (*Ficus religiosa*). Moreover, as during its flight it often utters its harsh note, it is a bird which attracts the notice of the most casual observer. It often flies in threes; and a visit from

these birds is much to be dreaded in well-stocked fruit-gardens. It feeds on all kinds of fruit, but more especially on figs, whether cultivated or of the wild varieties. The bird, its beak, and its structure have been so often described, that I will confine my remarks to what I have myself observed.

During the year 1867 I was resident at Mainpúri, N.W. provinces, India, and was much troubled with these birds, of which I shot a dozen. This was an easy matter, as when in search of food they are very fearless. I observed its habit of climbing by the beak, somewhat as a Parrot does; and the way in which they cleared the trees of fruit and jerked the said fruit into their throats, after seizing it with the points of their beak, was very curious.

I had some very choice, large, loose-skinned oranges; and I often found apparently entire skins only still attached to the twig, the whole of the inside having been extracted, piece by piece, section by section, by this clever "Dhauēl," as he is there called.

In April 1868 I received intelligence of two nests, and found that both had been made in the trunks of "Seemal," or cotton-trees (*Bombax heptaphyllum*), the bird having dug out and enlarged with his bill holes in this soft wood which had been previously used by Parrots.

In each case I obtained three eggs; and the hole, at a great height from the ground, appeared to have been plastered up with cowdung, or something nearly resembling it. I could not, however, determine this positively, as in each case I had to go some six or eight miles, and so had no opportunity of observing the process. The bird which I took from one nest had lost many of her loosely put-on feathers, and appeared to be in bad condition. As, however, the natives wanted her flesh for medicinal purposes, I allowed them to take her.

I was, however, more fortunate at the close of the same month (April 1868). On my lawn, surrounded by other trees, stood a noble sissoo-tree (*Dahlbergia sissoo*); and where the first great fork diverged was a hole, for the possession of which for purposes of incubation the Rollers and Parrots were always noisily contending. I had often wished the Hornbills to use this; and I was much pleased to see that, after great consultation and inspection, and vociferation by the Rollers, and screeching by the Parrots, they on April 28, 1868, made up their minds to use it. The hole was nearly a foot in depth, and roomy inside. On the 29th of April the female went into the hole, and did not again come out.

There was sufficient room in it for the female to draw in her head altogether when she wished to conceal herself or to bring up the ordure from below.

The hole being about 10 feet from the ground and opposite my verandah, I could watch everything perfectly through a glass. The tree was also very near to the house.

From the time the female went in, the male was most assiduous in feeding her, bringing generally the small Peepul-fig.

On April 30th I observed the female working hard at closing the

orifice with her own ordure. This she must have brought up from the bottom of the hole; and she plastered it right and left with the flat sides of her beak, as with a trowel.

I never saw the male bring anything but food; and I never found any fruit which had been rejected under the tree, and but very little ordure, which latter had apparently been thrown out by the female when the closing-work was finished.

The male bird would alight near, then fly to the hole, holding on to the bark by his claws, and knock with his beak. On this the points of that of the female appeared and received the fruit, when the male flew off.

I herewith beg to submit some of the substance with which the hole was closed up, which is manifestly what I suppose it to be, and when fresh, possesses great viscidity. It contains the remains of insects, which probably the female had eaten before she entered the hole—thus confirming Dr. Jerdon's statement as to their various diet.

The hole was at first perhaps 6 inches in height, and 3 or 4 wide. When closed up, the opening at the widest part was a little larger than would admit the finger. It should, however, be borne in mind that the bill opened upwards, and thus had 3 or 4 inches play. The plastering-operation took two or three days, after which the ordure was thrown out.

The third Hornbill used to hover about, watch proceedings, and sometimes quarrel with the accepted lord, but he never brought food to the female.

On May 7, thinking that I had given time enough for the female to lay her three eggs, which I wanted, I got a ladder, opened out the nest, and with some difficulty got out the bird, who was fat and in good condition, with the desired eggs (three). At first she could scarcely fly, but did so after a little time.

The natives, who know the habits of these birds well, told me that the female digs herself out directly her newly hatched young need food; and this is most probably correct.

7. Notes on *Ploceus baya* and its Nest.

By C. Horne, F.Z.S.

(Plate XVII.)

In submitting these notes upon *Ploceus baya* I do not suppose that I am narrating anything not previously observed, although I have never met with any account of the method in which this ingenious bird obtains its material.

I cannot solve the mystery of the lumps of clay found in the nests, although I have examined many at all seasons for the purpose. I may remark, however, that I have seldom, if ever, found a finished nest without them.

Here is an extract from my journal:—"This morning (July 7, 1865), as I passed our solitary palm tree (*Phœnix dactylifera*) in the field, I heard a strange twittering overhead, and looking up saw such a pretty sight as I shall never forget.

"In this tree hung some thirty or forty of the elegantly formed nests of woven grass of the Baya bird, so well known to all. The heavy storms of May and June had torn away many and damaged others, so as to render them, as one would think, past repair. Not so thought the birds; for a party of about sixty had come to set them all in order.

"These little birds are about the size of a Sparrow, and have yellow in their crests, and are darker about the wings, being paler below, with shortish tails. The scene in the tree almost baffles description. Each bird and his mate thought only of their own nest. How they selected it I know not, and I should like much to have seen them arrive. I suppose the sharpest took the best nests, for they varied much in condition. Of some of the nests, two-thirds remained, whilst others were very nearly all blown away. Some of the birds attempted to steal grass from other nests, but generally got pecked away.

"As the wind was blowing freshly, the nests swung about a good deal; and it was pretty to see a little bird fly up in a great hurry with a long bit of grass in his beak. He would sit outside the nest holding on by his claws, with the grass under them. He would then put the right end into the nest with his beak, and the female inside would pull it through and put it out for him again; and thus the plaiting of the nest went on. All this was done amidst tremendous chattering, and the birds seemed to think it great fun. When a piece was used up one would give the other a peck, and he or she would fly off for more material, the other sitting quietly till the worker returned. Nests in every stage of building afforded every position for the bird, who seemed at home in all of them. The joy, the life, the activity, and general gaiety of the birds I shall never forget.

"July 11, 1865.—To-day I noticed that nearly all the nests had been repaired, and the birds were more scattered, either helping themselves to my Jowahor (*Sorghum vulgare*) in the field or collecting insects.

"July 20.—I observed some eight or ten newly built nests on the ground under the tree, which I believe to have been deliberately cut off from their supports by the thievish Striped Squirrels (*Sciurus palmarum*) for use by them in their nests. Some of these had unbroken eggs in them.

"August 18.—Noticed to-day how the birds obtain their grass. The little bird alights at the edge of the high strong Seenta grass (*Andropogon euripeta*?) with its head down, and bites through the edge to the exact thickness which it requires. It then goes higher up on the same blade of grass, and having considered the length needed, bites through it again. It then seizes it firmly at the lowest notch and flies away. Of course, the strip of grass tears off and

stops at the notch. It then flies along, with the grass streaming behind it. As the edge of the grass is much serrated, the bird has to consider and pass it through the work the right way. This serration renders it so difficult to pull a nest to pieces, and makes the same nest last for years.

In some instances the male continues to build for amusement after the nest is finished, not only elongating the tubular entrance, but also making a kind of false nest.

Before the colony ceased building there were more than seventy nests in the tree, which is represented in the photograph now exhibited (Plate XVII.). Three great notches may be seen on the trunk. These were made when the tree was smaller, by baring a side of the crown and tapping the trunk for toddy to be used in bread-making. This operation so weakened the tree, that last year in a violent storm the crown broke off, and thus destroyed the whole settlement.

8. Note on the Young of the Spotted Hyæna (*Crocuta maculata*). By Dr. J. E. Gray, F.R.S., V.P.Z.S., &c.

The British Museum has lately acquired a very young female pup of the Spotted Hyæna (*Crocuta maculata*), which was born in the Society's Gardens.

The animal is covered with a short soft fur of nearly uniform length, of a nearly uniform rather brownish-black colour, which is rather paler on the face. It is without any indication of spots. The tail is slender, tapering. There is a stuffed specimen of a rather older and larger male in the British Museum, which was preserved by M. Verreaux at the Cape; it is of the same uniform tint, but is much paler, and has become paler than it originally was on one side by exposure in the case.

I may observe that the pups of the Striped Hyæna (*Hyæna striata*) are pale and streaked like the adult. There are some specimens of very young pups of this species in the British Museum.

The skull of the very young female pup is solid; and the bones are well ossified, and united in all parts by very narrow and often indistinct sutures. The bullæ of the ears are peculiar for having a large space on the outer side of the under surface only covered with membrane, which has the opening of the ear in the upper part near the margin of its outer side. This disk occupies about one-third of the lower surface of the bony bullæ. The cutting-teeth and the canines are well developed, the cutting-teeth in each of the jaws being placed in a straight line, the outer tooth in each series being rather the largest. The grinders are not developed above the alveoli; but their situation is indicated by the dried pulps. There are three pulps on each side of each jaw: the two front ones on each side of the upper jaw, belonging to the premolars, are small; the others in both jaws are rather large.

Fig. 1.

Fig. 2.

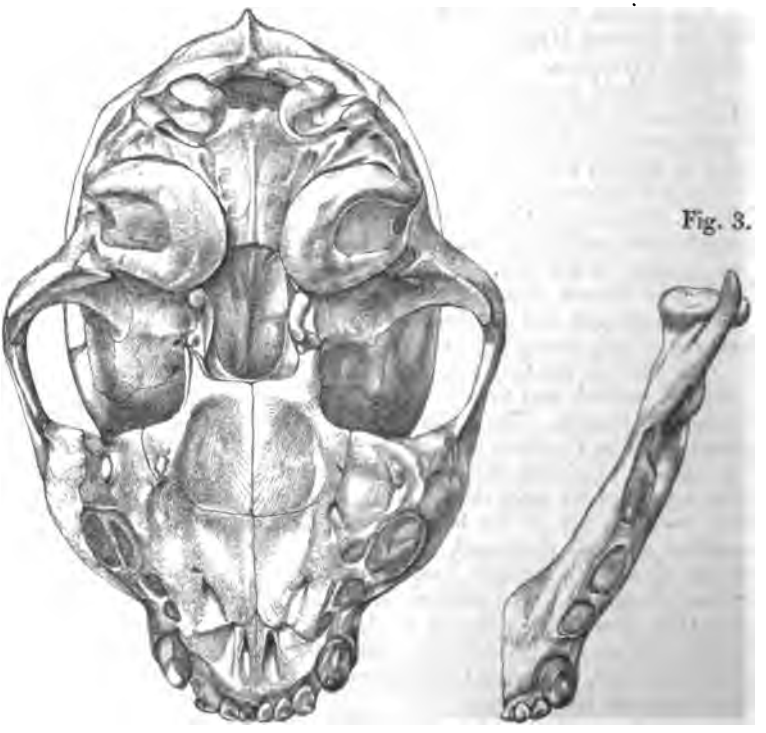


Fig. 3.

Fig. 1. Skull of young Hyæna (lateral view).
2. Lower surface of ditto.
3. Left ramus of lower jaw.

The upper jaw, when cut away at the side (as shown in fig. 1, p. 246), exhibits a very rudimentary canine tooth of the adult series, and three molars, the middle being the flesh-tooth of the milk-series.

The lower jaw shows three molars of the milk-series in a moderate state of development, and a cavity in which the large hinder molar is to be developed, but which is now in a very rudimentary state.

The first tooth indicated on the edge of the jaw is the permanent canine, and the two other teeth are the anterior molars.

I am not aware that the skull of the young animal of this genus has been figured; so I have had some drawings, to illustrate this paper, made by Mr. Ford.

9. On a Variety of the *Canis vulpes* (*Vulpes vulgaris*, Brisson) found in the Forest of the Ardennes, Belgium. By Dr. Edward Hamilton, F.L.S.

The Prince of Musignano, in his 'Fauna Italica,' describes a variety of the *Canis vulpes* under the name of *melanogaster*, and claims specific characters, in that the colour of the fur on the throat, chest, and abdomen is black instead of whitish grey; the head and back dark greyish, and mixed with a quantity of silver hairs; the tail more bushy, and furnished with a white tip. Mr. Gerrard, in his 'Catalogue of Bones in the British Museum,' places the *Vulpes melanogaster* as a distinct species. Dr. Gray, "Catalogue of the Canidæ" (P. Z. S. 1868, p. 515), describes it as a variety only; *Hab.* Italy. Linnæus describes a variety, *Canis alopex*, with a straight tail black at the tip, and smaller than the *Canis vulpes*. Buffon's *Renard charbonnier*, or *Alopex europæus*, is of a silver greyish colour, tail tipped with white; remarkable black feet and legs, which appear as if produced by charcoal-dust, hence its name; it is smaller than the common Fox. *Hab.* Burgundy.

The variety which I bring before the notice of the Society was shot last autumn in the Forest of the Ardennes, near Rochefort, in Belgium. The hunters there know it under the name of "Le Renard Noir." It is comparatively rare; about five or six are killed during the season. It is larger than the Common Fox, and a very active animal. Colour brownish grey, mixed with silver-grey hairs; deep brownish red stripe extending down the back, lighter towards the tail; head, face, and neck brownish red, mixed with silver-grey; throat, chest, and abdomen black, merging into blackish grey at the posterior part; tail blackish brown on the upper part, blackish yellow beneath, the tip black; fore legs blackish grey from shoulder to claws; hind legs, a blackish grey stripe running from the hip and becoming black at the feet.

The skin measures from tip of nose to root of tail 3 feet; tail 1 foot 6 inches. Approximate height at shoulders 1 foot 5–6 inches.

In comparing the skin with the figure given by the Prince of Musignano (*l. c.*) there is a great similarity, with the exception of

the white tip to the tail and the size, the Ardennes variety being a much larger and stronger animal. Nilsson describes a variety very like the *Vulpes melanogaster* as inhabiting Scandinavia.

10. Notes on the Friendship existing between the Malacopterygian Fish *Premnas biaculeatus* and the *Actinia crassicornis*. By Lieut. C. C. De Crespigny*.

The Anemone here spoken of is found at Labuan in various habitats—sometimes domiciled in rows along the horizontal fissures of sandstone rocks (the positions being chosen so that at low water they may be just awash), in other cases surrounding and covering a mass of exposed dead madrepore. It is also found attached to rocks or dead coral some inches under the surface of the sand, and from this vantage ground protruding or withdrawing its tentacula at pleasure, so that when they are withdrawn the animal is no longer visible. On a calm evening, when the tide is out, one may observe with advantage the sympathy which appears to exist between this animal and the little fish called *Premnas biaculeatus*. The *Actinia* is in a state of quiescence, allowing its tentacula to float and move about freely in obedience to the impulse of each ripple of the water, they being now supple, pointed at the extremities, and gravitating downwards. A *Premnas* now passes over the Anemone, and immediately the tentacula become erect and diverge as if galvanized, while their extremities become clubby and phosphorescent.

The fish hovers over it, gently rubbing the tentacula with his pectoral fins, and so will remain for some time. The hand-net is passed quietly down under the Anemone, and the alarmed fish, instead of swimming away, dives into the body of its friend, the tentacles closing over it and thus burying it in a living tomb. The hand of the captor now disturbs the fish in its hidden retreat, and upon its again rushing forth from its hiding-place the net is drawn to the surface of the water and the little fellow captured. The natural colour of this fish is pale red, having three perpendicular white stripes on the body. Upon its attaining full growth, however, when it is from four to five inches long, it becomes almost black, and the stripes are very nearly obliterated. In captivity I have known an Anemone live in perfect harmony with a *Premnas* for nearly a year. One morning the fish was found dead outside its tub, from which it had leapt in the night; the Anemone sickened, became elongated and flaccid, and died in a few days.

On the other hand, I have known a fish live in a tub for a long time without the society of its complementary Anemone.

It may be that the fish spawns upon the Anemone, or that by continually rubbing its fins against the extremities of the tentacles it rids itself and its friend of disagreeable parasites, or that it causes a continuous flow of water across the body of its friend, in which stream are conveyed the animalcula on which it lives.

* Communicated by E. Higgins, Esq., F.Z.S.

These points may be determined by future observations. It will be noticed that the extremities of the fins and tail of the *Premnas* are attenuated to what appears to be the utmost degree consistent with cohesion of their molecules.

April 22, 1869.

The Viscount Walden, President, in the Chair.

Mr. G. Dawson Rowley, F.Z.S., exhibited some specimens of British-killed Pipits, and made the following observations upon them:—

I have the pleasure to exhibit a series of Water-Pipits (*Anthus aquaticus*) and Rock-Pipits (*Anthus obscurus*), all shot or taken near Brighton, in spring and autumn plumage, male and female respectively, showing the distinction between the two species in the several states. Only two or three of the former have ever been, I think, noticed in print as found in the British isles, and considerable confusion has existed in collections respecting them. I have at times observed each one doing duty for the other. *A. aquaticus* is not very common; but it visits the south coast regularly in the spring, moves on to breed, and again stops with us a few weeks on its return in autumn. In spring it has a blue tinge on the back, with a vinous one on the chest, underparts greenish; in the autumn dress these are lost, and the underparts turn pure white. The outer tail-feather also changes from buff to white. Males differ little from females.

A communication was read from Mr. Thomas Graham Ponton, F.Z.S., containing a criticism of the arrangement of the shells of the genus *Mangelia* adopted by Reeve in his 'Monograph,' in which it was pointed out that the seventy species of this group given in the 'Conchologia Iconica' ought to be distributed amongst the genera *Defrancia*, *Cythara*, and *Mangelia*. Mr. Ponton gave a list of the species which he considered referable to each of these three genera, and proposed to assign one to *Defrancia*, fifty-three to *Cythara*, and sixteen to *Mangelia*.

The following papers were read:—

1. On the Muscular Sheath of the Cardiac End of the Œsophagus of the Aye-Aye (*Chiromys madagascariensis*). By GEORGE GULLIVER, F.R.S.

Among the many inexplicable structural arrangements of animal organs is that of the comparative distribution of the striped muscular fibre to the same part in different orders; and the obscurity is not

lessened by the discovery of this fibre on the whole alimentary canal of the Tench* (*Tinca vulgaris*), after I had observed that this is not the case in some other cyprinoid fishes.

Such facts tend to weaken the value in systematic zoology of the character afforded by the muscular sheath of the œsophagus. But whatever structure proves constant cannot be devoid of importance, however difficult the explanation may be; and, so far as my limited observations have gone, it is always easy to distinguish between certain orders of Mammalia, and these from birds and reptiles, simply by the muscular fibre of the œsophagus. For example, in the Quadrumana the striped muscular fibre stops short of the cardia, while in the Rodentia this fibre extends quite to that part of the stomach, as has been more particularly described of these and other vertebrates in the 'Proceedings' of this Society (1842, p. 63 *et seq.*).

Hence it seems desirable to add this character, for as much as it may be worth, to the descriptions already known respecting such Mammalia as may have a questionable position in systematic zoology. The Aye-Aye is one of these; for it has been alternately placed among the Rodentia and Quadrumana. And by the courtesy of Mr. Flower I have examined for striated muscle about an inch of the cardiac end of the œsophagus of this animal, preserved in spirit of wine. The results were entirely negative. Not a single striped muscular fibre appeared, although the whole thickness of the œsophagus was examined, from the outer part of the preparation to the plaster with which it had been artificially distended; in short, nothing of muscular tissue but the smooth variety could be found. And thus, so far as regards this point, the œsophagus of the Aye-Aye is as unlike that of Rodentia as it is like that of Quadrumana—a fact which tends to support the latest and now general conclusion as to the affinities of this singular animal.

2. On Venezuelan Birds collected by Mr. A. Goering. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.—Part III.†

(Plate XVIII.)

Mr. Anton Goering's present collection was principally formed in the vicinity of the Lake of Valencia, into which district he has made

* Since this fact first came to my knowledge, through the last edition of Professor Beale's excellent work on the Microscope, in which Weber is quoted as the observer, I have examined the intestines of the Tench, and found the striated muscular fibre on the greater part of its alimentary canal. The primitive muscular fascicles of the œsophagus, stomach, and intestines presented an average diameter of $\frac{1}{1333}$ of an inch, while those of the dorsal and ventral muscles measured as much as $\frac{1}{333}$. Thus the striated fibres of the hollow muscles are only about one-fourth the thickness of those of the ordinary voluntary muscles; and this agrees with my old measurements in fishes and other vertebrates, tabulated in the 'Proc. Zool. Soc.' (1842, p. 68).

† See Part I., P. Z. S. 1868, p. 165; Part II., P. Z. S. 1868, p. 626.

excursions from San Esteban, near Puerto Cabello, where he has been lately resident.

The collection contains altogether fifty-six species of birds, most of which are already well known as inhabitants of this part of the continent of South America. There are, however, several of great interest among them, and one in particular, a new species of Jacamar, which appears to have been hitherto undescribed.

The following extracts from a letter recently received from Mr. Goering will give the Society some information concerning the localities which he has lately explored, and the route which he is now intending to follow:—

"The Lake of Valencia seems to be a station for birds which come from the llanos and from the river-districts of the south of Venezuela. When the swamps and the llanos are dry, thousands of birds resort to it. There is, however, great difficulty in obtaining a boat for the purpose of shooting, nearly all of them having been demolished during the recent revolution. The mountains on the south of the lake (the Serro Azul of Guiguc) are tenanted by the same birds as the coast-range; but the vegetation is not so rank, and the species of small size appear to be less numerous. San Esteban is situated about six English miles inland from Puerto Cabello, in a valley, through which runs a small river. Most of the birds obtained here are different from those found in eastern Venezuela, where my first collections were formed. It is singular that *Cardinalis phœniceus*, so common near Carúpano, is very rare here. I have never seen this bird on the hills, but only on the plains near the coast, which are covered with a simple vegetation of *Mimosa*, *Cactus*, &c. The *Chasmorhynchus variegatus* is common here, but only during the months of April and May. It is also abundant in the forests of Caripé; and this spot seems to be nearly the extreme limit of its western range.

"Speaking of Caripé, I may mention that the *Steatornis* is not only found in the well-known cave near that city, visited by Humboldt, but also inhabits several other caverns in the forests situated to the south-east. I visited three of these, and found one of them much larger than the cave of Caripé. It was eight English miles in extent, and every part of it seemed to be inhabited by thousands of this wonderful bird. It is very impressive when, at sunset, they leave their subterranean abodes, and make the forest resound with their shrill cries."

Mr. Goering contemplates moving his quarters into the Sierra Nevada of Merida, to which district he will proceed by Maracaibo and Zulier.

The following is a list of the species contained in Mr. Goering's present collection, to which are added notes upon such of them as call for remark:—

Name.	Locality.
1. *Donacobius atricapillus*	Lake of Valencia.
2. *Henicocichla noveboracensis*	Maruria, north of the lake.
3. *Dendræca æstiva*	S. side of the Lake of Valencia.

	Name.	Locality.
4.	*Geothlypis æquinoctialis*	Maruria.
5.	*Hylophilus acuticaudus*	Plain of Valencia.
*6.	*Calliste cyaneicollis*	Maruria.
*7.	*Oryzoborus melas*	San Esteban.
8.	*Spermophila lineola*	Maruria.
*9.	—— *ocellata*	Plain of Valencia.
10.	*Coryphospingus pileatus*	Lake of Valencia.
11.	*Leistes guianensis*	Plain of Valencia.
12.	*Xanthosomus icterocephalus*	Maruria.
13.	*Cassidix oryzivora*	Plain of Valencia.
*14.	*Philydor columbianus*	Coast-range of Puerto Cabello.
15.	*Synallaxis albigularis*	Plain of Valencia.
16.	*Leptoxyura cinnamomea*	Lake of Valencia.
17.	*Dendrornis susurrans*	Guacara, Lake of Valencia.
18.	*Myrmotherula menetriesi*	San Esteban.
19.	*Formicarius crissalis*	San Esteban.
20.	*Arundinicola leucocephala*	Marshes in the Plain of Valencia.
21.	*Platyrhynchus albogularis*	Lake of Valencia.
22.	*Colopterus pilaris*	N. side of the Lake of Valencia.
*23.	*Euscarthmus impiger*	Guacara, Lake of Valencia.
24.	*Tyranniscus*, sp. inc.	Maruria.
25.	*Pyrocephalus rubineus*	Plain of Valencia.
26.	*Milvulus tyrannus*	Plain of Valencia.
27.	*Pachyrhamphus*, sp. inc. ♀	Guacara.
28.	*Pipreola formosa*	Coast-range of Puerto Cabello.
29.	*Pyroderus orenocensis*	Puerto Cabello.
*30.	*Brachygalba goeringi*, sp. nov.	Maruria.
31.	*Ceryle amazona*	Lake of Valencia.
32.	*Nyctidromus albicollis*	Maruria.
33.	*Ramphastos ambiguus*	Guataparo.
34.	*Falco columbarius*, L.	Maruria and Lake of Valencia.
35.	*Hypotriorchis femoralis* (Temm.)	Lake of Valencia.
36.	—— *rufigularis* (Daud.)	San Esteban.
*37.	*Tinnunculus sparverius* (L.)	Plain of Valencia.
38.	*Elanus leucurus* (Vieill.)	Lake of Valencia.
39.	*Gampsonyx swainsoni*, Vig.	Maruria.
40.	*Accipiter bicolor* (Vieill.)	Maruria.
*41.	*Micrastur zonothorax*	Coast-range of Puerto Cabello.
42.	*Urubitinga meridionalis* (Lath.)	Plain of Valencia.
43.	*Circus macropterus*, Vieill.	Plain of Valencia.
44.	*Polyborus tharus* (Mol.)	Maruria.
45.	*Milvago chimango* (Vieill.)	Lake of Valencia.
46.	*Eupsychortyx sonnini* (Temm.)	Plain of Valencia.
*47.	*Crypturus strigulosus* (Temm.)	Serro Azul of Guiguc.
48.	*Vanellus cayennensis* (Gm.)	Lake of Valencia.
49.	*Ægialites collaris* (Vieill.)	Lake of Valencia.
50.	*Limosa hudsonica* (Lath.)	Lake of Valencia.
51.	*Porzana carolina* (L.)	Lake of Valencia.
52.	*Parra jacana*, L.	Lake of Valencia.
53.	*Ardea cærulea*, L.	Lake of Valencia.
54.	*Butorides virescens* (L.)	Lake of Valencia.
55.	*Querquedula discors* (L.)	Lake of Valencia.
56.	*Podilymbus podiceps*	Lake of Valencia.

6. CALLISTE CYANEICOLLIS (Lafr. et d'Orb.).

One example (♂, iris dark brown) from the mountains south of the Lake of Valencia, where it is said to be "not common."

This is evidently the bird described by Mr. Cassin (Pr. Ac. Sc. Phil. 1864, p. 287) as *Calliste kannahiæ*; but we are not convinced

that the characters given by him to distinguish it from the true *C. cyaneicollis* are sufficient. Of two skins from Bogota in Sclater's collection, one has the blue abdomen, and one not. The latter, we may remark, is the original of Sclater's figure in his 'Monograph of *Calliste*' (pl. 38). The variation would therefore appear not to be constant in the same locality. We have not, however, yet had an opportunity of recomparing the Bogota skins with examples of *C. cyaneicollis* from its typical country (Bolivia).

7. ORYZOBORUS MELAS, Scl. et Salv. P. Z. S. 1867, p. 979.

One example from Esteban (♂, bill silvery, legs greyish blue, above browner), apparently agreeing best with the bird described by us from Pebas.

9. SPERMOPHILA OCELLATA, Scl. et Salv. P. Z. S. 1866, p. 181.

One example from the plain of Valencia, "bill and legs black," agreeing with the birds described by us from Mr. Bartlett's collection, except in having the bill and legs *black* instead of brown.

14. PHILYDOR COLOMBIANUS, Cab. et Hein. Mus. Hein. ii. p. 29; Scl. et Salv. P. Z. S. 1868, p. 170.

One example (♂, iris brown, legs yellowish brown) from the coast-range of Puerto Cabello, at an elevation of 1500 feet.

23. EUSCARTHMUS IMPIGER, Scl. et Salv. P. Z. S. 1868, p. 171, t. XIII. f. 1.

Another specimen of this Tyrant from the plain near Guacara, on the north side of the Lake of Valencia. "Iris yellowish white, legs bright flesh-colour. A quiet bird, generally found in the Mimosa bushes."

30. BRACHYGALBA GOERINGI, sp. nov. (Plate XVIII.)

Supra æneo-viridis, capite colloque toto fuscis, superciliis indistinctis et nucha dilutioribus, flavicante tinctis: subtus nigricans; gutture, pectore medio et ventre toto cum crisso pure albis, plumis in ventre medio ferrugineo tinctis: rostro et pedibus nigris: long. tota 7·0, alæ 2·75, caudæ 2·3, rostri a rictu 2·0 poll. Angl.

Fem. *Mari similis sed ventre medio fere omnino ferrugineo.*

Hab. in vicin. Lacus Valenciæ, in Venezuela.

Obs. Sim. *B. inornatæ*, sed gutture albo facile distinguenda.

Mr. Goering sends us three skins of this fine new Jacamar, which we have the pleasure of naming after its discoverer. It was obtained near Maruria, at the foot of the mountain of Guiguc, where the birds were met with in pairs sitting close together on the branches of trees. "Iris red-brown; bill, legs, and claws black."

This species makes the fourth of the genus *Brachygalba*, two of which have white beaks (*B. melanosterna* and *B. albigularis*), and two have the beak black (*B. inornata* and the present bird).

37. TINNUNCULUS SPARVERIUS (Linn.).

A single male, from the plain of Valencia, has the body below wholly without spots, as the bird described by Swainson as *Falco isabellinus* (An. in Men. p. 281). See v. Pelzeln's remarks on this supposed local race in his List of *Falconidæ* in the Imperial Collection (Verh. zool.-bot. Ges. 1863, p. 627).

41. MICRASTUR ZONOTHORAX.

Climacocercus zonothorax, Cab. Journ. f. O. 1865, p. 406.

A single skin, immature, but no doubt referable to this northern form of *M. ruficollis* sive *xanthothorax* as described by Cabanis. Whether it is really distinct we have not yet sufficient materials to give a decided opinion.

47. CRYPTURUS STRIGULOSUS.

Tinamus strigulosus, Temm. Pig. et Gall. iii. p. 594.

Mr. Goering's skin agrees generally with the specimens in the British Museum thus marked (*cf.* Gray, List of Gall. p. 100), but has the middle of the throat pure white.

3. Notes on the Myology of *Menopoma alleghaniense*. By ST. GEORGE MIVART, F.L.S., Lecturer on Comparative Anatomy at St. Mary's Hospital.

Having been engaged for some months in working at the Urodele Batrachians, the liberality of the authorities of the Royal College of Surgeons, and the kindness of my friend Mr. W. H. Flower, have placed at my disposal certain specimens well preserved in spirit of wine. One of these is the subject of the following notes.

In describing the muscles I think it better to give each a distinct name. In doing so, however, I by no means intend to imply that there is necessarily a real relation of homology between the several muscles of *Menopoma* and those of Mammals and Sauropsidans. It may well be that in many cases the resemblance is merely one of analogy, resulting from similarity of conditions.

The general form of this species is well known, with its broad and flat body, its very wide and flat head, and rounded muzzle. The tail has a rather deep cutaneous fin both above and below; but while it is continued along the whole length of the dorsum of the tail, it only extends along about the hindmost sixth of its inferior border.

The skin is nearly smooth all over, and is destitute of any tubercles or prominences. It is smoothest on the middle of the crown of the head and on the middle of the belly. Numerous short transverse wrinkles, however, extend, at short intervals, across the throat and along the whole back and belly; on the tail, on account of the great lateral compression of that organ, these wrinkles assume a vertical direction.

Two large cutaneous folds (each much convoluted and like a frill) extend backwards, one along each side of the body, from the arm-pit to a little behind and above the root of the pelvic limb.

A marked fold on each side of the neck projects round the branchial orifice, and is continued backwards from its upper border towards or over the root of the pectoral limb.

The antero-posteriorly elongated cloacal aperture is placed just behind, and not between, the pelvic limbs. Its circumference (which is of a lighter colour than the rest of the skin) is thrown into numerous small, sharp folds.

The proximal and distal divisions of each arm and leg (*i. e.* the arm and forearm and the thigh and leg respectively) are subequal in length.

The posterior digits are very broad, through cutaneous expansions.

The pectoral limb when turned forwards does not attain the angle of the mouth, nor when turned backwards does it even nearly meet the pelvic limb turned forwards.

A cutaneous fold extending along the margin of each jaw serves as a lip.

The external nostrils are very small and simple apertures close to the end of the muzzle.

The eyes, as is well known, are very small and quite destitute of eyelids.

The gape of the mouth extends backwards beyond the eye.

The head is very flat, without ridges or any marked concavities or convexities. A shallow, rather ill-defined, longitudinal depression runs along the middle of the back. The size and proportions of the specimen are as follows:—

Dimensions.	inches.
Extreme length, measured along dorsum, from anterior end of muzzle to posterior end of tail	13·20
Length from mandibular symphysis to middle point between the arm-pits	3·00
From the said middle point to anterior end of cloaca	5·13
Length of cloacal aperture	·22
——— from anterior end of cloacal aperture to end of tail	5·07
——— of head, about	1·60
Breadth of head	1·70
Vertical thickness of head and throat	·95
——— ——— of mid-body, about	·83
Greatest breadth of body, the cutaneous lateral folds not included	1·70
Transverse thickness of tail at about its mid-length	·30
Vertical extent of tail at the same place	1·40
Distance between the eyes	1·00
——— ——— the outer nares	·40
Extreme length of pectoral limb (with manus)	1·53
Its longest digit	·40
Extreme length of pelvic limb (with pes)	1·80
Its longest digit	·50

	inches.
Distance from mid-point between the eyes to end of muzzle .	·56
Extreme width of mouth	1·55
Distance from mid-point between the angles of the mouth to the mandibular symphysis..	·65
Length from angle of mouth to branchial orifice, about	1·22
——— —— branchial orifice to root of pelvic limb, about..	·72

Proportions.

Length of head compared with its breadth at 100	94·10
Height of head compared with its breadth at 100	55·88
——— of body compared with its breadth at 100	48·82
Breadth of mid-tail to its height at 100	46·66
——— of body to its length (without head and tail) at 100	33·13
Height of body to its length at 100	16·17
Length of tail to length of body at 100	98·83
Length of pectoral limb to length of body at 100	29·82
Length of pelvic limb to length of body at 100	35·08

Myology.

On removing the skin of my specimen I do not find the fat which, according to Drs. Schmidt, Goddard, and Van der Hoeven *, exists in the hollows at the roots of the limbs in *Cryptobranchus*. Neither have I found any conspicuous cutaneous muscle or the contrast in colour which those authors have described as existing in the last-named genus between some and others of the muscles, but all are moderately pale in my specimen.

The general muscular investment of the body is, in the tail, divisible into an antero-posterior series of segments corresponding to the division of the vertebral column into vertebræ. In the trunk this divisibility is very obscurely indicated, least so towards the middle of the abdomen, where there are transverse tendinous intersections.

The muscular envelope consists of four longitudinal portions separated by four more or less marked linear divisions.

The first of these divisions extends backwards from the mid-cranial region to the end of the dorsum of the tail. It is deepest by far in the caudal region of the body, where it is filled up by a very large accumulation of fat. A fibrous membrane extends down from the bottom of this dorsal furrow to the spines and neural arches of the vertebræ, and forms a partition between the dorsal muscular mass of one side and that of the other side.

The second antero-posterior linear division extends similarly along the ventral surface of the body from the thoracic region backwards. It is only a deep furrow, however, behind the cloacal aperture; in

* Aanteekeningen over de Anatomie van den *Cryptobranchus japonicus* door Dr. F. J. J. Schmidt, Dr. Q. J. Goddard, en Dr. J. Van der Hoeven. Natuurkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem. Tweede Verzameling, Negentiende Deel, Eerste stuk, 1862.

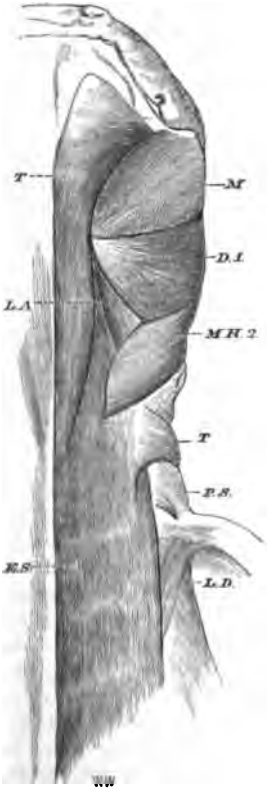
front of that orifice it is represented by a more or less marked tendinous interval, or linea alba, in the midst of the superficial muscles of the ventral portion of the abdominal muscular mass.

The third and fourth linear divisions are placed one on each side of the throat, trunk, and tail. In the throat region the anterior end of this furrow forms the gap out of which the ends of the branchial arches protrude. In the trunk it is a mere shallow furrow, dividing the dorsal part of each lateral half of the muscular mass from the ventral portion of such half.

In the trunk this linear division is situated above the middle (vertically) of the side of the body. In the tail it is situated at about the middle.

Each dorsal portion of the lateral muscular mass (*i. e.* the part

Fig. 1.



Superficial muscles of right side of head and of anterior part of trunk. *D.*1. Digastric. *E. S.* Erector spinæ. *L. A.* Levator arcuum. *L. D.* Latissimus dorsi. *M.* Masseter. *M. H.* 2. Mylo-hyoideus posterior. *P. S.* Deltoid. *T.* Temporalis. *T.* Trapezius.

between the dorsal furrow and the lateral linear division) extends from the upper surface of the skull to the distal end of the dorsum of the tail (figs. 1 & 8, *E. S*), investing the transverse processes, neural arches, and spines of the vertebræ, and also the ribs, but it has no direct connexion with either the pectoral or pelvic girdle. It forms a continuous and very thick fleshy mass, answering to the *erector spinæ* of higher animals, but not differentiated into distinct muscles. Its fibres are all antero-posteriorly directed.

Each ventral portion of the lateral muscular mass (*i. e.* the part between the lateral linear division and the middle of the ventral surface of the body and tail) presents a larger surface than does the dorsal portion of the lateral muscular mass. It extends from the basihyal to the distal end of the ventral surface of the tail, interrupted, however, by the pelvis.

As in higher vertebrata, the abdominal portion of this mass is distinguished into muscular layers with differently directed fibres; in the caudal region, however, as might be expected, this distinction does not obtain.

Muscles of the Trunk.

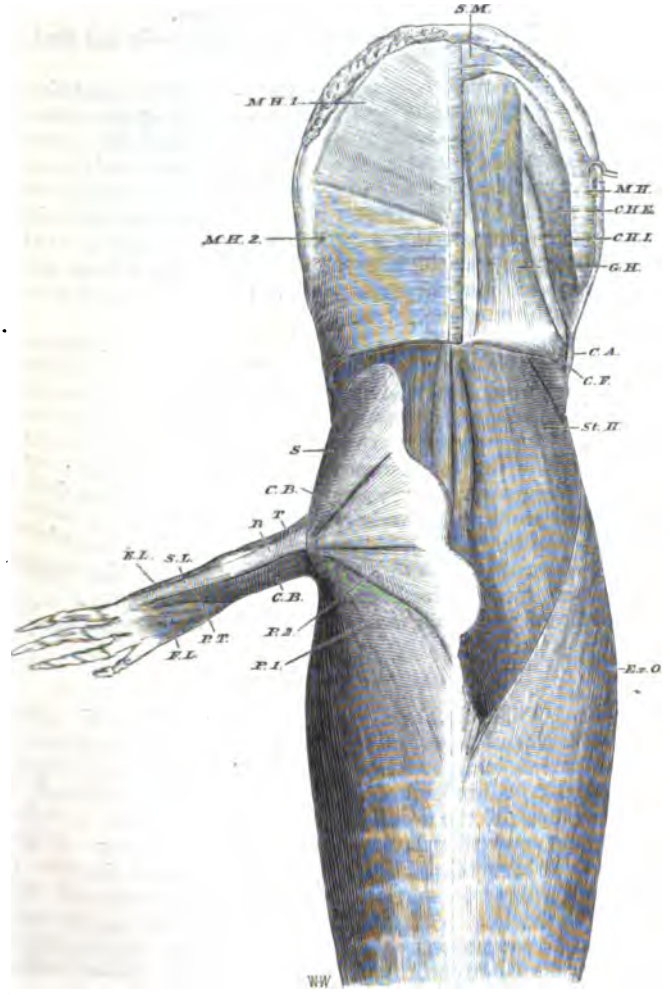
The external oblique (figs. 2, 3, 5, & 7, *Ex. O*). This is an elongated sheet of muscular fibres (with the usual direction downwards, backwards, and mesiad) extending from the lateral longitudinal furrow to the outer margin of the rectus. The muscle extends forwards as far as the scapula (passing beneath the latissimus dorsi), its anterior extremity being overlapped by the minute and oppositely directed serratus magnus. Posteriorly it is inserted into the fascia investing the root of the thigh, also with the ilium and the pubis. It fuses so gradually with the rectus that I have not succeeded in defining the line of demarcation between the two. The external oblique appears to be continued on in the caudal region as the most external portion of its infero-lateral muscular mass. This caudal continuation, however, takes fresh origin from the hinder side of the ilium.

The *internal oblique* (fig. 5, *In. O*) is the largest muscle of the body, and extends antero-posteriorly from the basihyal backwards to the end of the tail (for the pelvis seems only partially to interrupt it), and inwards from the lateral longitudinal furrow. The fibres are but very slightly oblique, very many are altogether antero-posterior in direction, and the fasciculi are very large and coarse. The muscle is thickest anteriorly and in the tail. In the pelvic region many fibres are inserted into the ilium and into the rib which articulates with the ilium, but other fibres appear to continue on altogether beneath these bones without being interrupted by them.

At its anterior end this muscle becomes indistinguishably fused with what may be a deeper part of the rectus, and which has here been called the sterno-hyoid (fig. 2, *St. H*). This is inserted into the basihyal and into the adjacent root of the first branchial arch.

Transversalis. A very delicate lamella of transversely directed muscular fibres represents this muscle. It extends in a continuous

Fig. 2.



Muscles of ventral surface. On the right side superficial muscles. On the left side deeper muscles, with removal of left pectoral limb.

B. Biceps. *C. A.* Constrictor arcuum. *C. B.* Coraco-brachialis. *C. F.* Constrictor faucium. *C. H. E.* Cerato-hyoideus externus. *C. H. I.* Cerato-hyoideus internus. *E. L.* Extensor longus. *Er. O.* External oblique. *F. L.* Flexor longus. *G. H.* Genio-hyoideus. *M. H.* 1. Mylo-hyoideus anterior. *M. H.* 2. Mylo-hyoideus posterior. *P.* 1. & *P.* 2. Pectoralis. *P. T.* Pronator teres. *S.* Subclavius. *S. L.* Supinator longus. *S. M.* Submentalis. *St. H.* Sterno-hyoideus. *T.* Triceps.

sheet from the region of the heart backwards to the inside of the pelvis. It does not seem to extend so far inwards towards the middle line of the body as does the internal oblique.

The abdominal nerves pass along between this muscle and the internal oblique.

Rectus. This muscle consists, as usual, of antero-posteriorly directed fibres in the middle of the abdomen, but is very difficult accurately to define. It seems to be overlapped externally by some of the fibres of the external oblique, while internally it is closely adherent to what is either a deeper portion of the rectus or the median part of the internal oblique, and which runs forwards (with the scapular arch, except the sternum, altogether superficial to it) to be inserted, as before said, into the basihyal. The external portion of the rectus is inserted anteriorly into the sternum, posteriorly into the anterior part of the pelvis.

Retrahens costarum. This elongated muscle passes antero-posteriorly, on each side of the spine, beneath the bodies of all the trunk-vertebræ, being attached to them and to the ribs down to their extremities, where it is closely connected with the fascia of the transversalis. The muscle gets thinner and smaller backwards, and appears to end at the commencement of the caudal region; but anteriorly it enlarges and passes, as a fleshy mass, beneath the skull. Throughout the trunk this muscle is separated from the dorso-lateral muscular mass by the internal oblique and transversalis; but where these diverge from that mass to leave space for the branchial arches, there the muscle now described becomes applied to the under surface of the dorso-lateral mass, and more or less closely connected with it.

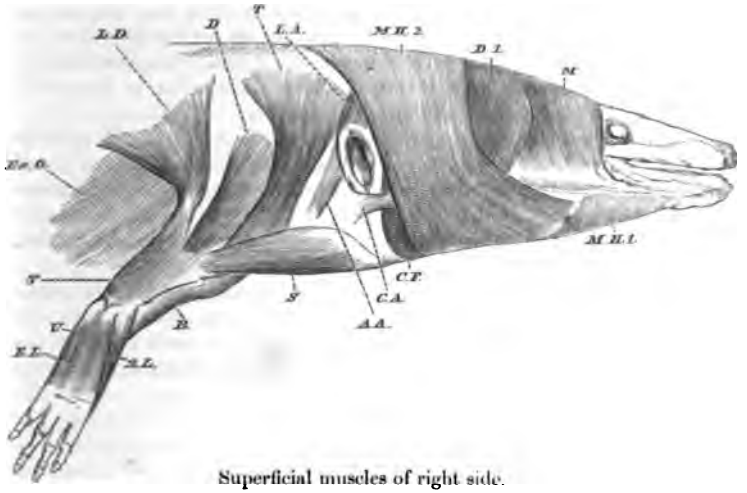
Muscles of the Head.

Temporalis. This (fig. 1, *T.*) is the most anterior of all the muscles on the dorsal aspect of the body, its anterior margin even extending forwards in front of the eyes. It is not a completely distinct muscle, as its hinder end is but imperfectly separated from the innermost part of the dorsal lateral mass of the same side; of which it, in part, may therefore be considered the extreme anterior prolongation. It also takes origin, by fascia, from the first three neural spines and from the anterior part of the upper surface of the skull—Cuvier's frontal. The most anterior fibres slope backwards; but all converge, and passing behind the eyeball, are ultimately attached, by means of a strong tendon, to the inner side of the summit of the mandible just in front of its articulation with the suspensorium, and behind and somewhat within the insertion of the masseter.

The *pterygoid.* Dr. Fischer* describes this muscle as arising from the side of the skull and from the upper surface of the pterygoid, and with a similar insertion to the temporal, from which it is very indistinctly separable. In my specimen it seems to be so intimately united with the temporal that I cannot but doubt its distinctness.

* Anatomische Abhandlungen über die Perennibranchiaten und Derotremen. Hamburgh, 1864, p. 63.

Fig. 3.



Superficial muscles of right side.

A. A. Adductor arcuum. *B.* Biceps. *C. A.* Constrictor arcuum. *C. F.* Constrictor faucium. *D.* Deltoid. *D.* 1. Digastric. *E. L.* Extensor longus. *Ex. O.* External oblique. *L. A.* Levator arcuum. *L. D.* Latissimus dorsi. *M.* Masseter. *M. H.* 1. Mylo-hyoideus anterior. *M. H.* 2. Mylo-hyoideus posterior. *S.* Subclavius. *S. L.* Supinator longus. *T.* Trapezius. *T.* Triceps. *U.* Ulnaris.

Masseter (figs. 1, 3, & 5, *M*). This is an exceedingly thick muscle, which arises from the anterior surface of the suspensorium as far as the margin of the parietal. It is inserted into the upper border and outer surface of the posterior part of the mandible. It covers externally the descending terminal portion of the temporal, which runs down in a sort of groove on its inner surface.

The *digastric* (figs. 1, 3, & 5, *D.* 1 & *D.* 2) is a very large and powerful muscle, consisting of two parts, which are together inserted into the posterior extremity of the mandible. The hinder portion of the muscle arises from the dorsal fascia, closely connected with the similarly arising part of the posterior mylo-hyoid, and overlapping the levator arcuum. The anterior portion takes origin from the occiput, the hinder surface of the suspensorium. Both portions pass over the cornu of the hyoid (without being directly connected with it) to their before-mentioned insertion.

Levator arcuum (figs. 1 & 3, *L. A*). This is a small delicate layer of fibres springing from the dorsal fascia in the angle between the digastric and the temporal. Passing obliquely downwards and backwards, and covered, more or less, by the hinder part of the digastric and the posterior mylo-hyoid, the fibres go to the dorsal segments of the last three branchial arches as Fischer has described*.

Mylo-hyoideus anterior (figs. 2 & 3, *M. H.* 1). This forms, with

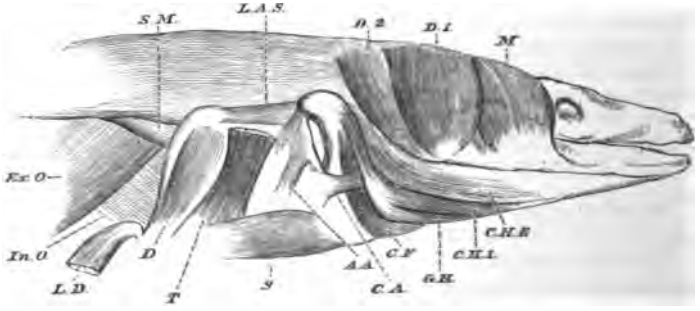
* *L. c.* p. 83, tab. 4. fig. 2, *la*.

its fellow of the opposite side, a thin transverse sheet of muscular fibres immediately beneath the skin. It springs from the inner surface of the lower margin of the mandible, almost as far backwards as the articulation of the latter with the suspensorium. Its fibres incline slightly backwards; and a sort of faint *linea alba* is interposed between it and its fellow of the opposite side.

The *mylo-hyoideus posterior* (figs. 1, 2, & 3, *M. H.* 2), with its fellow, forms another thin transverse sheet of muscular fibres placed immediately beneath the skin, except where the mylo-hyoideus anterior is superficial to it. It springs from the dorsal fascia and from that over the cornu of the hyoid, and covers the hinder portion of the digastric and part of the levator arcuum.

Submentalis (fig. 2, *S. M*). This small, azygos, transverse muscle connects together the anterior ends of the two mandibular rami. It is placed immediately above the most anterior portions of the mylo-hyoidei anteriores, and is much connected with them and with the genio-hyoidei.

Fig. 5.



Deeper muscles of right side, the *mylo-hyoidei*, the *trapezius*, and the *latissimus dorsi* being removed or cut short.

A. A. Adductor arcuum. *C. A.* Constrictor arcuum. *C. F.* Constrictor faucium. *C. H. E.* Cerato-hyoideus externus. *C. H. I.* Cerato-hyoideus internus. *D.* Deltoid. *D.* 1 & *D.* 2. Digastric. *Ex. O.* External oblique. *G. H.* Genio-hyoideus. *In. O.* Internal oblique. *L. A. S.* Levator anguli scapulæ. *L. D.* Latissimus dorsi. *M.* Masseter. *S.* Subclavius. *S. M.* Serratus magnus. *T.* Trapezius.

*Constrictor faucium** (figs. 2, 3, and 5, *C. F*). This muscle springs from the under surface of the dorsal segment of the second branchial arch (*i. e.* the second after the hyoidean cornu), and is inserted into a fascia beneath the throat, into which the genio-hyoid of the same side is also inserted. As the constrictor faucium passes downwards it is overlapped (and strapped in, as it were) by the band-like constrictor arcuum.

The *constrictor pharyngis* is a delicate muscular sheet arising

* Constrictor faucium internus of Schmidt, &c., see *l. c.* p. 29, and pl. 6. fig. xiii. 4.

partly from the postero-ventral border of the last branchial arch*, partly from the fascia of the side of the neck behind the branchial arches†. Thence it descends to the middle line of the body beneath the trachea, and above the sterno-hyoid, which latter is superficial to it.

Genio-hyoideus‡ (figs. 2 & 5, *G. H*). On removing the mylo-hyoidei, the two genio-hyoidei are seen running backwards (one on each side) from the symphysis of the mandible. Each genio-hyoid arises from the anterior part of the ramus of the mandible of its own side (more or less connected with the submentalis), and is inserted posteriorly into the fascia, which also receives the insertion of the constrictor faucium.

The *cerato hyoideus externus* (figs. 2 & 5, *C. H. E*) is a considerable muscle which arises from the first branchial arch, and is inserted into the cornu of the hyoid towards its middle.

The *cerato-hyoideus internus* (figs. 2 & 5, *C. H. I*) can hardly perhaps be reckoned a distinct muscle in *Menopoma*, in which it has a common insertion with the muscle last noticed. It arises, however, from the ventral segment of the second branchial arch.

Constrictor arcuum (figs. 2, 3, & 5, *C. A*). This small band-like muscle arises from the first branchial arch, and is inserted into the last two branchial arches. Fischer says§, no doubt correctly, that the muscle consists of two layers, the superficial one being inserted into the last branchial arch, and the deeper layer into the penultimate branchial arch. This muscle overlaps and binds down the constrictor faucium.

The *adductor arcuum* (figs. 3 & 5, *A. A*) is a very small muscle, arising from the fascia on the ventral surface of the sterno-hyoid. Passing upwards and outwards, it goes to the last branchial arch.

Sterno-hyoideus (fig. 2, *St. H*) A considerable muscular mass, which may conveniently be distinguished by this name‖, though in fact it is the anterior termination of that great ventral muscular mass which consists of the united internal oblique and rectus. Its insertion is into the posterior part of the under surface of the basi-hyal and the adjacent parts of the ventral segments of the branchial arches.

The antero-internal portion of the ventral part of each sterno-hyoid shows a slight indication of distinctness as a muscular fasciculus inserted into the fascia into which the genio-hyoideus is inserted. This appears to represent, in a rudimentary manner, the distinct muscle named levator maxillæ inferioris brevis by the Dutch authors¶.

* The hyo-trachealis of Fischer, *l. c.* p. 92.

† The dorso-trachealis of Fischer, *l c.* p. 92.

‡ The levator maxillæ inferioris longus of Schmidt, &c., see *l. c.* p. 29, pl. 6. fig. xiii. 5.

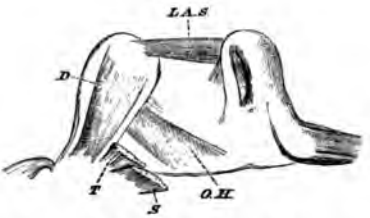
§ *L. c.* p. 75, and tab. 4. fig. 2, *ca*.

‖ It is so by Dr. Fischer, see *l. c.* p. 104, and tab. 4. fig. 2, *sh*. It is the cerato-hyoideus of the Dutch authors, Schmidt &c., see *l. c.* p. 30, pl. 6. fig. xiii. 9.

¶ See Schmidt &c., p. 30, and pl. 6. fig. xiii. 6.

Omo-hyoideus (fig. 6, *O. H*). This is a flat band of muscle which springs from the lower part of the anterior margin of the scapula, and, passing forwards, downwards, and inwards, loses itself in the lateral part of the sterno-hyoid, with which it coalesces.

Fig. 6.



Deepest muscles of outside of right shoulder, the *trapezius* and *subclavius* being cut short to show the *omo-hyoid*.

D. Deltoid. *L. A. S.* Levator anguli scapulæ. *O. H.* Omo-hyoideus. *S.* Subclavius. *T.* Trapezius.

Genioglossus. I have not succeeded in defining this muscle; but, according to Dr. Fischer*, it is represented by some fibres which pass from the hinder surface of the mandibular symphysis to the skin of the mouth. This is not the genioglossus of Schmidt &c., which is my submentalis†.

Appendicular Muscles.

Pectoral Limb.

Trapezius (figs. 1, 3, 5, & 6, *T*). This is a small subtriangular muscle which arises from the fascia outside the trunk-muscles, and immediately behind the levator arcuum and mylo-hyoideus externus. Passing downwards and slightly backwards, it is inserted into the angle between the scapula and the precoracoid (of Parker), but mainly into that side of the angle which is formed by the lower end of the anterior margin of the scapula.

The *latissimus dorsi* (figs. 1, 3, & 5, *L. D*) is a small triangular muscle of about the same size as the trapezius. It arises from the fascia outside the dorsal muscles, and, passing downwards and forwards, is partly inserted into the head of the humerus, and, partly fusing with the triceps, is continued on by that muscle to the proximal end of the ulna.

The *pectoralis* (fig. 2, *P.* 1 & *P.* 2) consists of two parts with a common insertion. The first and larger part springs from the surface of the superficial abdominal muscles; the second portion from the sternum. They are inserted into the inner side of the radial (greater) tuberosity of the humerus.

Serratus magnus (fig. 5, *S. M*). This very small muscle arises

* *L. c.* p. 66. † *L. c.* tabb. 6, 7.

from the lateral muscular mass just at the lateral longitudinal groove, and is inserted on the inner side of the upper part of the scapula.

The *levator anguli scapulæ* (fig. 5, *L. A. S*) is the antagonist of the muscle last described. It is very long and slender, and arises from the hinder and inferior margin of the exoccipital, and is inserted into the upper part of the inner side of the scapula.

The *omo-hyoid* has been already described as the last but one of the muscles of the head.

The *subclavius** (figs. 2, 3, 5, & 6, *S.*) arises from the outer surface of the precoracoid (of Parker) and, passing backwards beside the coraco-brachialis, and more or less connected with the latter, is inserted into the summit of the great tuberosity.

Coraco-brachialis (fig. 2, *C. B*). This muscle is large, and consists of two parts. The first of these springs from the whole surface of the coracoid, and is partly covered up by the pectoralis; it is inserted into the inner side of the radial tuberosity of the humerus. The second part, thick and long, arises from the posterior margin of the coracoid, close behind the glenoid cavity; passing down into the bend of the elbow-joint, it is inserted into the shaft of the humerus down to the internal condyle.

Deltoid (figs. 3, 5, & 6, *D*). A muscle which may perhaps answer to the deltoid of higher forms springs from the outside of the scapula, and passing down is inserted into the outer side of the radial tuberosity, near its summit.

Subscapularis. A very small triangular muscle, springing from the inner side of the scapula close to the glenoid surface, and implanted into the humerus. It passes between the two heads of the triceps, which spring from the scapular arch.

Biceps (figs. 2 & 3, *B*). This muscle, which appears to answer both to the biceps and brachialis anticus of higher animals, consists perhaps of two parts, though one is with difficulty separable from the long coraco-brachialis. This latter portion springs from the posterior margin of the coracoid, close to the glenoid surface; and a strong tendon runs along it. The other part arises from the front of the shaft of the humerus, immediately below the insertions of the pectoralis and subclavius. The muscle is partly inserted into the shaft of the radius, and in part fuses with the supinator longus.

Triceps (figs. 2 & 3, *T*). This is a large muscle arising partly, by a considerable head, from the junction of the scapula and coracoid just in front of the glenoid surface, by another and much smaller head from the inner surface of the coracoid, just behind the glenoid surface. It also takes origin from the inner and outer surfaces of the humerus near its summit, and it receives an accession by the union of the latissimus dorsi. It is implanted into the proximal end of the ulna.

Supinator longus (figs. 2, 2A, 3, & 4, *S. L*). A thick muscle which may be thus named springs from the radial side of the lower

* Prof. Rolleston has shown, I think conclusively, that my epicoraco-humeral is really the subclavius; and the muscle here described in *Menopoma* may probably be the same as my epicoraco-humeral.

part of the humerus, and is inserted into the same side of the radius towards and at its distal end, some fibres seeming to run on to the carpus.

Fig. 2A.

Deeper flexor muscles of right forearm, the *flexor longus* cut and reflected.

B. Biceps. *F. B.* Flexor brevis. *F. L.* Flexor longus. *S. L.* Supinator longus. *P. T.* Pronator teres.

Fig. 4.

Deeper muscles of extensor surface of right forearm, the *extensor longus* cut and reflected.

E. B. Extensor brevis. *E. L.* Extensor longus. *P. Q.* Pronator quadratus. *S. L.* Supinator longus. *U.* Ulnaris.

Ulnaris. A muscle which extends along the ulnar border of the forearm (figs. 3 & 4, *U*), arises from the ulnar side of the lower end of the humerus, and is inserted along the corresponding border of the ulna. Some fibres coming from the radial condyle of the humerus, and fusing with this muscle, doubtless represent the extensor ulnaris of higher animals.

The *pronator teres* (figs. 2 & 2A, *P. T*) is a rather large muscle. It springs from the lower end of the ulnar border of the humerus, and is inserted into about the distal half of the radius. Although a wide muscle, only the narrow edge of it is seen before the removal of the flexor longus.

Extensor longus (figs. 2, 3, & 4, *E. L*). This arises from the radial border of the lower end of the humerus, and, expanding as it passes downwards, is inserted by fascia into the digits.

Extensor brevis (fig. 4, *E. B*). A subtriangular muscle may perhaps be thus named which arises from the distal part of the radial side of the ulna and from the carpus, and goes mainly to the radial digit. It may perhaps represent the extensor pollicis.

Pronator quadratus (?) (fig. 4, *P. Q*). A small muscle passes

downwards, and radiad between the ulnaris, the supinator longus, and the extensor brevis. It arises from the proximal end of the ulna; and some fibres seem to come from the internal condyle. It is inserted into the ulnar aspect of the radius.

Flexor longus (figs. 2 & 2A, *F. L*). This muscle springs from the ulnar border of the lower end of the humerus, and, passing downwards and expanding, goes to the palm of the manus, and is inserted by delicate tendons into the digits.

Flexor brevis (fig. 2A, *F. B*). A short triangular muscle which may be thus named arises from the ulna and the palmar surface of the carpus, and, passing downwards and expanding, goes to the digits.

Pelvic Limb.

Semimembranosus (figs. 7, 8, 9, & 10, *S. M*). This small muscle, which may perhaps be but a second head of the semitendinosus, arises from the underside of the caudal vertebræ at about the fourth

Fig. 7.

Superficial muscles of ventral surface of right side.

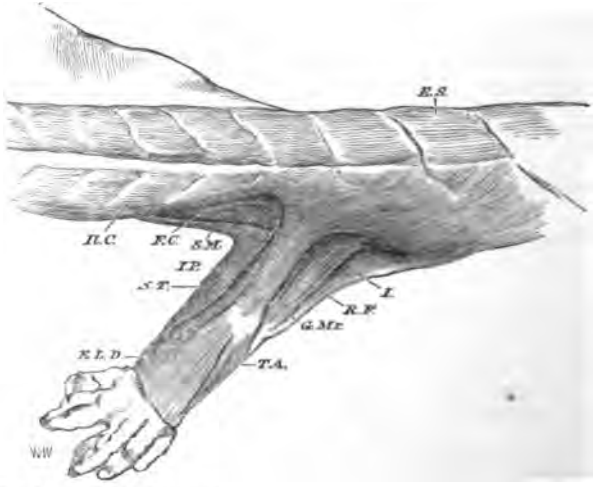
Ex. O. External oblique. *F. C.* Femoro-caudal. *G.* Gracilis. *I.* Iliacus. *I. C.* Ischio-caudal. *Il. C.* Ilio-caudal. *S. M.* Semimembranosus. *S. T.* Semitendinosus. *T. A.* Tibialis anticus.

postsacral. It comes to the surface between the adjacent sides of the femoro-caudal and ischio-coccygeal muscles, and is inserted into the posterior edge of the semitendinosus a little after the latter muscle has left the ischium.

The *ischio-caudal* (figs. 7 & 10, *I. C*) passes forwards beside the cloacal aperture, and therefore forms the most median part of the subcaudal muscular mass. It springs from the hypapophyses of the first four caudal vertebræ, and is inserted into the postero-external angle of the ischium.

Femoro-caudal (figs. 7, 8, 9, & 10, *F. C*). A rather large muscle which I thus name comes out of a sort of muscular sheath on each side of the proximal part of the under half of the tail. The sheath is formed by the ilio-caudal above, and by the semimembranosus below; and the muscle springs from the sides of the hypapophyses of two or three of the anterior caudal vertebræ. It is inserted by a strongish tendon into the flexor surface of the femur just below the great trochanter, just behind and outside of part of the insertion of the adductor.

Fig. 8.



Superficial muscles of outer side of hinder part of trunk and anterior part of tail, and of the dorsal (extensor) side of right pelvic limb.

E. S. Erector spinæ. *E. L. D.* Extensor longus digitorum. *F. C.* Femoro-caudal. *G. Mx.* Gluteus maximus. *I.* Iliacus. *Il. c.* Ilio-caudal. *I. P.* Ilio-peroneal. *R. F.* Rectus femoris. *S. M.* Semimembranosus. *S. T.* Semitendinosus.

Ilio-caudal (figs. 7, 8, 9, & 10, *Il. C*). This is that part of the infero-lateral caudal muscular mass which is inserted into the posterior aspect of the ilium. The insertion is just above the origins of the gluteus maximus and biceps.

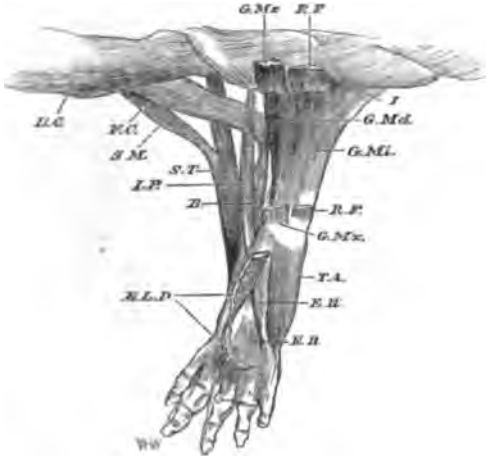
Gracilis (figs. 7 & 10, *G*). A very large sheet of muscle may

perhaps be thus named. It is thickest posteriorly, and arises from the whole length of the much prolonged pubo-ischiatic symphysis. It is inserted into the postero-peroneal surface of the upper half of the tibia.

The *adductor* (figs. 10 & 11, *A*) is a very thick mass of muscle which arises from the whole ventral surface of the pelvic shield between the acetabulum and the pubo-ischiatic symphysis, and is covered by the gracilis. It is inserted into the postero-tibial surface of the femur down to the intercondyloid space, where its insertion is widest.

Semitendinosus (figs. 7, 8, 9, 10, & 11, *S. T*). A muscle I venture, suggestively, thus to designate, arises from the postero-external angle of the ischium, just at the insertion of the ischio-caudal. It is inserted, passing downwards, into the outside of the lower part of the flexor longus digitorum, on its plantar surface. A little after leaving the ischium it is joined by the before described semimembranosus.

Fig. 9.



Deeper muscles of dorsal or extensor surface of right pelvic limb, the *gluteus maximus*, *rectus femoris*, and *extensor longus* being cut and reflected.

B. Biceps. *E. B.* Extensor brevis. *E. H.* Extensor hallucis. *E. L. D.* Extensor longus digitorum. *F. C.* Femoro-caudal. *G. Md.* Gluteus medius. *G. Mi.* Gluteus minimus. *G. Mx.* Gluteus maximus. *I.* Iliacus. *Il. C.* Ilio-caudal. *I. P.* Ilio-peroneal. *R. F.* Rectus femoris. *S. M.* Semimembranosus. *S. T.* Semitendinosus. *T. A.* Tibialis anticus.

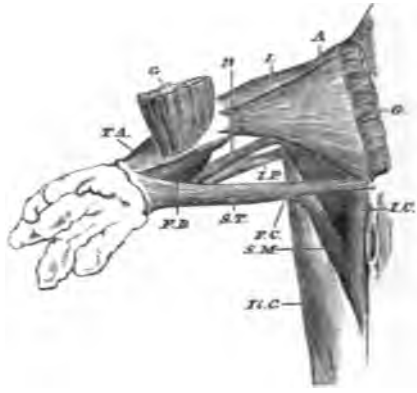
Iliacus (figs. 7, 8, 9 & 10, *I*). This is a very considerable muscle, and arises from the anterior part of the internal (abdominal) surface of the pubic shield. Curving over the anterior margin of that shield, it is inserted into the lower two-thirds of the femur, down to the tibial condyle; but no fibres extend to the tibia itself.

Gluteus maximus (figs. 8 & 9, *G. Mx*). An elongated, but tolerably wide muscle (which I provisionally distinguish by this name) springs from the outside of the lower part of the ilium, and, passing downwards, ends in an aponeurosis which invests the knee anteriorly, and passes to the upper part of the front of the tibia.

Rectus femoris (fig. 8 & 9, *R. F*). This is very similar in shape and size to the preceding. It arises from the pelvis immediately in front of the gluteus maximus and of the acetabulum, and, passing downwards on the tibial side of the last-named muscle, is inserted by aponeurosis into the inner side of the upper part of the tibia.

Gluteus medius (?) (fig. 9, *G. Md*). A small muscle invests the outer side of the femur, somewhat as a vastus externus. It arises, however, from the ilium just above the acetabulum. Passing downwards, covered by the gluteus maximus, it is inserted into the front and peroneal side of the shaft of the femur down to near the external condyle.

Fig. 10.



Deeper muscles of ventral or flexor surface of right pelvic limb, the *gracilis* being cut and reflected.

A. Adductor. *B.* Biceps. *F. C.* Femoro-caudal. *F. D.* Flexor digitorum. *G.* Gracilis. *I.* Iliacus. *I. C.* Ischio-caudal. *Il. C.* Ilio-caudal. *I. P.* Ilio-peroneal. *S. M.* Semimembranosus. *S. T.* Semitendinosus. *T. A.* Tibialis anticus.

Gluteus minimus (?) (fig. 9, *G. Mi*). This is a still smaller muscle than the preceding, and arises from the hinder surface of the ilium and immediately opposite the origin of the gluteus medius, being separated from it only by the ilium. Passing downwards it is inserted beside the last-named muscle, with which it is intimately connected.

Ilio-peroneal (figs. 9 & 10, *I. P*). A muscle which I propose thus to designate, and which is very long and slender, arises from the ilium immediately beneath and closely connected with the gluteus maximus. It is inserted into the peroneal side of the fibula slightly above its middle.

The *biceps* (?) (figs. 9 & 10, *B*) is slender, like the muscle last described; it extends from the insertion of the femoro-caudal to the fibula, being fixed to that bone immediately below the attachment of the ilio-peroneal. It expands somewhat just before its insertion.

Tibialis anticus (figs. 7, 8, 9, 10, & 11, *T. A*). This is a large and prominent muscle. It arises from the front of the distal end of the femur and from the proximal parts of the tibia and fibula. It is inserted into the tarsus on its tibial side.

Peroneus. A portion of muscle, somewhat difficult to define exactly, passes down, in front of the insertions of the ilio-peroneal and biceps, from the head of the fibula to the peroneal side of the tarsus.

Extensor longus digitorum (figs. 8 & 9, *E. L. D*). This large muscular layer arises, by a strong aponeurosis, from the front of the distal end of the femur. Passing downwards it goes to the digits.

Extensor hallucis (?) (fig. 9, *E. H*). A rather delicate muscle, covered by that last described. It goes from the upper part of the fibula downwards to the hallux.

Extensor brevis digitorum (fig. 9, *E. B*). A small triangular muscle, placed on the peroneal side of that last described, passes down obliquely from the lower end of the fibula to the four peroneal digits.

Flexor digitorum (figs. 10 & 11, *F. D*). This considerable muscle comes into view when the expanded lower part of the semitendinosus is removed. It arises from the posterior surface of the peroneal condyle of the femur, and passes downwards to the pedal digits.

Fig. 11.

Deepest muscles of ventral or flexor surface of right pelvic limb, the *semitendinosus* and *flexor digitorum* being cut and reflected.

A. Adductor. *F. D.* Flexor digitorum. *F. H.* Flexor hallucis. *G.* Gracilis. *S. T.* Semitendinosus. *T. A.* Tibialis anticus.

Flexor hallucis (?) (fig. 11, *F. H*). On the removal or reflection of the flexor digitorum, a deeper layer of muscle, subtriangular in shape, comes into view. It arises from the whole length of the fibula, and passes obliquely downwards to the sole of the foot. It goes mainly, if not exclusively, to the hallux.

Peroneo-tibial (?). Some muscular fibres connect the lower part of the tibia and fibula, passing obliquely from the latter bone downwards and inwards to the former.

4. Descriptions of a New Genus and Fourteen New Species of Marine Shells. By Henry Adams, F.L.S.

(Plate XIX.)

Conus (Coronaxis) cernicus, Barcl. MS. (Plate XIX. fig. 1.)

C. *testa conica, solida, polita, spiraliter puncto-striata, striis antice validioribus et propinquioribus; spira elevata, convexo-conica, sutura valde impressa; anfr.* 9, *angulatis, coronatis; cinereo-alba, rubido-fulvo fasciata et nebulosa, maculis albis aspersis, juxta suturas rubido-fulvo notata; apertura angusta, lineari.*

Long. 25, lat. 12 mill.

Hab. Barkly Island, Mauritius (*Coll. Barclay*).

This and several of the following species were procured at Mauritius after a late severe storm, by which large masses of coral were displaced and formed into a small island on the coast, which has been named Barkly Island, after the Governor Sir Henry Barkly.

Clathurella robillardi, Barcl. MS. (Plate XIX. fig. 2.)

C. *testa turrita, tenui, alba, costis validis rotundatis ad* 10 *longitudinaliter ornata, costulis transversis et striis longitudinalibus cancellata; anfr.* 9, *convexis, postice excavatis, ultimo* $\frac{1}{3}$ *longitudinis testæ; apertura anguste lunata; columella costulis obliquis insculpta; labro incrassato, intus subsulcato; sinu angusto, haud profundo; rostro longo, recurvo.*

Long. 25, lat. $8\frac{1}{2}$ mill.

Hab. Barkly Island, Mauritius (*Coll. Barclay*).

Drillia barkliensis, H. Ad. (Plate XIX. fig. 3.)

D. *testa elongato-turrita, roseo-fulvida, longitudinaliter striata, ad basim plicata; spira anfr.* 8, *prope suturam excavatis, costulis granulosis (granulis albis) cinctis, interstitiis transversim striatis, ad medium nodulis albis ornatis; apertura oblonga,* $\frac{1}{3}$ *longitudinis testæ æquante; columella rectiuscula; sinu mediocri; labro extus varicoso, macula fulva notato.*

Long. 18, lat. $6\frac{1}{2}$ mill.

Hab. Barkly Island, Mauritius (*Coll. H. Ad.*).

I am indebted to Mr. Caldwell, of Mauritius, for an example of this species.

Coralliophila coronata, Barcl. MS. (Plate XIX. fig. 4.)

C. *testa imperforata, ovato-fusiformi, plicis longitudinalibus distantibus, et costis transversis undulatis confertis sculpta, in medio anfractus ultimi costis duabus validioribus, posteriore spinis curvatis armata; purpureo-fulva, costis transversis pallidioribus; anfr.* 7, *convexis, ultimo dimidiam longitudinis testæ superante; apertura acuminato-ovata, intus violacea; columella lævi, sim-*

plici; canali mediocri, antice roseo tincta; labro intus leviter lirato.

Long. 20, lat. 10 mill.

Hab. Barkly Island, Mauritius (*Coll. Barclay*).

Genus MAURITIA, H. Ad.

Testa fusiformis, spira acuminata; apertura angusta, lineari, antice truncata; columella numerose plicata; labro extus incrassato, antice decurtato.

MAURITIA BARCLAYI, H. Ad. (Plate XIX. figs. 5, 5*a*.)

M. *testa oblongo-fusiformi, solida, striis concentricis confertis (antice validioribus) sculpta, lineis rufis distantibus transversis cincta, callo vitreo tenui fulvo tecta; spira brevi, subacuminata, apice acutiusculo, sutura leviter impressa; anfr.* 8, *subplanatis, ultimo ascendente,* $\frac{2}{3}$ *longitudinis æquante; apertura angusta, antice latiore; columella callosa, plicis parvis obliquis ad* 10 *(superioribus majoribus) antice instructa, truncata, producta, basi recurvata; labro postice angulato, margine recto, extus valde incrassato.*

Long. 50, lat. 15 mill.

Hab. Barkly Island, Mauritius (*Coll. M'Andrew*).

In general appearance *Mauritia* resembles *Dibaphus*, but from that genus the presence of folds on the columella distinguishes it. From *Mitra* it differs both in form and in the columellar plaits being much more numerous and less distinct.

MARGINELLA (GLABELLA) MIRABILIS, Barcl. MS. (Plate XIX. figs. 6, 6*a*.)

M. *testa trigono-ovata, solida, polita, longitudinaliter valde plicata, plicis subtus obsoletis, albida, lilaceo nebulosa et fasciata, punctis lividis aspersis, fascia livida angusta interrupta ad suturam et ad peripheriam ornata; spira parum elevata, apice obtuso, sutura mediocri; anfr.* 6, *ultimo ascendente; apertura angusta; columella plicis* 4 *validis vix obliquis instructa; labro extus valde incrassato, albido, maculis et liris sanguineis notato, intus crenulato.*

Long. 32, lat. 19 mill.

Hab. ——? (*Coll. Barclay*).

NACELLA (CELLANA) CERNICA, Barcl. MS. (Plate XIX. figs. 7, 7*a*.)

N. *testa tenui, ovata, depresso-conica, costis obtusis radiantibus numerosis et liris elevatis concentricis confertis undulatis decussata, albida, radiis rubro-fulvis ornata; apice subcentrali, obtuso; apertura ovata; fascia interna secundum superficiem exteriorem decussata et picta, micante, submargaritacea; margine plus minusve late crenulato.*

Long. 39, lat. 29, alt. 10 mill.

Hab. Barkly Island, Mauritius (*Coll. Barclay*).

This beautiful example of the genus *Nacella* differs from the typical species in the apex being nearly central, and in the form being depressedly conical. I therefore propose to separate it as a subgenus under the name of *Cellana*.

NATICA MARMORATA, H. Ad. (Plate XIX. fig. 8.)

N. *testa subglobosa, solida, subtilissime ac oblique striatula, albida, pallide fulvo marmorata, juxta suturam strigis fulvis angulatis, et in medio anfractus ultimi maculis sagittatis seriatim fasciata; spira parum elevata, sutura distincta; anfr.* 5, *ventricosis; apertura subsemilunari; columella arcuata, callosa, callo antice castaneo; umbilico parvo, funiculato; labro simplici, recto.*
Long. 16, lat. 12 mill.
Hab. Canary Islands (*Coll. M'Andrew*).

SCALA DELICATULA, H. Ad. (Plate XIX. fig. 9.)

S. *testa vix perforata, elongato-turrita, tenui, albida, lamellis elevatis tenuibus numerosis longitudinalibus, ad suturam productis, clathrata, inter lamellas spiraliter striata; spira anfr.* 11, *convexis, contiguis, apicalibus lævibus; apertura subcirculari; labro vix incrassato.*
Long. $6\frac{1}{2}$, lat. $2\frac{1}{3}$ mill.
Hab. Lancerote (*Coll. M'Andrew*).

SYRNOLA MINUTA, H. Ad. (Plate XIX. fig. 10.)

S. *testa subulata, in medio tumida, solidula, polita, albida; anfr. ad* 10, *planatis, fascia angusta pallide fulvo ad suturas cincta; sutura impressa; apertura ovata; plica parietali conspicua, transversa; labro intus simplici.*
Long. 4, lat. $\frac{7}{8}$ mill.
Hab. Orotava (*Coll. M'Andrew*).

TURBONILLA SPECIOSA, H. Ad. (Plate XIX. fig. 11.)

T. *testa subulato-turrita, solida, albida vel pallide fulva; anfr.* 16, *planiusculis, costis obliquis validis undulatis rotundatis instructis, interstitiis æquantibus lævibus; costis in anfractu ultimo ad peripheriam desinentibus; apertura ovato-quadrata; labio recto.*
Long. 18–24, lat. $4\frac{1}{2}$–$5\frac{1}{2}$ mill.
Hab. Vigo (*Coll. M'Andrew*).

CANCELLARIA PUSILLA, H. Ad. (Plate XIX. fig. 12.)

C. *testa imperforata, ovato-turrita, albida, longitudinaliter obtuse nodoso-costata et filis remotis cincta; spira elata, sutura leviter impressa; anfr.* 5, *convexiusculis, ultimo $\frac{1}{3}$ longitudinis testæ; apertura oblonga, antice vix canaliculata; labio antice sinuato, plicis duabis validis instructo; labro simplici, intus valde lirato.*
Long. 6, lat. $2\frac{1}{3}$ mill.
Hab. Canary Islands (*Coll. M'Andrew*).

HAMINEA SUBPELLUCIDA, H. Ad. (Plate XIX. fig. 13.)

H. *testa tenuissima, albida, subpellucida, ovata, in medio plerumque gibbosa, longitudinaliter striis undulatis rugosis, et spiraliter lineis elevatis irregularibus sculpta; vertice excavato, subperforato; apertura antice dilatata; margine columellari simplici, arcuato; labro recto, postice rotundato.*

Long. 17, lat. 11 mill.

Hab. Lisbon (*Coll. M'Andrew*).

GOULDIA MODESTA, H. Ad. (Plate XIX. fig. 14.)

G. *testa subtriangulari, solidula, costis concentricis insculpta, intervallis costis æqualibus, pallide fusca, maculis rubris paucis picta; extremitate antica versus umbones concava, postica arcuata; umbonibus acutis approximatis; margine ventrali convexo, intus crenulato.*

Long. $6\frac{1}{2}$, alt. 6 mill.

Hab. Gulf of Tunis (*Coll. M'Andrew*).

I take this opportunity of correcting a few names given by me to shells in former papers, which I have since found to be preoccupied:—

PLANORBIS (ADULA) SEPTEMVOLVIS to be altered to PLANORBIS (ANCÆUS) SEPTEMVOLVIS (Proc. Zool. Soc. 1861, p. 145).

HELIX (GEOTROCHUS) BLANFORDI to be altered to HELIX (GEOTROCHUS) BLANFORDIANA (Proc. Zool. Soc. 1865, p. 415).

PUPINA PFEIFFERI to be altered to PUPINA PFEIFFERIANA (Proc. Zool. Soc. 1865, p. 416).

STYLODONTA (EREPTA) RUFOCINCTA to be altered to STYLODONTA (EREPTA) RUFOZONATA (Proc. Zool. Soc. 1867, p. 303).

NANINA (?ROTULA) CONULUS to be altered to NANINA (?ROTULA) TURRITELLA (Proc. Zool. Soc. 1867, p. 307).

DESCRIPTION OF PLATE XIX.

Fig. 1. *Conus* (*Coronaxis*) *cernicus*, p. 272.
2. *Clathurella robillardi*, p. 272.
3. *Drillia barkliensis*, p. 272.
4. *Coralliophila coronata*, p. 272.
5, 5*a*. *Mauritia barclayi*, p. 273.
6, 6*a*. *Marginella* (*Glabella*) *mirabilis*, p. 273.
7, 7*a*. *Nacella* (*Cellana*) *cernica*, p. 273.
8. *Natica marmorata*, p. 274.
9. *Scala delicatula*, p. 274.
10. *Syrnola minuta*, p. 274.
11. *Turbonilla speciosa*, p. 274.
12. *Cancellaria pusilla*, p. 274.
13. *Haminea subpellucida*, p. 275.
14. *Gouldia modesta*, p. 275.

May 13, 1869.

John Gould, Esq., F.R.S., V.P., in the Chair.

The Secretary called the attention of the Meeting to the following remarkable additions to the Society's Menagerie during the months of March and April:—

1. A Senegal Coucal (*Centropus senegalensis*) from West Africa, being the first specimen of this bird exhibited in the Society's collection. It was purchased March 8th.

2. Three Menopomas (*Menopoma alleghaniense*) from the Alleghany river, U. S. A., presented by the Trustees of the Smithsonian Institution, U. S. A. (March 9th), and believed to be the first examples of this singular Batrachian brought alive to this country.

3. A young Yaguarundi Cat (*Felis yaguarundi*) from Panama, presented by Capt. G. E. Bird, of the Royal Mail S. S. Co.'s service.

4. A female Musk (*Moschus moschiferus*), presented by Major F. R. Pollock, Commissioner at Peshawur, and most carefully conveyed to this country by Lieut. C. H. T. Marshall, F.Z.S., from whom it was received March 31st. This animal had been captured in June 1867, in the Hills of Cashmere, by Major Delmé Radcliffe of the 88th Regiment, who shot both the parents, and brought it when quite a kid to Peshawur. It was now about two years old, and was believed to be the only Musk ever brought to Europe alive.

5. A Cape Eared Owl (*Otus capensis*, Smith, Ill. Zool. S. Afr. t. lxvii.), captured on the rock of Gibraltar by Major Irby, and deposited in the Society's Gardens by Lord Lilford, F.Z.S., April 5th. In reference to this bird, Mr. Sclater remarked that, although its occasional occurrence upon the southern coast of Spain had been mentioned by Kjärbolling some years ago*, there was not, as far as he was aware, any previous authentic record of a specimen of it having been obtained in Europe.

6. An Ælian's Wart-hog (*Phacochœrus æliani*), which had been captured near Zoulla, on the coast-district of the Red Sea, and brought to England in one of the transports engaged on the Abyssinian Expedition, April 15th (see Plate XX.). This animal had been placed in the Swine-house, next to the fine pair of Æthiopian Wart-hogs from Natal (*P. æthiopicus*), which had been presented to the Society by H. R. H. the Duke of Edinburgh on the 6th of May, 1866. The external differences between the two species were very obvious on comparison, the sides being much more naked in *P. æliani*, while the hairs on the back and nape of the head were much thicker and longer. In *P. æliani* the ears were longer, more pointed, and more naked; in *P. æthiopicus* these organs were densely clothed with hair. In *P. æliani* also the whiskers are very long and well developed.

One other specimen of Ælian's Wart-hog had been previously living in the Menagerie—namely an adult female from Ashantee, presented to the Society by H.M. the Queen in 1861†.

* Naumannia, ii. p. 10 (1852).

† See P. Z. S. 1861, p. 30.

Phacochœrus æthiopicus.

Phacochœrus æliani.

Mr. Sclater exhibited drawings illustrative of the external differences between these two Wart-hogs, and also made remarks upon their well-known cranial and dental differences, which had been fully described by F. Cuvier, Van der Hoeven, and Owen, but which had not prevented Dr. Gray from uniting the two species in his recent Catalogue* of these animals.

The following extract was read from a letter addressed by Dr. J. Anderson, C.M.Z.S., to Mr. A. Grote, F.Z.S., concerning his recent expedition to Yunan:—

"I have brought back a large collection of birds, mammals, reptiles, fishes, insects, and land and freshwater mollusks, and believe I have a number of novelties amongst them. I will send you a copy of my report when finished, but that will not be for some time yet.

* P. Z. S. 1868, p. 46, and Cat. Carnivorous, Pachydermatous, and Edentate Mamm. p. 352 (1869).

Mr. W. T. Blanford has kindly given me the names of the shells, and Dr. Day of Madras has worked out the fishes. I shall do the mammals, birds, and reptiles myself, and give an account of the geology. I have collected vocabularies of the various native tribes, and shall be able to give you a rather interesting account of the hill tribes between Burmah and China.

"I have brought two living Monkeys of the *Rhesus* group from Yunan, quite different from anything I have ever seen. I also came across another peculiar form of this genus, and sent the specimen alive to Bhamaun under the care of a policeman (one of our guards), with strict orders, if it died, to preserve the skin and skeleton; this, however, was not done. The two specimens I have brought with me are small, and have the red face of *Macacus rhesus*. I agree with you that more than one species have been hitherto united under that name. My specimens are great pets; and after they have been figured, I will send them to the Zoological Society. They were obtained in the province of Yunan, at an elevation of from 4000 to 5000 feet. I got *Thaumalea amherstiæ*, and a Francolin which I am not quite sure about, as also a Pheasant, which is the living image of the English bird. I have also species of *Suthora* and *Pycnonotus*, and other birds which have yet to be determined. The mammals and reptiles are not yet finished. Day has described a number of new fishes, and Blanford about twelve new species of land and freshwater shells.

"I am trying hard to get living specimens of the pigmy Hog of the Terai for the Zoological Society, and hope to succeed. To-day I have had a letter from Mr. J. C. Haughton, Commissioner of Julpigom, offering me a living *Arctonyx*, which I have also accepted for the Society. I do not know the species yet, but it will probably be *A. collaris*."

The Secretary also read the following extract from a letter addressed to him by the same gentleman, dated Indian Museum, Calcutta, April 11th, 1869:—

"I know you will be interested to learn that the three specimens of *Ailurus* have arrived. I have taken them under my charge, and am doing all I can to mitigate their sufferings from the heat, which has been very great during the last few days, reaching as high as 95° on the cool shaded side of the house. I have a man attending to them all day; and when the sun goes down I have them carried out into a cool breezy spot. I have had a new and comfortable airy cage constructed, as the one they were in was filthy in the extreme.

"The original specimen, which I found at Darjeeling, and which now belongs to Dr. Simpson, is in capital condition, and may live through the heat of the Red Sea; but I doubt much if the others will. I have told Dr. Simpson to preserve their bodies if they die. They are most interesting animals. In appearance they are wonderfully like Raccoons. Every movement is Bear-like; they sit up on their hind quarters and strike with their paws in the same way as the Bear, climb like the Bear, and when irritated make the sudden

rush of that animal and emit a nearly similar cry; the bushy barred tail, which is fully as long as the body, is carried straight out, or nearly so. They are very fond of milk, bamboo-leaves, and grass, and have a strong *penchant* for sugar. We cannot get them to eat any of the plain's fruits. It will be a splendid success if they reach Europe alive."

A communication was read from Dr. F. von Mueller, F.R.S., C.M.Z.S., containing a list of birds permanently occurring, or periodically visiting, the Botanic Gardens, Melbourne:—

1. *Falco melanogenys.*
2. *Ieracidea berigora.*
3. —— *occidentalis.*
4. *Astur novæ-hollandiæ.*
5. —— *approximans.*
6. *Accipiter torquatus.*
7. *Circus assimilis.*
8. *Strix tenebricosus.*
9. *Athene boobook.*
10. —— *strenua.*
11. *Ægotheles novæ-hollandiæ.*
12. *Hirundo neoxena.*
13. *Atticora leucosternon.*
14. *Dacelo gigantea.*
15. *Alcyone azurea.*
16. *Halcyon sancta.*
17. *Artamus sordidus.*
18. —— *superciliosus.*
19. *Dicæum hirundinaceum.*
20. *Pardalotus punctatus.*
21. *Graucalus melanopsis.*
22. *Pachycephala melanura.*
23. —— *pectoralis.*
24. *Colluricincla harmonica.*
25. *Oreoica gutturalis.*
26. *Falcunculus frontalis.*
27. *Gymnorhina tibicen.*
28. —— *leuconota.*
29. *Corcorax leucopterus.*
30. *Corvus coronoides.*
31. *Strepera anaphonensis.*
32. —— *graculina.*
33. *Rhipidura motacilloides.*
34. —— *rufifrons.*
35. —— *albiscapa.*
36. *Seissura inquieta.*
37. *Malurus cyaneus.*
38. —— *melanotus.*
39. *Stipiturus malacurus.*
40. *Sphenœacus gramineus.*
41. *Calamanthus fuliginosus.*
42. *Anthus australis.*
43. *Sericornis osculans.*
44. *Acanthiza chrysorrhoa.*
45. —— *lineata.*
46. —— *nana.*
47. *Ephthianura albifrons.*
48. *Petroica phœnicea.*
49. —— *multicolor.*
50. *Cincloramphus rufescens.*
51. *Estrelda bella.*
52. —— *temporalis.*
53. *Amadina lathami.*
54. *Oreocincla lunulata.*
55. *Oriolus viridis.*
56. *Meliphaga australasiana.*
57. —— *longirostris.*
58. *Glyciphila albifrons.*
59. —— *fulvifrons.*
60. *Ptilotis penicillata.*
61. *Anthochæra lunulata.*
62. —— *mellivora.*
63. *Acanthogenys rufogularis.*
64. *Acanthorhynchus tenuirostris.*
65. *Tropidorhynchus corniculatus.*
66. *Melithreptes lunulatus.*
67. *Climacteris scandens.*
68. *Sittella chrysoptera.*
69. *Calyptorhynchus naso.*
70. *Aprosmictus scapulatus.*
71. *Platycercus eximius.*
72. —— *pennantii.*
73. *Nymphicus novæ-hollandiæ.*
74. *Euphema elegans.*
75. *Melopsittacus undulatus.*
76. *Trichoglossus rubritorques.*
77. —— *pusillus.*
78. *Cuculus cinerascens.*

79. *Chrysococcyx lucidus.*
80. *Phaps chalcoptera.*
81. *Peristera elegans.*
82. *Synœcus australis.*
83. —— *diemenensis.*
84. *Lobivanellus lobatus.*
85. *Scolopax australis.*
86. *Schœniclus australis.*
87. —— *subarquatus.*
88. *Rhynchæa australis.*
89. *Herodias syrmatophorus.*
90. *Nycticorax caledonicus.*
91. *Grus australis.*
92. *Botaurus australis.*
93. *Platalea regia.*
94. *Porphyrio melanotus.*
95. *Fulica australis.*
96. *Rallus pectoralis.*
97. *Gallinula tenebrosa.*
98. *Cygnus atratus.*
99. *Cereopsis novæ-hollandiæ.*
100. *Anseranas melanoleuca.*
101. *Bernicla jubata.*
102. *Anas superciliosa.*
103. —— *nævosa.*
104. —— *punctata.*
105. *Malacorhynchus membranaceus.*
106. *Biziura lobata.*
107. *Nyroca australis.*
108. *Sternula nereis.*
109. *Pelicanus conspicillatus.*
110. *Phalacrocorax carboides.*
111. —— *leucogaster.*
112. —— *sulcirostris.*
113. *Podiceps australis.*
114. —— *gularis.*

The following papers were read:—

1. On the Classification of the Anurous Batrachians. By St. George Mivart.

In June 1858 Dr. Günther read a very valuable paper before the Zoological Society *, stating the principles according to which he was disposed to arrange, systematically, the Anurous Batrachians. The system therein offered is that adopted by the same author in his Catalogue of the Frogs and Toads contained in the British Museum †.

In 1865 Mr. E. Cope gave to the world another and very different plan for arranging the same animals ‡, a plan which he has amended and further elaborated in papers published in the 'Journal of the Academy of Natural Sciences of Philadelphia' §.

Dr. Günther's system reposes mainly on external and readily ascertainable characters.

Mr. Cope's system is founded on certain points of osteological detail.

I venture here to propose a classification which is derived from, and in all the most important points agrees with, that of Dr. Günther, but which differs from it in certain minor respects (owing to a different estimate of the value of certain points of structure), while

* Proc. Zool. Soc. 1858, p. 339.

† 'Catalogue of the Batrachia Salientia in the Collection of the British Museum,' by Dr. Albert Günther. 1858.

‡ Natural History Review, vol. v. 1865, p. 97.

§ Vol. vi. of the new series of that Journal, part 1, July 1866, p. 67, and part 2, September 1867, p. 189.

it adopts from the labours of Mr. Cope osteological characters noticed by him, but which are here restricted in their application to the limitation of more subordinate groups than those for which he uses them.

Mr. Cope's osteological system would divide the Anura into two great series, the *Arciformia* and the *Raniformia*.

The *Raniformia* are thus characterized * :—"Coracoidei abutting; epicoracoidei, when present, continuous, transverse, and abutting on coracoidei; not connected with the latter by overlapping longitudinal cartilages."

The *Arciformia* are distinguished as follows † :—"Acromials and coracoids divergent, the former directed forward and connected with the latter by a longitudinal arched cartilage, which is free from, and overlapped by, the corresponding cartilaginous arch of the opposite side."

This system associates *Bombinator*, *Pelodytes*, and *Cultripes* with *Hyla*, *Cystignathus*, *Hylodes*, and *Bufo*, in one division; while *Engystoma*, *Phryniscus*, and *Hemisus* are altogether separated from the true Toads, in order to be classed with *Rana*, *Hylarana*, &c.

Such approximations seem to me forced and unnatural, and likely to lead to the rejection of the system from which they necessarily result.

Mr. Cope employs other osteological characters for more subordinate groups; thus his *Hylidæ* ‡ are characterized, among other points, as having the "fronto-parietalia shortened anteriorly, usually embracing a fontanelle," and "superior plate of ethmoid never covered by fronto-parietals, usually produced anteriorly, between fronto-nasals."

Skeletal characters are, indeed, most valuable ones in leading us to detect the deepest and truest affinities of vertebrate animals. But these affinities once found, it is very desirable that zoological classifications should not, if it can possibly be avoided, *repose* upon them only, but rather on more external and more readily ascertainable characters. Such external characters will probably be found to exist in all really natural groups, although they may turn out to be distinctions so little obvious that they might never have been noticed, but for the guidance afforded by the previous careful study of the osteology of such groups.

As to the particular character selected to distinguish Mr. Cope's two great primary divisions, I cannot think it of anything like the importance § he attaches to it. The point is one easily to be studied, as the Common Frog is the type of the *Raniformia*, while the Common Toad exemplifies the Arciform type of structure.

When the two adult shoulder-girdles are compared, a considerable

* Journal Acad. Phil. new series, vol. vi. pt. 2, p. 190.

† Ibid. pt. 1, p. 67.

‡ Ibid. p. 83.

§ I am fortified in this, I rejoice to say, by the valuable opinion of one of the very first of existing osteologists, I mean my esteemed friend Mr. W. K. Parker, F.R.S.

difference certainly appears at first sight to exist; but if a Frog of a somewhat earlier age is examined, it will be seen to be as "arciferous" as in the Toad. In Mr. Parker's elaborate Monograph on the shoulder-girdle, published by the Ray Society, this fact is well shown at plate 5, where the various stages are represented between the shoulder-girdle of the Frog-tadpole, "with budding limbs but perfect tail" (fig. 1), and that of the "old male Frog" (fig. 11). In the Frog, a few weeks after metamorphosis (fig. 9), the arched cartilages are well shown; and the young Frog *with the tail absorbed* (fig. 6) exhibits a condition, as regards the overlapping cartilaginous arches, *closely resembling that presented by the Toad of the first summer* (fig. 16).

Now the existence of structures in a rudimentary, transitory condition during the development of certain animals, does not necessarily invalidate the employment of the manifest conspicuous presence of such structures in the adult condition of other animals as distinguishing characters of the latter. But in all such cases a really marked distinction must be capable of being drawn. This cannot be said to be the case in the present instance, where two animals (the common Frog and Toad) closely resemble each other after they have assumed their final, adult external form.

The Anura, then, can hardly, I think, be divided into two primary sections on the strength of a character so little distinctive as Mr. Parker's observations prove the visible presence of these cartilaginous arches to be. I say *visible presence*, because even in the *old* male Frog this arch really persists, though its existence is disguised and hidden by the superficial extension over it of the lower part of the coracoid. Some of the other characters are also but little satisfactory. Thus the presence of a fontanelle is sometimes at least merely a proof of the immaturity of the individual possessing it.

The Anura form such a remarkably homogeneous group, that their subdivision is a work of great difficulty. I fully agree with Mr. Cope that adaptive modifications should be neglected as affording distinctive characters of groups, in favour of others going deeper into their essential relations and affinities. But here it is not at all evident to me which *are* the really essential characters; and when these cannot be clearly distinguished, I think it well to turn to such others as can easily be observed, though regretting at the same time the absence of more significant and satisfactory distinctions.

Thus the system proposed by Dr. Günther should, I think, be retained as far as possible, being so "complete and practically useful," as Mr. Cope acknowledges*.

That Dr. Günther's system admits now of some modification, I think its author would freely acknowledge. The discovery that some species of *Callula* have very large digital disks, while others are totally devoid of such expansions, cannot but cause grave doubts as to the propriety of the dividing the Anura into large groups on the strength of such a character. Then the presence or absence of a

* Natural History Review, vol. v. p. 120.

web is sometimes so variable in one and the same genus, that, I submit, *family* distinctness can hardly be determined by it. I therefore propose to treat the presence or absence of disks as a character of minor importance, and to place in one family all forms not otherwise distinguishable than by the presence or absence of a web.

The two remarkable and aberrant genera *Pipa* and *Dactylethra* (which agree in having the eustachian tubes so united as to have but one pharyngeal orifice, and in being destitute of a tongue) I am not disposed to regard as low forms. The absence of the tongue is a defect; but then the highest of all reptiles (the Crocodilia) differ from the inferior forms of their class by a similar one. The single eustachian opening is certainly rather an evidence of *higher* development.

It is with considerable doubt, and mainly out of deference to the opinion of others, that I make *Pipa* and *Dactylethra* types of one and the same primary subordinal division. It may be that *Pipa* is to the edentulous Anura what *Dactylethra* is to the toothed forms, and that they are, as Mr. Cope has suggested*, extremes of two different series. Nevertheless the agreement between these genera is very remarkable, not only as to the absence of a tongue and the structure of the tympanum, but also as regards the expanded sacral vertebra, the absence of parotoids and of teeth on the palate, the hidden tympanum, and the broadly webbed toes.

In searching for an important character by which to divide primarily the rest of the Anura, I have to choose between that afforded by the expansion or non-expansion of the transverse process of the sacral vertebra, and the presence or absence of maxillary teeth, as (considering the conditions presented by the genus *Callula*) I decline altogether to adopt as an important distinction the expansion of the ends of the digits into disks.

The sacral dilatation is certainly a very remarkable structure, and one probably rather essential than adaptive†. Nevertheless, were it to be selected as the primary character, it would lead to the association of *Engystoma* and *Bufo* with *Hyla* and *Discoglossus*, and the radical separation of the last-named genus from *Rana*, and of *Polypedates* and *Hylodes* from *Hyla*. I therefore conclude to adopt that character which Dr. Günther considers the most important after the

* Natural History Review, 1865, vol. v. p. 98.

† Dr. Günther says, "What influence the dilated or more cylindrical form of the process of sacral vertebra has upon the mode of life is difficult to explain, as it does not absolutely correspond with other physiological or anatomical characters. The pelvis obtains by the dilatation of these processes much more firmness; and a lateral motion is more or less entirely impeded. We should therefore expect to meet with this character in those Batrachians which are provided with the longest and most powerful hind legs, according to the physical problem that the longest lever requires the strongest centre. But, on the contrary, the Batrachians with the shortest legs exhibit a much-dilated sacral vertebra, whilst on the other hand the long-legged *Hylidæ* show the same peculiarity. In fact, *this osteological form seems to be connected with none of the modifications of locomotion*; for we find among these Batrachians good swimmers as well as bad, tree- as well as earth-frogs, those which always hop as well as those which often crawl; finally we are unable to refer to it a peculiarity of any part of the propagation." (P. Z. S. 1858, p. 340.)

tongue and digital disks—which latter I decline to select. This character is the presence of maxillary teeth.

On this subject Dr. Günther observes*, "When we consider that the lower jaw of the tailed Batrachians is provided with a series of teeth, and that these are wanting in all the tailless Batrachians, we are obliged to acknowledge the importance of this character." Since this was written, however, two forms have been discovered which *are* provided with mandibular teeth†; and this may perhaps be considered to strengthen Dr. Günther's refusal to consider the possession of teeth a primary character—a refusal he fortifies by reference to the Edentata and Salmonidæ.

But the learned Doctor's refusal was mainly grounded on his "not being able to consider the character of the dentition among the tailless Batrachians as one intimately connected with their mode of life"‡, an objection the force of which I am so far from being disposed to admit that I would select for classificatory purposes the least adaptive characters I could find, provided they were constant and easily to be ascertained. It is true that in the Edentata we have edentulous and many toothed forms, but then these forms are very distinct; we have no edentulous Armadillos and no toothed Anteaters, and indeed the order may well be primarily divided according to the dentition; so that I think that, on the whole, the Edentata favour my view.

Characters as to dentition serve also to define the primary divisions of the orders Primates, Chiroptera, Insectivora, Cetacea, and Marsupialia, at the least, if not others also; and the edentulous Chelonia form the most natural and well-defined primary groups of existing Reptiles.

Mr. Cope opposes the adoption of dental characters for important divisions as follows:—"The increase of knowledge furnishes us with cases of rudimental dentition, indicating a less significance for the character which has been supposed to characterize the Bufoniformia. Such occurs in the genus *Colostethus*, Cope, which seems to be quite identical with *Dendrobates*, except in the possession of teeth. *Microhyla*, a true Engystomatid, is said by Dr. Günther to possess teeth; and minute rugosities on the maxillæ of *Callula natatrix* deceived me into the belief at one time that teeth actually existed. Among arciferous genera *Eupemphix* (Steindachner) is said by him to possess very minute teeth, which in some adults are entirely wanting"§.

To this it may be replied that the loss of teeth in certain individuals, perhaps aged, can hardly be a valid reason to reject this character as one of weight. Secondly, *Microhyla* does *not* possess teeth; the possession of teeth was attributed to it by Dr. Günther on the

* Proc. Zool. Soc. 1858, p. 340.

† These are:—*Hemiphractus scutatus*, described by Peters, in 'Berlin. Monats.' 1863, p. 144; and *Grypiscus*, described by Cope in 'Journal of Acad. Philadelphia,' 1867, vol. vi. part 2, p. 205.

‡ Proc. Zool. Soc. 1858, p. 340.

§ Journal of the Acad. of Nat. Sc. of Philadelphia, new series, vol. vi. part 2, p. 189.

authority of Tschudi* and MM. Duméril and Bibron†. Thirdly, Mr. Cope admits that he was misled as to the existence of teeth in *Callula natatrix*. Perhaps a similar circumstance may have occurred as regards *Colostethus*, or perhaps *Hylaplesia* may be found to have teeth at some period of life.

Next in importance to the presence or absence of teeth I am disposed to rank the condition of the development of the ear and the dilatation of the sacral transverse process. I am moreover inclined to lay additional weight on them from their not being adaptive characters—the dilatation of the sacral vertebra being, as we have seen, apparently independent of locomotive habit.

As to the condition of the internal ear, neither Dr. Günther nor Mr. Cope are disposed to attach primary importance to it; and I fully agree with the first-named author in thinking that "the Batrachians with imperfectly developed ear would form together an unnatural group, and would be separated too far from other allied forms"‡, if that character were made the main character in Batrachian classification. Nevertheless it seems to me a character of such great importance that I propose to rank it next after the presence or absence of teeth.

Of the characters that remain the most readily available are the presence or absence of parotoids and the dilatation or non-dilatation of the tips of the digits.

That the latter character is, as Mr. Cope considers, not one of any great real value, seems to me to be demonstrated, as before said, by the varying condition in which it is found in the single genus *Callula*. The presence or absence of parotoids therefore may, I think, well take precedence of the digital disks as a distinctive character. As to the "presence or absence of a web between the toes," that character can only be applied with doubt and uncertainty even to certain groups ranking as low as genera.

Making use of these characters in the subordination above indicated, we shall have, besides *Pipa* and *Dactylethra*, two great series—(1) a toothed (Frog) series, and (2) an edentulous (Toad) series. As some of the animals of the latter series seem to offer the lowest condition found in the order, we may ascend through them to the Frogs, beginning with a section containing those in which the ear is imperfect. The first family of these will be the *Rhinophrynidæ*, which have parotoid glands and a tongue free anteriorly. The second family will be the *Phryniscidæ*, in which there are no parotoid glands, and in which the tongue is fixed in front. The next edentulous section will consist of such toothless forms as have a perfect ear. It will contain one family with an undilated sacral vertebra (the *Hylaplesidæ*) and three families in which the sacral vertebra is dilated, the first of the three (*Bufonidæ*) having parotoid glands, the other two being destitute of such structures and distinguished from

* 'Classification der Batrachier,' p. 71, "*Dentes maxillares et palatinos brevissimos.*"

† Erpétologie Générale, vol. viii. p. 614.

‡ Proc. Zool. Soc. 1858, p. 342.

each other by the tongue being fixed in front as usual (the *Engystomidæ*) or free in front (the *Xenorhinidæ*).

The toothed (or Frog) series may also be similarly divided into two sections:—first, those with an imperfect ear, the *Bombinatoridæ*; secondly, those with a perfect ear. This latter section contains more families than any other section of the order, there being three families in which the sacral vertebra is not dilated, and four in which it is dilated—seven in all. In order, however, to place those families in juxtaposition which have most affinity for each other (*e. g.* the *Discoglossidæ* next to the *Ranidæ*, &c.) I have thought it desirable, in the annexed table, to treat the dilatation of the sacral vertebra as subordinate to the presence or absence of parotoids. I do not, however, consider, as I have already said, the latter character to be inferior in importance; but such a way of treating the matter is convenient in this particular instance.

Thus the *Plectromantidæ*, with parotoids and non-dilated sacral vertebra, will come first, then those with parotoids and dilated sacral vertebra; first, the *Alytidæ*, without digital disks, and then the *Pelodryadidæ*, with them.

Of those without parotoids the *Hylidæ* have a dilated sacral vertebra and digital disks; while undilated sacral vertebra is common to the *Polypedatidæ* and *Ranidæ*, which differ in the presence or absence of the disks; after these the *Discoglossidæ*, which have the sacral vertebra dilated, but are devoid of disks.

Finally come *Pipa* and *Dactylethra*, which thus form a third primary division of the Anura, characterized by a highly developed tympanum, but no tongue.

ANURA.

A. *Without maxillary teeth at any time of life, but with a tongue.*

- I. Ear imperfect.
  - Tongue free in front ..... *Rhinophrynidæ.*
  - Tongue fixed in front ..... *Phryniscidæ.*
- II. Ear perfect.
  - α. Sacral vertebra not dilated ..... *Hylaplesidæ.*
  - β. Sacral vertebra dilated.
    - 1. Parotoids ..... *Bufonidæ.*
    - 2. No parotoids.
      - Tongue free in front ..... *Xenorhinidæ.*
      - Tongue fixed in front..... *Engystomidæ.*

B. *With maxillary teeth at some time of life and with a tongue.*

- I. Ear imperfect ..... *Bombinatoridæ.*
- II. Ear perfect.
  - α. Parotoids.
    - 1. Sacral vertebra not dilated .... *Plectromantidæ.*
    - 2. Sacral vertebra dilated.
      - No digital disks..... *Alytidæ.*
      - Digital disks ..... *Pelodryadidæ.*

β. No parotoids.

1. Sacral vertebra dilated; digital disks ..... *Hylidæ.*
2. Sacral vertebra undilated; digital disks ..... *Polypedatidæ.*
3. Sacral vertebra undilated; no digital disks ..... *Ranidæ.*
4. Sacral vertebra dilated; no digital disks ..... *Discoglossidæ.*

C. *No tongue; maxillary teeth present or absent.*

I. Maxillary teeth absent ..... *Pipidæ.*
II. Maxillary teeth present ..... *Dactylethridæ.*

Section A. *No maxillary teeth; a tongue.*

Division I. *Ear imperfect.*

Fam. I. RHINOPHRYNIDÆ.

No tympanum; no cavum tympani; no eustachian tubes; transverse processes of sacral vertebra dilated; parotoid glands present but hidden, large, with smooth surface; tongue free in front, fixed behind; fingers webbed at the base, toes half webbed; "no articulated ribs or opisthocœlian vertebræ;" "ethmoid septal walls ossified to the end of the muzzle, and separating the prefrontals; its superior plate covered by the completely ossified fronto-parietale. Fronto-nasalia well developed, entirely in contact with *fronto-parietalia*, separated by a median point of the latter and by the ethmoid septum." "Coracoid and epicoracoid divergent, connected by a narrow single cartilage; the former not dilated, in contact with, or slightly separated from, that of the opposite side." Nine vertebræ and a coccyx attached by two condyles.

Tropical America.

Rhinophrynus, Dum. & Bibron, viii. p. 758, pl. 91. figs. 2, 2*a*; Günther, P. Z. S. 1858, p. 348; Cope, Nat. Hist. Review, vol. v. 1865, p. 100.

Genus *Rhinophrynus*, Mexico.

Fam. II. PHRYNISCIDÆ.

No tympanum; no cavum tympani; eustachian tubes absent or rudimentary; transverse processes of sacral vertebra dilated; no parotoid glands; tongue more or less elongate, fixed in front, free behind, where it is entire; digits free or webbed, but undilated or only moderately dilated. No arciform cartilages.

Neotropical and Australian, Indian and Ethiopian regions.

This is almost equivalent to the *Brachycephalina* of Dr. Günther, including, as it does, the *Phryniscidæ*, *Brachycephalidæ*, and adding to them the *Micrhylidæ* (Cat. of Bat. Salientia, pp. 42, 45, & 121, and Synopsis, p. 8).

Subfam. 1. PHRYNISCINA.

" Prefrontals small, widely removed from each other and from the fronto-parietals; eustachian tubes rudimentary; no digital disks; precoracoidei present and smaller than coracoids"*.

See Cope, Journal of Acad. of Phil. 1867, p. 195.

Genera:—*Phryniscus*, Neotropia; *Pseudophryne*, Australian; *Brachycephalus*, Neotropia.

Subfam. 2. HEMISINA.

No eustachian tubes; tongue posteriorly retractile into a sheath; fronto-parietal and prefrontal bones fully developed, in contact, the latter separated to end of muzzle by ossified ethmoid septum; manubrium present; coracoids more slender than precoracoids; no digital disks.

See Cope, *l. c.* p. 198.

Genus *Hemisus*, Ethiopia.

Subfam. 3. MICHRYLINA.

Precoracoidei wanting; no eustachian tubes; ethmoid arch ossified; prefrontals fully developed, in contact with each other and fronto-parietals; latter complete; moderate digital disks.

Genus *Micrhyla*, Indian region.

Division II. *Ear perfect.*

Subsection *α*. *Sacral vertebra not dilated.*

Fam. III. HYLAPLESIDÆ (Günther).

A tympanum and cavum tympani; two eustachian tubes; processes of sacral vertebra not dilated; no parotoid glands; tongue free behind; digits free and all dilated at their ends; no arciform cartilages; precoracoids present; sacrum distinct from coccygeal style, three lobes to the liver; prefrontals widely separated; ethmoid broad, ossified to extremity of muzzle; terminal phalanges with two divaricate limbs.

Tropical America.

Hylaplesidæ, Günther, Cat. of Bat. Sal. p. 124.

Dendrobatidæ, Cope, Journal Phil. 1867, p. 197.

Genus *Hylaplesia*, Neotropia.

Subsection *β*. *Sacral vertebra dilated.*

Fam. IV. BUFONIDÆ (Günther).

A tympanum and cavum tympani; two eustachian tubes; pro-

* These characters may not apply to *Pseudophryne*, which does not appear to be included by Cope in his *Phryniscidæ*, though in the paper in the Nat. Hist. Review it is placed beside *Phryniscus*, *l. c.* p. 102.

cesses of sacral vertebra dilated; parotoid glands present; tongue free behind; digits not dilated, toes more or less webbed.

Cosmopolitan, except Australia.

Subfam. 1. Kalophrynina.

No arciform cartilages; precoracoids present; prefrontals fully developed, forming suture with each other and fronto-parietals; skin of the back forming one large flat parotoid. East-Indian islands.

Genus *Kalophrynus*, Indian region.

Subfam. 2. Bufonina.

Arciform cartilages; precoracoids present; parotoids normal, prominent. Cosmopolitan, except Australia.

Genera:—*Bufo*, cosmopolitan, except Australia; *Otilophus*, Neotropical region; *Peltaphryne*, Neotropical region; *Pseudobufo*, East-Indian archipelago; *Schismaderma*, Ethiopian.

Fam. V. Xenorhinidæ.

A tympanum and cavum tympani; two eustachian tubes; processes of sacral vertebra dilated; no parotoid glands; tongue entirely attached behind, free in front; digits all free, but only the toes provided with disks; tympanum distinct, large; no tarsal tubercle; habit of *Engystoma*.

New Guinea.

See Peters, Berlin. Monats. 1863, p. 82.

Bombinator oxycephalus, Schlegel, Handleiding tot de beolfening der Dierkunde, ii. p. 58, tab. iv. fig. 74.

Genus *Xenorhina*, Australian region.

Fam. VI. Engystomidæ.

A tympanum and cavum tympani; two eustachian tubes; processes of sacral vertebra dilated; no parotoid glands; tongue fixed in front; digital disks present or absent.

African, Indian, Neotropical, and Australian regions.

Includes *Engystomidæ*, *Rhinodermatidæ*, *Brachymeridæ*, and *Hylædactylidæ* of Dr. Günther, Cat. of Bat. Salientia, Synopsis, pp. 8 & 9.

Subfam 1. Engystomina.

Coracoidei abutting; no precoracoids; no arciform cartilages. *Engystomidæ* of Cope, *l. c.* pp. 190 & 191.

Genera:—*Engystoma*, Neotropical region; *Diplopelma*, Indian region; *Cacopus* (*Systoma*), Indian; *Glyphoglossus*, Indian; *Callula*, Indian; *Brachymerus*, Ethiopian; *Adenomera*, Neotropical; *Pachybatrachus* (?), Australia.

Subfam. 2. Brevicipitina.

Coracoidei abutting; precoracoids present; no arciform cartilages.

Genera:—*Breviceps*, Ethiopian region; *Chelydobatrachus*, Australian; *Hypopachus*, Neotropical; *Rhinoderma*, Neotropical; *Atelopus*, Neotropical; *Copea*, Neotropical.

Subfam. 3. Paludicolina.

Coracoids and precoracoids present; also arciform cartilages.
Genus *Paludicola*, Neotropical region.

Section B. *With maxillary teeth at some time of life, and with a tongue.*

Division I. *Ear imperfect.*

Fam. VII. Bombinatoridæ (Günther).

Tympanum and cavum tyampani present or absent; eustachian tubes always absent, or reduced to a minute foramen with an absent tympanum (*Cacotus*); transverse processes of sacral vertebra almost always dilated; no parotoid glands; tongue fixed in front; toes free or webbed; no digital disks; arciform cartilages present.
Palæarctic and Neotropical regions, and New Zealand.

Subfam. 1. Bombinatorina.

No tympanum; no cavum tympani; eustachian tubes rudimentary, minute, or wanting; tongue entirely adherent; fingers free; toes webbed; vomerine teeth; vertebræ opisthocœlian; ribs present; a fronto-parietal fontanelle; prefrontals in contact anteriorly; one coccygeal cotylus.
Genus *Bombinator*, Palæarctic region.

Subfam. 2. Pelobatina.

No tympanum; no cavum tympani; eustachian tubes, if present, very narrow; tongue free behind (*Didocus*?), nearly entire; vertebræ procœlian; no ribs; vomerine teeth; "coccygeal style without condyloid articulation, its axial portion restricting that of the sacrum and connate with it."
Genera:—*Pelobates*, Europe; *Didocus*, Europe.

Subfam. 3. Alsodina.

No tympanum, cavum tympani, or eustachian tubes (*Telmatobius*?); toes webbed; sacral vertebra not, or scarcely dilated; vertebræ procœlian; no ribs; coccyx attached by two condyles; vomerine teeth present or absent.
Genera:—*Alsodes*, Neotropia; *Telmatobius*, Neotropia.

Subfam. 4. Cacotina.

Tympanum absent, but minute eustachian tubes; sacral vertebra not dilated; toes quite free; vomerine teeth.
Genus *Cacotus*, Günther, P. Z. S. 1868, p. 482, Neotropia.

When reading his paper before the Zoological Society, Dr. Günther called attention to the interesting and highly remarkable parallelism between this genus of South America and the European *Bombinator*.

Subfam. 5. LIOPELMATINA.

Tympanum none (or hidden); no eustachian tubes; sacral vertebra dilated; no vomerine teeth; toes webbed at the base.

Genus *Liopelma*, Fitz., and Günther, B. Mus. Cat. MS., New Zealand.

Divison II. *Ear perfect.*

Subsection *a*. *Parotoids.*

Fam. VIII. PLECTROMANTIDÆ.

A tympanum and cavum tympani; two eustachian tubes, each with a considerable aperture; transverse processes of sacral vertebra not dilated; parotoids present as a large oblong gland behind the mouth; tongue large, rounded and free behind; toes nearly all free, but with small disks; no disks to fingers. [Arciform cartilages present?]

Genus *Plectromantis*, Neotropical region.

Fam. IX. ALYTIDÆ.

Answers to the *Alytidæ* and *Uperoliidæ* of Dr. Günther.

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra dilated; parotoid glands present; tongue fixed in front; digits not dilated at the tips; arciform cartilages present.

Palæarctic, Nearctic, and Neotropical regions.

Subfam. 1. ALYTINA.

Vertebræ opisthocœlian; ribs present; "first coccygeal vertebra united as usual with the second or style, but furnished with posteriorly divergent diapophyses, and attached to the sacral by two cotyloid cavities; a fronto-parietal fontanelle; terminal phalanges continuous, simple."

Genus *Alytes*, Palæarctic region.

Subfam. 2. SCAPHIOPODINA.

Vertebræ procœlian; no ribs; no coccygeal diapophyses; coccyx connate with sacrum; terminal phalanges continuous, conic.

Genus *Scaphiopus*, North America.

Subfam. 3. UPEROLIINA (*Uperoliidæ*, Günther).

Vertebræ procœlian; no ribs; coccyx separate, attached to two condyles, with no diapophyses; terminal phalanges simple.

Genera:—*Hyperolius*, Neotropical region; *Helioporus*, Neotropical; *Nattereria*, Neotropical.

Fam. X. Pelodryadidæ (Günther).

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra dilated; parotoid glands present; tongue fixed in front; digits dilated at the tips.

Genera:—*Phyllomedusa*, Neotropical region; *Pelodryas*, Australian; *Chirodryas*, Australian.

Subsection β. *No parotoids.*

Fam. XI. Hylidæ (Günther).

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra dilated; no parotoid glands; tongue fixed in front; digits dilated into disks at the tips; arciform cartilages present; coccyx articulated by two condyles; "fronto-parietals shortened anteriorly, usually embracing a fontanelle; terminal phalanges articulated inferiorly on to the extremity of the penultimate, globular or swollen proximally, and giving rise to the curved acute distal portion."

Genera:—*Hyla*, Cosmopolitan, except Indian and Ethiopian regions; *Hylella*, Neotropical; *Ololygon* (*Thoropa*), Neotropical; *Pseudacris* (*Chorophilus*), North American; *Pohlia*, Neotropical; *Litoria*, Australian; *Triprion*, Neotropical; *Opisthodelphys*, Neotropical; *Trachycephalus*, Neotropical; *Nototrema*, Neotropical.

Fam. XII. Polypedatidæ (Günther).

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra not dilated; no parotoid glands; tongue fixed in front; arciform cartilages present or absent; digits dilated at the tips.

Answers to the *Polypedatidæ* and *Hylodidæ* of Dr. Günther.

Cosmopolitan, except Palæarctic region.

Subfam. 1. Polypedatina.

Coracoids and precoracoids, but no arciform cartilages; simple coccyx attached by two cotyloid cavities; manubrium bony. No fronto-parietal fontanelle; toes almost always more or less webbed.

Genera:—*Ixalus*, Indian and Ethiopian regions; *Megalixalus**, ——?; *Hylarana*, Indian and Ethiopian; *Leptomantis*†, Indian; *Hylambates*, Ethiopian; *Platymantis*, Indian and Polynesia; *Cornufer*, Indian and Australian; *Hemimantis*, Ethiopian; *Rhacophorus*, Indian; *Chiromantis*, Ethiopian; *Polypedates*, Indian and Ethiopian; *Theloderma*‡, Indian; *Rappia*, Indian and Australian regions and the Seychelles.

Subfam. 2. Acridina.

Arciform cartilages present; vertebræ procœlian; simple coccyx

* Skeletal characters unknown, but placed provisionally beside *Ixalus*.

† Placed here on the authority of Peters, who says it is so like *Ixalus*.

‡ Placed here on the authority of Cope.

with two condyles; terminal phalanges curved, sharp-pointed, swollen at the base, hyloid; ethmoid never covered by fronto-parietals.

Genera:—*Acris*, North America; *Leiyla*? (Keferstein), Costa Rica.

Subfam. 3. Hylodina.

Arciform cartilages present; vertebræ procœlian; coccyx separate, attached to two condyles; manubrium wanting, or cartilaginous; terminal phalanges with a transverse limb (*Strabomantis*?), not hyloid.

Genera:—*Elosia*, Neotropical region; *Epirhexis*, Neotropical; *Phyllobates*, Neotropical; *Hylodes*, Neotropical; *Cropodactylus*, Neotropical; *Strabomantis* (?), Neotropical.

Subfam. 4. Calostethina.

Precoracoids present, but no arciform cartilages; xiphisternum and manubrium wanting; terminal phalanges with transverse limb; no vomerine teeth.

Calostethidæ, Cope, Journ. Ac. Philad. 2nd ser. vol. vi. pt. 2.

Genus *Calostethus*, Neotropia.

Fam. XIII. Ranidæ.

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra not dilated; no parotoid glands; tongue fixed in front; arciform cartilages present or absent; digits not dilated at the tips.

Answers to the *Ranidæ* and *Cystignathidæ* of Dr. Günther.

Cosmopolitan.

Subfam. 1. Ranina.

No arciform cartilages; manubrium with a strong bony style; xiphisternum similar; no fronto-parietal fontanelle; no mandibular teeth.

Genera:—*Rana*, all regions except the Australian region; *Odontophrynus*, Neotropical; *Dicroglossus*, Indian; *Oxyglossus*, Indian; *Phrynobatrachus*, Ethiopian; *Hoplobatrachus*, Indian; *Phrynoglossus* (? skeletal characters unknown, but otherwise very like *Oxyglossus*); *Clinotarsus* (skeletal characters unknown), ——?

Subfam. 2. Cystignathina.

Arciform cartilages present; manubrium wanting or cartilaginous (except *Limnocharis*); a styloid osseous xiphisternum with a cartilaginous disk; sometimes a fronto-parietal fontanelle; no mandibular teeth.

Genera:—*Pseudis*, Neotropical region; *Pithecopsis*, Neotropical; *Mixophyes*, Australian; *Pyxicephalus*, Ethiopian and Indian; *Ceratophrys*, Neotropical; *Zachænus*, ——?; *Platyplectrum*, Australian; *Neobatrachus*, Australian; *Cyclorhamphus*, Neotropical; *Limnodynastes*, Australian; *Crinia*, Australian; *Eusophleus*, Neotropical; *Pleurodema*, Neotropical; *Leiuperus*, Neotropical; *Hylorhina*, Neo-

tropical; *Limnocharis*, ——?; *Cystignathus*, Neotropical and Ethiopian.

Subfam. 3. HEMIPHRACTINA.

Mandibular teeth.

Genus *Hemiphractus*, Neotropical.

Fam. XIV. DISCOGLOSSIDÆ (Günther).

A tympanum, cavum tympani, and eustachian tubes present; transverse processes of sacral vertebra dilated; no parotoid glands; tongue fixed in front; digits not dilated at the tips; arciform cartilages present or absent; bony manubrium present or absent; ribs present or absent; mandibular teeth present or absent.

Answers to both the *Discoglossidæ* and the *Asterophrydidæ* of Dr. Günther.

Cosmopolitan, except Nearctic and Ethiopian regions.

Subfam. 1. CHIROLEPTINA.

Vertebræ procœlian; no ribs; arciform cartilages present; manubrium wanting or cartilaginous; fronto-parietal bones complete, no fontanelle; xiphisternum a cartilaginous plate; no mandibular teeth.

Genera:—*Chiroleptes*, Australian region; *Zachænus* (?); *Calyptocephalus*, Neotropical.

Subfam. 2. ASTEROPHRYDINA.

Vertebræ opisthocœlian; no ribs; arciform cartilages present; no mandibular teeth.

Genera:—*Cryptotis*, Australian region; *Asterophrys*, Australian; *Xenophrys*, Indian; *Megalophrys*, Indian; *Nannophrys*, Indian.

Subfam. 3. PELODYTINA.

Vertebræ procœlian; no ribs; arciform cartilages present; no mandibular teeth.

Genera:—*Pelodytes*, Palæarctic region; *Leptobrachium*, Indian region.

Subfam. 4. DISCOGLOSSINA.

Vertebræ opisthocœlian; short ribs present; arciform cartilages present; no mandibular teeth.

Genera:—*Discoglossus*, Palæarctic region; *Zaphrissa*, Palæarctic; *Latonia*, Palæarctic.

Subfam. 5. ARTHROLEPTINA.

No arciform cartilages; no ribs; precoracoids present; no mandibular teeth; manubrium and xiphisternum bony; no fontanelle.

Genus *Arthroleptis*, Ethiopian region.

Subfam. 6. GRYPISCINA.

iform cartilages present; no ribs (?); mandibular teeth ped.

Cope, Journ. Ac. Philad. 1867, vol. vi. pt. 2, p. 205.

Genus *Grypiscus*, Neotropia.

Section C. *No tongue; maxillary teeth present or absent.*

Division I. *No maxillary teeth.*

Fam. XV. PIPIDÆ.

A tympanum and an entirely bony cavum tympani; eustachian tubes united, with a single oral opening; transverse processes of sacral vertebra dilated; no parotoids; no tongue; atlas and second vertebra confluent; vast cartilaginous xiphoid and great arciform cartilages.

Genus *Pipa*, Neotropical region.

Division II. *Maxillary teeth.*

Fam. XVI. DACTYLETHRIDÆ.

A tympanum and an entirely bony cavum tympani; eustachian tubes united, with a single oral opening; transverse processes of sacral vertebra dilated; no parotoids; no tongue; atlas and second vertebra distinct; coccyx and sacrum confluent; moderate cartilaginous xiphoid, and no arciform cartilages; yet coracoid and precoracoid very widely diverging.

Genus *Dactylethra*, Ethiopian region.

2. Description of a New Genus and Species of the Family *Trochilidæ*. By JOHN GOULD, F.R.S. &c.

Genus OREONYMPHA.

Gen. Char.—Bill longer than the head, stout, and with a somewhat downward curvature; wings large and sickle-shaped; tail ample and forked; tarsi clothed nearly to the toes, which are of moderate size; the hinder toe and nail rather shorter than the middle toe and nail.

Notwithstanding the length and stoutness of the bill, I consider this form to be nearly allied both to *Oxypogon* and *Ramphomicron*. It has the same kind of brilliant gular streak, a similar laxity of plumage, and soft flexible tail-feathers.

OREONYMPHA NOBILIS.

Bill and legs black; crown blue, with a streak of black down the centre; on the throat a lengthened streak of brilliant feathers, of which those nearest the bill are green, those which succeed are red-

dish purple, and those at the tip purplish blue, the whole being bordered on each side with black; sides of the neck and chest greyish white; abdomen, flanks, and under tail-coverts mottled white, grey, and light brown; back of the neck and upper surface bronzy brown; wings ourplish brown; outer tail-feather on each side white, with a longitudinal streak of bronzy brown at the tip of the inner web; the next on each side the same, but the bronzy mark of greater extent; the central feathers entirely bronze, as in *Oxypogon*.

Total length 6 inches, bill $1\frac{1}{8}$, wing $3\frac{1}{4}$, tail 3, tarsi $\frac{1}{4}$.

Remark.—This remarkably large and handsome species was discovered by Mr. H. Whitely at Tinta in Peru, at an elevation of 11,500 feet.

3. On the Fishes of Orissa.

By Surgeon F. Day, F.Z.S., F.L.S.—Part I.

Having during the last few months been employed in conducting an inquiry into the present state of some of the freshwater fisheries on the eastern coast of India, I propose in the following paper giving a list of such species of fishes as I obtained in the province of Orissa. This portion of Bengal is comprised in one Commissionership, commencing in the south at the Chilka lake, and terminating at Jellasore in the north. I have also included a few species from the Cossye at Midnapore.

My investigations occupied December 1868 and the following month, and were instituted into the condition of every river which empties itself into the sea, also into the condition of many tanks, and the fisheries at the mouth of the Balasore river. Although I was not so fortunate as to obtain many species new to science, I was much gratified in procuring several of Hamilton Buchanan's and M'Clelland's fish whose existence has been doubted, or which have been referred to different species or genera or even renamed.

Before commencing the list I may remark upon the interesting fact that at last I have been a witness to fish being exhumed alive from beneath the mud of an Indian tank. On January 18, I was out fishing a tank, when I mentioned to an intelligent native official my wish to see fish exhumed from the mud of tanks. He remarked that the *Labyrinthici*, *Ophiocephalidæ*, and *Rhynchobdellidæ*, besides the *Saccobranchus* and *Clarias*, invariably retire into the mud of tanks when the water dries up, but denied that the Carps ever did so. Pointing to a neighbouring tank which was almost dry, he observed that we could at once make the examination. I promised a reward to whoever would let me see him exhume fish, and we adjourned to the spot.

The tank was about one acre in extent, and had not above 4 inches depth of water at its centre, whilst its circumference was sufficiently dried up to walk upon. The soil was a thick, consistent, bluish clay, and I refused to allow any one to go nearer the water than 30 paces. Six coolies set to work, and in less than five minutes

extracted from at least 2 feet below the surface of the mud, two specimens of the *Ophiocephalus punctatus*, Bloch, and three of the *Rhynchobdella aculeata*, Willughby. All of these fish were very lively, and not in the slightest degree torpid. They were covered over with a thickish adherent slime; and on dissecting them at a subsequent date, none contained ova. The natives stated that if I returned in about a month, by which time they expected the ground would be hard and caked, they were confident that we should still find fish below the surface.

1. LATES CALCARIFER, Bloch.

Bekkut (Ooriah).

This marine Perch ascends the rivers far beyond the influence of the tides, following those species which migrate to the fresh waters for the purpose of depositing their ova. In the Mahanuddi it is frequently taken at Benki, about 76 miles from the sea.

2. MESOPRION CHIRTAH, Cuv. & Val.

Soosta (Ooriah).

B. viii. D. $\frac{11}{14}$. P. 19. V. $\frac{1}{5}$. A. $\frac{3}{9}$. C. 17. L. l. 54. L. tr. $\frac{14}{25}$. Cæc. pyl. 6.

The form I obtained was the young *M. annularis*, C. & V., at Chanderpore, near the mouth of the Balasore river, where I examined the stake-nets on three different days during the spring tides, and obtained several species of fish and two sorts of sea-snakes, one of the latter of which bit my left heel whilst wading in the sea amongst the fishing-nets. I procured specimens, and I find it to be the *Enhydrina bengaliensis*, Gray. As the fangs drew blood, I am inclined to think that perhaps the reptile had discharged his venom on some fish previously to trying his teeth on my heel. I may mention that I found alive on the shore at the same place a very fine specimen of that handsome Sea-snake the *Pelamis bicolor*, Schneider.

3. MESOPRION SILLAOO, Cuv. & Val.

Purruwa (Ooriah).

B. vii. D. $\frac{10}{15}$. P. 17. V. $\frac{1}{5}$. A. $\frac{3}{8}$. C. 17. L. l. 50. L. tr. $\frac{7}{12}$.

Some fine specimens of this fish were taken in the sea at Chanderpore; I likewise saw many which had been dried in the sun.

4. AMBASSIS ALTA, Cuv. & Val.

Chandee (Ooriah).

B. vi. D. $7\left|\frac{1}{12\text{-}15}\right.$. P. 11. V. $\frac{1}{5}$. A. $\frac{3}{13\text{-}15}$. C. 17. L. l. 58.

Several spines about the head; six directed backwards on the preorbital; one moderately strong one is placed on the centre of the anterior margin of the orbit, and five more along its lower edge. On the centre of the posterior margin of the orbit is a similar spine, with

five more, decreasing in size, along its superior half. The horizontal limb of the præoperculum with a double denticulated margin.

Hab. Rivers and tanks of Orissa.

5. AMBASSIS PHULA, H. Buchanan.

Goa chuppi (Ooriah).

B. vi. D. 7|$\frac{1}{14}$. P. 11. V. $\frac{1}{5}$. A. $\frac{3}{14}$. C. 19.

Lower jaw much the longest. Three denticulations along the anterior edge of the orbit. Vertical limb of præoperculum with two or three small denticulations at its angle in the young, which become blunted by age; its horizontal limb with a double denticulated margin, which also becomes blunter in the adult. Other opercles entire. A large canine tooth on either side of symphysis of lower jaw.

Scales very minute.

Lateral line at first curves upwards, and becomes horizontal under the second dorsal fin.

Hab. Tanks in Orissa.

6. AMBASSIS DUSSUMIERI, Cuv. & Val.

Chandee (Ooriah).

B. vi. D. 7|$\frac{1}{9-10}$. P. 15. V. $\frac{1}{5}$. A. $\frac{3}{9-10}$. C. 17. L. l. 27. L. tr. $\frac{3}{6}$.

Lateral line interrupted.

Hab. Mostly in rivers even within the influence of the tides, but is also found in tanks.

7. AMBASSIS NAMA, H. Buch.

Carteana (Ooriah).

B. vi. D. 7|$\frac{1}{14}$. P. 11. V. $\frac{1}{5}$. A. $\frac{3}{14}$. C. 17.

Lower jaw much the longest. One denticulation at centre of the anterior margin of the orbit, and another at its posterior superior angle. Præorbital with three strong denticulations along its margin. Vertical limb of præoperculum entire, but two or three denticulations at its angle becoming blunter with age; its horizontal limb has its double edge scarcely denticulated. Canine teeth in lower jaw.

Lateral line entirely absent.

Hab. Tanks.

8. AMBASSIS LALA, H. Buch.

Laal chandee (Ooriah).

B. vi. D. 7|$\frac{1}{11}$. P. 11. V. $\frac{1}{5}$. A. $\frac{3}{14}$. C. 17.

Length of head a little above $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of caudal $\frac{2}{7}$ of the total length. Height of head $\frac{1}{3}$, of body $\frac{1}{4}$ of the total length.

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

Præorbital strongly serrated; horizontal limb of præoperculum with a double denticulated margin. No denticulations around the orbit.

Scales minute.

Lateral line entirely absent.

Colours as described by Buchanan. The term *lala* is evidently derived from "*laal*," "red," the predominant colour.

Hab. Tanks in northern Orissa, where it grows to $1\frac{1}{2}$ inch in length.

9. THERAPON TRIVITTATUS, H. Buch.

Gahnu (Ooriah).

These fish are frequently taken inside large medusæ.

Hab. Seas and estuaries in salt or brackish water.

10. LOBOTES SURINAMENSIS, Bloch.

Chota bekkut (Ooriah).

Not uncommon at Chanderpore in the sea.

11. SILLAGO SIHAMA, Forsk.

Curama (Ooriah).

B. vi. D. 10–11 | $\frac{1}{20-22}$. P. 16. V. $\frac{1}{5}$. A. $\frac{1}{22-23}$. C. 17. L. l. 74. Cæc. pyl. 4. Vert. $\frac{19}{15}$.

No elongated spine in dorsal fin. Teeth villiform.

This species about Coconada begins to give place to the next, which is most numerous in the sea at Orissa.

12. SILLAGO DOMINA.

Gudji curama (Ooriah).

B. vi. D. 9 | $\frac{1}{25}$. P. 21. V. $\frac{1}{5}$. A. $\frac{1}{26}$. C. 19. L. l. 90. Cæc. pyl. 4.

An elongated spine in the first dorsal fin.

Teeth. An external conical row in both jaws, with the four largest in the centre of the upper jaw, and several villiform rows posterior to them. A transverse semicircular band of villiform teeth in the palate.

13. MUGIL CORSULA, H. Buch.

Kakunda (Ooriah).

B. iv. D. 4 | $\frac{1}{8}$. P. 13. V. $\frac{1}{5}$. A. $\frac{3}{9}$. C. 13. L. l. 50. L. tr. 15.

The eyes of this species of Mullet are considerably elevated, their superior margin being above the level of the upper profile of the head.

This fish is very abundant in the rivers of Orissa, ascending far beyond tidal influence. I took considerable numbers above Cuttack, or 60 miles from the mouth of the river. It grows to a foot in length, and is excellent eating.

It swims with its snout on a level with the water, so that its eyes are above it; immediately it perceives any one approaching it rapidly darts down out of sight.

14. MUGIL AXILLARIS, Cuv. & Val.

Magi (Ooriah).

B. v. D. 4 | $\frac{1}{8}$. P. 15. V. $\frac{1}{5}$. A. $\frac{3}{8-9}$. C. 14. L. l. 42. L. tr. 14.

Hab. The sea and brackish waters, along with the *M. parsia*.

15. MUGIL PARSIA, H. Buch.

B. vi. D. 4 | $\frac{1}{8}$. P. 14. V. $\frac{1}{5}$. A. $\frac{3}{8-9}$. C. 14. L. l. 35. L. tr. 12.

I took this species in brackish water within tidal influence, but not in the sea.

It grows to 8 inches in length.

16. MUGIL BORNEENSIS, Bleeker.

B. vi. D. 4 | $\frac{1}{8}$. P. 15. V. $\frac{1}{5}$. A. $\frac{3}{9}$. C. 14. L. l. 34. L. tr. 13.

One specimen from Chanderpore in the sea.

17. SCATOPHAGUS ARGUS, Linn.

Found in the sea at Chanderpore, and also ascending the mouth of the river. Is not used as food.

18. CORVINA MILES, Cuv. & Val.

Hab. Chanderpore, in the sea.

I may here mention that I have satisfied myself that the species I named *C. neilli* in my 'Fishes of Malabar,' p. 55, is the *C. albida*, Cuv. & Val. I took specimens at Pondicherry and Madras. The rays &c. were

B. vii. D. 9 | $\frac{1}{24-25}$. A. $\frac{2}{7}$. L. l. 53. L. tr. 24.

Dr. Günther gives them as follows from the British Museum specimens:— D. 10 | $\frac{1}{24}$. A. $\frac{2}{7}$. L. l. 75. L. tr. 7/19.

19. CORVINA COTTOR, H. Buch.

Botahl, Putteriki (Ooriah).

This species ascends rivers to far beyond tidal influence for breeding-purposes. I took it above Cuttack.

20. OTOLITHUS MACULATUS, Cuv. & Val.

Birralli (Ooriah).

B. vii. D. 10 | $\frac{1}{30}$. P. 19. V. $\frac{1}{5}$. A. $\frac{2}{11}$. C. 19.

This fish, hitherto recorded from Malaysia, is very common in the sea at Chanderpore, where specimens were taken up to 13 inches in length.

21. Bola pama, H. Buch.

Botul (Ooriah).

B. vii. D. 10 | $\frac{1}{40-43}$. V. $\frac{1}{5}$. A. $\frac{2}{7}$. C. 17. L. l. 70-80. L. tr. $\frac{9}{25}$. Vert. 24. Cæc. pyl. 9.

It ascends rivers for breeding-purposes as far as does the *Corvina coitor*. It grows to 5 feet in length; and if cooked directly it is taken from the water, it is fair eating.

22. Polynemus paradiseus, Linn.

Tupsi (Ooriah).

B. vii. D. 7 | $\frac{1}{15}$. P. 15/vii. V. $\frac{1}{6}$. A. $\frac{2}{12}$. C. 19. L. l. 70. L. tr. $\frac{5}{14}$. Cæc. pyl. 5.

Common in the sea at Chanderpore. I found only five cæcal appendages, and not ten, which is said to be the normal number.

23. Polynemus sextarius, Bloch.

B. vii. D. 8 | $\frac{1}{12-13}$. P. 15/vi. V. $\frac{1}{5}$. A. $\frac{3}{12}$. C. 17. L. l. 48. L. tr. $\frac{5}{10}$.

Grows to 7 inches in length. Common in the sea at Chanderpore.

24. Polynemus indicus, Shaw

B. vii. D. 8 | $\frac{1}{13-14}$. P. 20/v. V. $\frac{1}{5}$. A. $\frac{2-3}{11-12}$. C. 17. L. l. 62-65. L. tr. $\frac{7}{13}$. Vert. $\frac{5}{19}$.

One 30 lbs. weight taken at Chanderpore in the sea.

25. Trichiurus savala, Cuv. & Val.

Droga puttiah (Ooriah).

Hab. Chanderpore, in the sea.

26. Scomber kanagurta, Cuv. & Val.

B. vi. D. 8–9 | $\frac{1}{11}$ | v. P. 21. V. $\frac{1}{5}$. A. $\frac{1}{11}$ | v.–vii. C. 25. Vert. $\frac{13}{16}$.

No præanal spines.

Hab. Chanderpore in the sea.

27. Cybium guttatum, Bloch.

Very common at Chanderpore.

Hab. Chanderpore, in the sea.

28. Stromateus argenteus, Bloch.

Hab. Chanderpore, in the sea.

29. Stromateus cinereus, Bloch.

Hab. Chanderpore, in the sea.

30. STROMATEUS NIGER, Bloch.

Baal (Ooriah).

Hab. Chanderpore, in the sea.

31. CARANX ARMATUS, Forsk.

Hab. Chanderpore, in the sea.

32. CHORINEMUS LYSAN, Forsk.

One large specimen taken at Chanderpore, in the sea.

33. EQUULA RUCONIUS, H. Buch.

? *Equula splendens*, Cuv. & Val.

Tunker chandee (Ooriah).

B. v. D. $\frac{8}{16-17}$. P. 21. V. $\frac{1}{5}$. A. $\frac{3}{14}$. C. 19. L. l. 68.

This species Dr. Günther has considered to be the same as the *E. interrupta*, Cuv. & Val., of which he observes, "No spines above the orbit; the cavity on the head is triangular, and twice and a half as long as broad. The lower præopercular margin is minutely serrated."

The following is a description of Hamilton Buchanan's fish, which I found common in the rivers of Orissa, far beyond tidal influence:—

Length of head $\frac{1}{4}$, of pectoral fin above $\frac{1}{5}$, of base of first dorsal $\frac{1}{8}$, of base of second dorsal $\frac{1}{3}$, of base of anal $\frac{1}{3}$ of the total length. Height of head $\frac{1}{3}$, of body $\frac{1}{2}$, of first dorsal $\frac{1}{6}$, of second dorsal $\frac{1}{16}$, of ventral $\frac{1}{10}$, of anal $\frac{1}{6}$ of the total length.

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

Dorsal profile rises rather abruptly to opposite the anterior third of the orbit, and the occipital process ascends very abruptly, as shown in Hamilton Buchanan's figure.

Lower jaw inferiorly concave. Lips fleshy. Cavity on head lanceolate, half as wide as long. Lower margin of præoperculum with a strongly serrated edge. Two strong sharp spines, one over the anterior third of the orbit, the other above it and posterior to the nostril. The upper margin of the orbit serrated in the whole of its posterior two-thirds.

Fins. Dorsal spines strong, the second being one-third as high as the body, and slightly longer but not so strong as the second anal spine. Third anal spine serrated on the lower half of its anterior margin. Caudal forked, lower lobe slightly the longest.

Scales minute, but firmly adherent to the fish.

Lateral line in 68 fine tubes, and distinct from the scales. It first ascends slightly, and opposite to the end of the second dorsal it proceeds horizontally.

Colours. Silvery, shot with purple, and having dusky greyish bands descending from the back to the middle of the body. Snout covered with black spots. Fins yellowish. Eyes with a dark superior edging. A silver stripe is sometimes apparent along the side of the body.

34. GOBIUS GIURIS, H. Buch.

Gulah, Bali gulah (Ooriah).

Hab. Tanks and rivers throughout Orissa.

35. APOCRYPTES LANCEOLATUS, Bloch.

Pittalu (Ooriah).

This fish resides in fresh or brackish water, but not beyond tidal influence so far as I have observed; the best place to capture it is the mud at the sides of rivers. Considering its size, this is a most savage species, biting at any other fish that comes near it, and holding on with its teeth most tenaciously.

36. APOCRYPTES BATO, H. Buch.

Rutta (Ooriah).

This fish inhabits the same localities as the last. The largest specimen captured was 5½ inches in length. Natives take them in the following manner: they walk about in the mud, and as soon as they see or feel a fish moving they seize it with both hands.

37. EUCTENOGOBIUS STRIATUS, Day.

Makturi, Naolli (young, Ooriah).

The very young have black vertical bands, most apparent in the posterior half of the body. The first dorsal is occasionally stained orange.

Hab. Found in the rivers of Orissa.

38. BOLEOPHTHALMUS BODDAERTII, Pall.

Apocryptes punctatus, Day, P. Z. S. 1867, p. 941.

This fish climbs up rocks and on to pieces of wood, and appears to mostly inhabit muddy estuaries. It may be seen bobbing about in the soft mud or dirty water as the *Mugil corsula* does in rivers. In deep water it becomes drowned. It is as savage as the *Apocryptes lanceolatus*.

39. ELEOTRIS FUSCA, Bloch.

Bundi, balah kera (Ooriah).

Hab. Fresh and brackish waters along the coast, also extending its range beyond tidal influence.

40. ELEOTRIS AMBOINENSIS?, Bleeker.

Gagi balah kera (Ooriah).

B. iv. D. 6 | $\frac{1}{8}$. P. 17. V. $\frac{1}{5}$. A. $\frac{1}{8}$. C. 13. L. l. 28. L. tr. 15.

Length of head $\frac{1}{3}$, of pectoral $\frac{1}{5}$, of base of first dorsal $\frac{1}{5}$, of base of second dorsal $\frac{1}{8}$, of base of anal $\frac{1}{8}$, of caudal $\frac{1}{6}$ of the total length. Height of head $\frac{1}{4}$, of body $\frac{1}{5}$, of first dorsal $\frac{1}{8}$, of ventral $\frac{1}{8}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Diameter $\frac{2}{9}$ of length of head, 1¼ diameter from end of snout, 1¼ diameter apart.

Head broad, depressed; snout produced. The greatest width is opposite the opercles. There is a considerable rise from the snout to the base of the first dorsal.

Lower jaw the longest. The maxilla extends posteriorly to beneath the centre of the orbit. A finely serrated ridge along the superior and posterior edges of the orbit, from which in the adult it is divided by one or two rows of scales. This serrated ridge is continued towards the snout, dividing opposite the nostrils and enclosing an irregular lanceolate space which extends close to the margin of the upper lip.

Teeth in numerous fine villiform bands, those on the outer row being slightly enlarged.

Fins. Base of pectoral rather muscular, the fin wedge-shaped, rays not silk-like. Caudal cut square.

Scales ctenoid, but cycloid on the chest; they extend as far forward as the snout.

Colours. Of a blackish stone. Fins black, second dorsal and caudal edged with white. Pectoral also white, with the exception of two black blotches at its base.

Specimens were captured up to 2½ inches in length in the Balasore river. It is said never to be found in salt water.

This species may be the same as Dr. Bleeker's fish from Amboina. Still in this Indian specimen there are serrated ridges extending along the summit of the head and on to the snout, whilst the pectoral rays are not silk-like.

41. AMBLYOPUS CÆCULUS, Bloch.

This species ascends rivers as far as tidal influence extends, even into fresh water. It is found in the same situations as the *Apocryptes*, and captured in the same way.

42. BADIS BUCHANANI, Cuv. & Val.

Boondei, kahli bundahni (Ooriah).

B. vi. D. $\frac{16-17}{8-9}$. P. 12. V. $\frac{1}{5}$. A. $\frac{3}{6-7}$. C. 16. L. l. 26–28. L. tr. $\frac{3}{8}$. Cæc. pyl. 0.

Air-bladder large and simple.

Hab. Common in tanks in Orissa, up to 3 inches in length.

43. NANDUS MARMORATUS, Cuv. & Val.

Bodosi, Gossiporah (Ooriah).

Hab. Rivers and tanks.

44. ANABAS SCANDENS, Dald.

Corvu (Ooriah).

In Madras the species of *Anabas* has no cæcal pylori, and its body is banded.

At Tranquebar and Pondicherry, to the south of Madras, and

Ganjam and Orissa to the north, every specimen dissected had three cæcal pylori, as stated by Cuvier. Placing the two varieties together, there does not appear to be any difference apparent externally, except in the coloration.

In the Ganjam district one was captured of a deep orange-colour, it appeared to be quite healthy, and the fishermen asserted that this change in colour is not uncommon.

45. TRICHOGASTER FASCIATUS, Bloch.

Kussuah (Ooriah).

Hab. Common in tanks.

46. OPHIOCEPHALUS MARULIUS, H. Buch.

Saal (Ooriah).

The coloration of these fish widely differs from the Madras specimens, and the ocellated blotch on the caudal was as distinct in a specimen 16 inches long as in the young.

47. OPHIOCEPHALUS STRIATUS, Bloch.

Sola (Ooriah).

Hab. Common in tanks and canals.

48. OPHIOCEPHALUS GACHUA, H. Buch.

Cheyung (Ooriah).

Hab. Found in tanks, canals, and sluggish rivers.

49. OPHIOCEPHALUS PUNCTATUS, Bloch.

Cartua gorai (Ooriah).

Hab. Found in tanks, canals, and sluggish rivers.

50. RHYNCHOBDELLA ACULEATA, Bloch.

Gutti (Ooriah).

Hab. Rivers and tanks.

51. MASTACEMBLUS PANCALUS.

Turi, Bahru (Ooriah).

Hab. Rivers and tanks.

52. MASTACEMBLUS ARMATUS, Lacép.

Barm, Bummi (Ooriah).

Hab. Rivers and tanks.

53. ETROPLUS SURATENSIS, Bloch.

Cundahla (Ooriah).

Hab. Found in tanks in the southern portion of Orissa near the sea-coast.

54. CLARIAS MAGUR, H. Buch.

Magur (Ooriah).

Hab. Tanks.

55. SACCOBRANCHUS SINGIO, H. Buch.

Singi (Ooriah).

Hab. Tanks.

56. WALLAGO ATTU, Bloch.

Boalli, Ballia, Moinsia ballia (Ooriah).

Hab. Rivers and tanks.

57. CALLICHROUS CHECKRA, H. Buch.

Pobtah (Ooriah). "Butterfish" of Europeans.

Hab. Rivers and tanks.

58. EUTROPIICHTHYS VACHA, H. Buch.

B. xi. D. $\frac{1}{7}|0$. P. $\frac{1}{14}$. V. 6. A. $\frac{3}{40-47}$. C. 17.

Butchria (Ooriah).

Cleft of mouth extending in the adult to behind and beneath the posterior extremity of the orbit.

Teeth. Villiform teeth in a triangular spot on the vomer, and in a long pyriform shape on the palate; the whole of these with those on the upper jaw are so closely set together that it may give the appearance on a superficial examination that there are "no teeth on the palate," as remarked by Dr. Günther.

59. PSEUDEUTROPIUS ATHERINOIDES, Bloch.

Battuli, Jemmi carri, Bipotasse (Ooriah).

Hab. Rivers and tanks.

60. PSEUDEUTROPIUS MURIUS, H. Buch.

Eutropius? murino, Günth. Cat. v. p. 54.

Motusi (Bengali).

D. $\frac{1}{7}|0$. - P. $\frac{1}{11}$. V. 6. A. $\frac{4}{35}$. C. 17.

Snout rounded, upper jaw overhanging the lower to a slight extent. The angle of the mouth is under and close to the anterior third of the orbit. Nasal cirrus extends from between the two nostrils to opposite the posterior margin of the orbit. Maxillary cirrus arises opposite the centre of the anterior margin of the orbit, and extends to the base of the pectoral fin. The four mandibular cirri arise on a transverse line just behind the lower lip, and extend to slightly behind the vertical from the posterior margin of the orbit. Eyes lateral.

Out of sixteen specimens, the largest was 6 inches; it, however, was said to grow to a greater size. Those I obtained were from the Cossye at Midnapore.

61. PSEUDEUTROPIUS GARUA, H. Buch.

Punia buchua (Ooriah). *Pultosi* (Bengali).

B. vi. D. $\frac{1}{6}|0$. P. $\frac{1}{11}$. V. 6. A. $\frac{3-4}{26-30}$. C. 17.

This species forms the type of the genus *Schilbeichthys*, Bleeker, which differs from the *Pseudeutropius* chiefly in having no second or adipose dorsal fin.

I have taken a large number of the young of this species from 4 to 9 inches in length, and find that the adipose dorsal, though small, is distinct in the fry; but as the size of the specimens increases up to 6 or 7 inches it has either almost or entirely disappeared, and is invariably absent in the adult.

I therefore consider the species to be a *Pseudeutropius*; for the difference which exists in the nostrils between it and some others of the genus is insufficient for more than a specific division.

Hab. Rivers of Orissa and the Cossye at Midnapore.

62. AILIA BENGALIENSIS, Gray.

Puttuli, Bounce puttri (Ooriah).

Hab. Rivers and tanks.

63. PANGASIUS BUCHANANI, Cuv. & Val.

Hab. Ascends rivers far beyond tidal influence.

64. SILUNDIA GANGETICA, Cuv. & Val.

Jillung, Sillund (Ooriah).

Hab. Taken in the same places as the last.

65. MACRONES CAVASIUS, H. Buch.

Guntea, Cuntea (Ooriah).

Hab. Rivers and tanks.

66. MACRONES AOR, H. Buch.

Alli, Arriah alli; if young, *Gugah alli* (Ooriah).

Hab. Rivers and tanks.

67. MACRONES TENGARA, H. Buch.

Bikuntia (Ooriah).

Hab. Rivers and tanks.

68. MACRONES CORSULA, H. Buch.

Punjah gagah (Ooriah).

B. x. D. $\frac{1}{7}|0$. P. $\frac{1}{9}$. V. 6. A. $\frac{3}{8}$. C. 17.

Hamilton Buchanan has given an engraving of this species; but the description was omitted from the 'Fishes of the Ganges.'

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{6}$, of base of first dorsal $\frac{1}{9}$, of base of adipose dorsal $\frac{1}{16}$, of base of anal $\frac{1}{11}$, of caudal $\frac{1}{6}$ of the total

length. Height of head $\frac{1}{3}$, of body $\frac{1}{3}$, of first dorsal $\frac{1}{3}$, of adipose dorsal $\frac{1}{10}$, of ventral $\frac{1}{3}$, of anal $\frac{1}{3}$ of the total length.

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

Mouth antero-inferior; upper jaw the longest, its posterior extremity does not reach so far as to below the centre of the orbit. Nasal cirri extend to opposite the middle of the orbit, maxillary cirri to the base of the anal fin, the external mandibular to the base of the pectoral, and the internal to opposite the posterior extremity of the præoperculum. The central longitudinal groove along the summit of the head reaches to the base of the occipital process, which latter is short its whole length, not being equal to one diameter of the orbit.

Fins. Dorsal spine slender and equals half the length of the head in extent; it is slightly serrated posteriorly in its upper fourth. Pectoral spine strong, flattened, rugose externally, and serrated in its whole extent internally; it is slightly longer than the dorsal spine. Caudal deeply forked, upper lobe the longest.

Lateral line ceases at the base of the caudal fin.

Colours. Greyish brown superiorly, dirty white inferiorly. Fins greyish, stained with black, several vertical rows of black spots along the anterior portion of the lateral line.

Three specimens obtained from the Mahanuddi river at Cuttack, the longest being 8 inches.

69. RITA KUTURNEE, Sykes.

Rita buchanani, Bleeker.

Mussayahri, cunta gagah (Ooriah).

Hab. Rivers of Orissa.

70. ARIUS THALASSINUS, Rüpp.

Cuntea (Ooriah).

At Chanderpore large numbers were taken in the sea; some were of a very large size. They are much esteemed by the natives as food.

71. HEMIPIMELODUS CENIA, H. Buch.

Jungla (Bengali).

This species appears to have been entirely overlooked in the 'Catalogue of Fishes.'

B. vi. D. $\frac{1}{6\text{-}7}|0$. P. $\frac{1}{7}$. V. 6. A. $\frac{3}{10}$. C. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{6}$, of base of first dorsal nearly $\frac{1}{8}$, of base of adipose dorsal $\frac{1}{10}$, of base of anal $\frac{1}{10}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{3}$, of body $\frac{1}{3}$, of first dorsal $\frac{1}{3}$, of ventral nearly $\frac{1}{3}$, of anal $\frac{1}{3}$ of the total length.

Eyes. High, covered by skin, diameter $\frac{1}{3}$ of length of head, 1 diameter from end of snout, 1 diameter apart.

Body fusiform, with compressed sides. A considerable rise from the snout to above the orbit. Snout overhanging the mouth, upper

jaw the longest, the angle of the mouth is situated about midway between the snout and the anterior margin of the orbit. Maxillary cirrus osseous in its basal half; it extends nearly to the base of the pectoral fin. The four mandibular cirri arise in a transverse line just behind the margin of the lower jaw; they only extend to opposite the middle of the orbit. The occipital process is one-third as wide at its base as it is long; it extends to the basal bone of the first dorsal fin. The superior longitudinal groove is wide, but rather shallow, becoming indistinct. For a short distance opposite the posterior margin of the orbit, its upper portion extends nearly to the base of the occipital process, which, as observed by Buchanan, may be regarded as a point from which seven bony ridges arise. The upper surface of the head granulated. Nostrils large and placed close together; no well-developed valve to the posterior one.

Teeth. Five in both jaws, none on the palate.

Fins. Dorsal spine strong, anteriorly rugose. Pectoral spine somewhat stronger and of the same length as the dorsal; it is serrated internally, rough externally. The ventrals arise posterior to the vertical from the last dorsal rays. Caudal deeply forked.

Lateral line ceases at the base of the caudal fin.

Colours. Yellowish bronze, becoming silvery on the abdomen; three dark bands over the head, and four more over the back, descending as low as the lateral line. A black edging to the caudal, and a black blotch on each lobe. A dark mark across the dorsal fin.

It grows to about 3 inches in length, and is abundant in the Cossye river at Midnapore.

72. BAGARIUS YARRELLII, Sykes.

Sahlun, Cart cuntea (Ooriah).

Hab. Rivers of Orissa.

73. GAGATA TYPUS, Bleeker.

Callomystax gagata, Günther.

This species was Dr. Bleeker's type of the genus *Gagata*, of which Dr. Günther remarks, "Dr. v. Bleeker does not appear to have been acquainted with this fish; so that not only the characters of the genus which he proposed for it are incorrect, but it is also improperly referred to the 'phalanx' of *Arii*, and to the 'stirps' of *Bagrini*." He therefore renamed the genus, taking the same species as his type!

The air-bladder is divided into two portions, and enclosed in a bony capsule formed from the bodies of the anterior vertebræ.

It grows to 1 foot in length, and is common in the rivers of Orissa.

74. BELONE CANCILA, H. Buch.

Gungituri (Ooriah).

Hab. Common in rivers and tanks.

75. HEMIRAMPHUS ECTUNTIO, H. Buch.

Gungituri (Ooriah).

D. $\frac{2}{12}$. P. 11. V. 6. A. $\frac{2}{13}$. C. 15. L. l. 52. L. tr. 7/4.

Length of head $\frac{1}{3}$, of pectoral $\frac{1}{10}$, of base of dorsal $\frac{1}{5}$, of base of anal $\frac{1}{10}$, of caudal $\frac{1}{7}$ of the total length. Height of head $\frac{1}{12}$, of body $\frac{1}{10}$, of dorsal $\frac{1}{15}$, of ventral $\frac{1}{20}$, of anal $\frac{1}{12}$ of the total length.

Eyes. From $1\frac{1}{2}$ to 2 diameters from the posterior extremity of the opercle, and 1 diameter apart.

Præorbital one-third longer than high. Upper jaw nearly triangular, its base slightly longer than its length; it is keeled along its central line.

Teeth in both jaws, also on palatines.

Fins. Dorsal commences somewhat in advance of the anal; the ventral nearly midway between the posterior margin of the orbit and the base of the caudal fin, which last is lobed, the lower being the longest.

Scales scarcely deciduous, covering the body, and existing between the orbits and over the præorbital; none on the bases of the fins.

Lateral line runs the lower fourth of the abdomen.

Colours. Greenish above, silvery below. A burnished silvery line extends from above the orbit to the centre of the caudal fin; it is widest over the anal, where it has a dark edge along its upper margin. Dorsal and caudal stained at their edges.

This fish is very numerous in the rivers of Orissa; it has, however, been placed amongst the "doubtful species" in the Catalogue of the British Museum.

76. HAPLOCHEILUS PANCHAX, H. Buch.

Kanakuri (Ooriah).

Hab. Tanks and rivers throughout Orissa.

77. HAPLOCHEILUS MELASTIGMA, M'Clelland.

Panchax cyanophthalmus, Blyth.

D. $\frac{3}{5}$. P. 11. V. 6. A. $\frac{2}{20}$. C. 13. L. l. 29. L. tr. 13.

Hab. This species is not uncommon in tanks in Orissa.

4. Descriptions of some new Suctorial Annelides in the Collection of the British Museum. By W. BAIRD, M.D., F.R.S., &c.

Genus BRANCHELLION, Savigny.

1. BRANCHELLION INTYBIFOLIUM, Baird.

Body elongate, very concave ventrally, convex dorsally, consisting of about 48 segments, which are transversely striated on the back. Neck distinct from the body, consisting of 10 or 12 short, narrow segments. Oral sucker small. Ventral sucker large, circularly

striated round the external margin, and studded with granules internally, at the bottom of the cup. Both suckers are plaited on the margins. Each segment from the commencement of the body to within four of the posterior sucker is furnished on each side with a large foliaceous appendage, which is sessile, simple on the margin, but puckered and sinuated like the leaf of the endive.

The only specimen the British Museum possesses is of a uniform very dark colour, the edges of the posterior sucker excepted, which are much lighter.

Length about 1½ inch, breadth (of body) 4 or 5 lines*.

The habitat is unknown. The specimen was added to the Museum collection by the late Mr. H. Cuming.

2. Branchellion linearе, Baird.

Body linear-elongate, flattened, distinctly annulated. Segments of body about 32, those of neck not so distinct as those on the body, and about 10 or 12 in number. The neck is separated from the body by a well-marked constriction, but is nearly equal in diameter to the body. The oral disk is circular and smooth, or only finely striated interiorly. The ventral is considerably larger, circular, and densely granulated within the cup. The disks are slightly excentral. Branchiform lateral appendages simple, not puckered on the margin.

Length about 6 lines, breadth about 1 line.

This species was taken from a species of *Mustelus* in King George's Sound, N. Australia, by Mr. Rayner, Surgeon to H.M.S. 'Herald.'

3. Branchellion punctatum, Baird.

Body narrow, elongate, nearly flat on both ventral and dorsal surfaces, distinctly annulated. Segments somewhat striated on their backs, those of the body about 32 in number. Neck indistinctly annulated. Ventral surface light-coloured; dorsal dark, with numerous small, round, yellow spots scattered over the surface. The oral sucker is much smaller than the ventral, the margin thickened, and the cup is minutely granulated interiorly. Ventral sucker large, quite terminal, shallow, and with larger granulations on its interior surface. Branchiform appendages larger on the posterior portion of the body, simple, not puckered on the margin.

Length of largest specimen nearly 1½ inch, breadth about 2 lines.

The only specimen we possess in the British Museum collection was taken from a species of *Myliobates* caught in King George's Sound, N. Australia, by Mr. Rayner, Surgeon of H.M.S. 'Herald.'

Genus Eubranchella, Baird.

Margins of body furnished with linear, pinnated, instead of broad, foliaceous, appendages, much more resembling true branchiæ than those in *Branchellion*. Neck separated from the body. Head small, leech-like.

* The species described in this paper are all preserved in spirits; and being more or less corrugated by the spirit, the dimensions are only approximative.

EUBRANCHELLA BRANCHIATA.

Hirudo branchiata, Menzies, Linn. Trans. i. 188, tab. xviii. fig. 3.
Polydora testudinum, Oken.
Branchellion pinnatum, Savigny, Grube.
Branchiobdella menziesi, De Blainville, Diesing.

This, as far as I am aware, is the only species of this genus known. Savigny was the first to recognize it as belonging to a different genus from *Branchellion*. Diesing and Moquin-Tandon appear to consider the species doubtful; but Mr. Rayner, Surgeon of H.M.S. 'Herald,' succeeded in taking it from a turtle in Sharks' Bay, Australia, eleven or twelve years ago. The animal is only half an inch long.

Genus PONTOBDELLA, Leach.

1. PONTOBDELLA AFRA, Baird.

Body cylindrical, ventricose in the middle, attenuated at each extremity, slightly posteriorly, but more so anteriorly. Segments encircled with a series of rather large warts, each wart being circular in form, rather flattened, and covered with a series of smaller warts or minute tubercles on its centre. The neck consists of 12 segments, every third one being the largest and warty, the intervening ones quite smooth, and is separated from the body by five narrow smooth segments. The acetabulum or ventral sucker is much larger than the head, which is very small in comparison and armed on its margin with six rather small nodules or conical tubercles, three on each side.

The postoccipital segment is armed with a row of similar small conical tubercles, differing from the warts on the body. The colour of this Leech is a dark olive, or of a blackish hue.

The worm is about 4½ inches long, and the largest portion of the body is about 2¼ inches in circumference.

The only specimen the Museum possesses is ticketed "San Vicente," and was presented to the collection by the Rev. R. T. Lowe, late of Madeira.

2. PONTOBDELLA PLANODISCUS, Baird.

Body much flattened, attenuated at the anterior extremity. Segments surrounded with a row of conical raised warts, each wart having two or three small nodules on the upper surface. The neck consists of 12 segments, all of which are warty, the warts, however, being much smaller than those of the body, from which it is separated by five warty rings. The acetabulum is considerably larger than the head, is quite plane, not hollowed at all, and rayed externally with numerous rather broad bands of brown. The head is small and puckered round the edges, and has six small conical papillæ on the margin, three on each side, not in a line with each other but set in a triangular manner, two on the same plane, the third, forming the apex of the triangle, at some little distance from the margin. The body is marked on the anterior portion and the neck

with rather narrow circular bands of dark brown on a yellowish ground.

We possess only one specimen of this species. It was collected in Possession Bay, Patagonia, by Dr. Cunningham, naturalist to the late Surveying Expedition to the Straits of Magellan.

Length of body about 2 inches, breadth (at broadest part) about 4 lines.

3. PONTOBDELLA VARIEGATA, Baird.

Body cylindrical, somewhat fusiform, much attenuated at the anterior extremity. Posterior extremity the larger in circumference, gradually tapering towards the head. Segments covered with smooth, conical, rounded warts, of nearly uniform size. The neck is composed of 10 or 11 segments, and is separated from the body by five narrower ones, all the segments being slightly warty. The acetabulum is considerably larger than the head, which is smooth on its margin, having no nodules round the rim. The body is marked with spots of a deeper brown colour on a yellowish ground, and the acetabulum is rayed with the same hue.

We possess two specimens,—one in very good preservation from the Straits of Magellan, presented by the Lords of the Admiralty; the other from Possession Bay, Patagonia, collected by Dr. Cunningham along with the preceding species.

One specimen (somewhat contracted) measures about $2\frac{1}{4}$ inches in length, the other (more relaxed) is nearly 3 inches long; circumference (at the broadest part) $1\frac{1}{4}$ inch.

4. PONTOBDELLA RAYNERI, Baird.

Body cylindrical, much attenuated at the anterior extremity. Segments surrounded with raised conical warts, each wart having several small warts on its summit. The neck is elongated, and surrounded, as is the body, with warts. It consists of 12 segments, and is almost continuous with the body, being slightly separated from it by five warty rings. The acetabulum is larger than the head, faintly rayed with brown, and somewhat puckered round the margin. The head is small, circular, and the margin has six small conical papillæ. On the side of the head are two well-marked brown spots, somewhat triangular in shape. The warts on the body are so arranged as to present one row of large ones, and two rows of smaller ones succeeding it; that is to say, every third row of warts is the largest.

When relaxed, the length is about 1 inch; when corrugated by the spirit it diminishes one-fourth.

Hab. Found on a species of *Rhinobatis* in Sharks' Bay, Australia. Collected by Mr. Rayner, Surgeon H.M.S. 'Herald.'

Genus AULASTOMA, Moquin-Tandon.

1. AULASTOMA PLANUM, Baird.

Body flattened, slightly convex dorsally, very flat ventrally, at-

tenuated anteriorly, broadest about the centre. Colour of a light olive, uniform underneath, but marked with irregular black spots on the back. Rings rather narrow, with an indistinct keel along both dorsal and ventral surfaces of each. Oral sucker rather small, ventral large. Anus large. Teeth on the jaw nearly black.

Length of body (in spirits) 3 inches, breadth (at broadest part) 9 lines.

Hab. Cuba? From the collection of the late Mr. John Christy, F.R.S. &c.

2. AULASTOMA EXIMIO-STRIATUM, Baird.

Body flattened, especially on the ventral surface, slightly attenuated at each extremity, but more so anteriorly; broadest about the centre. Back olive-coloured, speckled with black spots or marks scattered profusely over the surface; ventral surface of a uniform colour, lighter than the back. Rings very distinct, particularly well-marked at the sides, which appear as if crenate; on the back they are marked with very numerous, minute fine striæ, which are best seen when the specimen is taken out of spirits. Oral sucker small; ventral moderate and rather deep, granose on outer edge. Anus large.

Length about 2 inches, breadth about 8 lines.

Hab. ——? Old collection.

Genus HIRUDO, Linnæus.

1. HIRUDO INCONCINNA, Baird.

Body much depressed, of a uniform dark olive-colour, somewhat lighter underneath, much attenuated at anterior extremity. Body broad posteriorly, coarsely annulated; surface of rings roughly wrinkled. Oral sucker small; ventral large, shallow, bordered with a smooth margin, distinctly radiately plaited on interior surface, and covered with flat granulations externally, or as it were tessellated.

Breadth of anterior portion immediately below the oral sucker 3 lines, breadth at broadest part of body 9 lines; diameter of ventral sucker 5 lines; length of body 4 inches.

Hab. Ceylon (*Sir A. Smith, M.D.*).

Several species of Leeches are found in Ceylon, and are particularly mentioned by the late Sir J. E. Tennent in his history of that island. This may be the Leech mentioned by him in vol. i. p. 305 (footnote), which was observed by Mr. Thwaites at Kolona Koole, but which he was not able to examine particularly. He describes it "as flatter and of a darker colour" than the paddy-field Leech (*Homopsis sanguisorba*) of Ceylon.

2. HIRUDO LOWEI, Baird.

Body depressed, concave on ventral surface, slightly convex dorsally, of a uniform olive-colour, rather lighter underneath. No bands or marks on the surface to be seen. Attenuated anteriorly. Body distinctly annulated; rings very irregular, contracted at about every fourth or fifth, the fourth or fifth being smaller than the rest,

and as it were sunk beneath the others. Rings beset with spinulous tubercles, about 30 or 35 in number. In many the spines are only on the lower edge of the ring and point downwards. Oral sucker small; ventral deep and large, much plaited both internally and on the external margin, and covered externally with spinulous tubercles.

Length nearly 3 inches, breadth (at broadest part) about 9 lines.

Hab. Borneo. From the collection of Mr. Lowe, H.B.M. Consul at Sarawak.

3. HIRUDO BELCHERI, Baird.

Body depressed, slightly convex on the back, of a yellowish grey colour, indistinctly banded near the dorsal margin with dark olive; edges as it were serrated, attenuated anteriorly. Body consisting of about 95 very narrow rings, each ring beset all round with numerous pointed raised dots or small tubercles, about 40 on each ring. Oral sucker of considerable size; ventral moderate, and radiately plaited internally and on external margin. The rings of this species are narrower and much more distinctly tubercular than those of *Hirudo granulosa* from India.

Length of body $2\frac{1}{4}$ inches, breadth (at broadest part) 6 lines.

Hab. Borneo (*Sir E. Belcher, R.N.*).

4. HIRUDO MACULATA, Baird.

Body depressed, flat beneath, slightly convex on the back; attenuated anteriorly. Back of a deep grey colour, marked in the centre with an interrupted black line, and a row of spots of the same colour near the edges, the spots being distributed alternately —first on one ring with an intermediate ring without a spot, then, secondly, a spot and two rings without a spot, and thus alternately throughout its whole length *. Abdominal surface lighter-coloured, with a broad line of a dark colour on each side. Rings very narrow, beset with numerous small tubercles, about 36 in number. Oral sucker of considerable size; ventral circular, with a simple border, strongly plaited internally and granulous externally.

Length of body about $2\frac{1}{2}$ inches; breadth (at broadest part) about $7\frac{1}{2}$ lines.

Hab. Siam.

5. HIRUDO ASSIMILIS, Baird.

Body rather narrow, attenuated anteriorly, of a light yellowish colour above and beneath. Back convex, marked with an indistinct row of small spots in the centre, and an interrupted row of larger black spots at the margins, the spotted alternating with the unspotted rings, in the same way as in *H. maculata*, described above. Ventral surface of a uniform colour, without any markings. Rings larger

* In general I have observed that in European species the marginal row of spots is continuous, a spot occurring on each ring, whilst in those from the Eastern countries the spots are alternate, as I have described them in the species mentioned here. This holds good with the *Hirudo granulosa* from India, the present, and succeeding species, all from the East.

than in *maculata*, and tubercular. Oral sucker moderate in size; ventral circular, radiately plaited internally and granulous externally.

Length of body about 3 inches, greatest breadth about 4 lines.

Hab. Hong-Kong, China (*Sir A. Smith, M.D.*).

A species has been described by Blainville from a drawing made by a native artist in the Chinese 'Encyclopædia,' and named by him *Hirudo sinica*. This Leech is said to be employed medicinally in China. It is small and entirely black, which would show it to be a different species from that found in Hong-Kong.

6. HIRUDO SEMICARINATA, Baird.

Body rounded, of a uniform dark olive-colour above and beneath, slightly narrower at anterior extremity. Rings narrow, with a few tubercles on the surface. Oral sucker round, with scarcely any lip, but plaited round its margin; ventral sucker moderate, indistinctly plaited on internal surface. Anus small. The anterior half of the body is marked on the dorsal surface with a sort of raised keel.

Length of body 16 lines, breadth of body about 3 lines (largest specimen).

Hab. Vancouver Island (*J. K. Lord, Esq.*); Great Bear Lake, N. America (*Sir J. Richardson, M.D.*).

7. HIRUDO LÆVIS, Baird.

Body depressed, flat ventrally, slightly convex dorsally, attenuated anteriorly. Of a uniform dull yellowish colour above and beneath. No bands or marks to be seen, unless an indistinct continuous band on each side dorsally. Rings quite smooth; the lower margin of each raised somewhat like a keel; and on the edges at the sides the rings are as it were divided into two, but only on the edges. Oral sucker small; ventral rather small, radiately plaited.

Length 4½ inches, greatest breadth about 9 lines.

Hab. ——? Old collection*.

Genus HETEROBDELLA, Baird.

Body composed of 160 rings. Male organ situated between the twenty-ninth and thirtieth ring; female between the forty-eighth and forty-ninth. Eyes five pairs—three situated on first ring, one on second, and one on fifth. Anus rather small, round, and distinct, situated between the fourth and fifth last ring, in the centre, a little above the ventral sucker, which is obliquely terminal, and so placed as to have a ventral aspect.

* A cargo of Leeches was lately imported into London from Australia; but, the demand for Leeches being now much restricted owing to the disuse of bloodletting by medical men in this country, it appears that they were almost all thrown into the Thames. Three or four specimens, however, were saved from the mass, and kindly sent alive to the British Museum by Mr. Morson of Southampton Row. This Leech is one which is used in Australia for medicinal purposes; and a dissection of the mouth shows the teeth to be strong and well developed. The species is the *Hirudo quinquestriata* of Schmarda, and described by him in his 'Neue Wirbelthiere,' vol. ii.

HETEROBDELLA MEXICANA, Baird.

Body rounded dorsally, flattened ventrally; narrow, nearly uniform in breadth, but slightly attenuated anteriorly; of a uniform pale brown colour. Rings very narrow, rather rugose. Oral sucker rather small; upper lip prominent, plaited. Ventral sucker round, deep, plaited on outer margin, smooth, obliquely terminal, and with a ventral aspect; in several specimens this sucker was closed, being contracted longitudinally. Anus distinctly visible, of moderate size, between the fourth and fifth last ring, above the ventral sucker.

Length about 20 lines, breadth about 4 lines.

Hab. Mexico. Collected by M. Sallé.

Genus GLOSSIPHONIA, Johnson.

1. GLOSSIPHONIA RUDIS, Baird.

Body of an obovate form, and of a uniform olive-colour; roughly annulated, each ring armed with a series of tubercles along its surface, and having a number of larger, reddish-coloured tubercles scattered irregularly over the surface of the back. Head and body continuous. Dorsum rather convex, ventrally concave. Oral sucker smaller than ventral, which is round, hollow, and smooth internally. Eyes? six in number (as far as could be made out). Sexual orifice about the twenty-third ring.

Length about 1 inch, greatest breadth nearly $\frac{1}{2}$ inch.

Hab. Great Bear Lake, N. America (*Sir J. Richardson, M.D.*).

2. GLOSSIPHONIA TRISULCATA, Baird.

Body obovate; head small, distinct from the body, being separated by a distinct notch. Eyes two, or, if four, placed so close together that they look as only two. Of a uniform dull olive-colour, with three distinct raised sulci or ridges, which converge to a point at the upper part of the body, just below the head, and nearly converging posteriorly also. The ridges are beset, all along their upper margins, with raised tubercles. Ventral surface as if trellised by crossing striæ. Ventral sucker rather small, round. Back somewhat convex, ventral surface concave.

Length about 10 lines, greatest breadth 4 lines.

Hab. ——? Old collection.

3. GLOSSIPHONIA CIMICIFORMIS, Baird.

Body rounded oval, flat, somewhat concave ventrally, nearly flat on dorsal surface. Rings very close and indistinct, beset with six longitudinal rows of raised tubercles, the two central rows the largest and most distinct. Colour above of a reddish brown, the tubercles lighter in hue. Borders or margins of body very thick and large, leaving a hollow space in the centre of ventral surface, with a row of black spots on each side running longitudinally for the greatest part of its length. Eyes six; anterior pair very small, second pair large, and third pair smaller than second. Body of a hard crusta-

ceous sort of structure; and the form altogether presents very much the appearance of a bug. Ventral sucker round and rather deep.

Length about 3 lines, breadth about $2\frac{1}{2}$ lines.

Hab. —— ? Old collection.

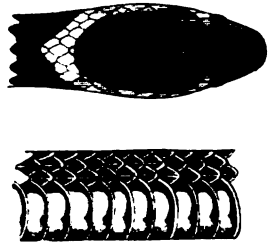
5. Descriptions of new Australian Snakes. By GERARD KREFFT, F.L.S., C.M.Z.S., Curator and Secretary of the Australian Museum at Sydney, N.S.W.

CACOPHIS FORDEI. (Figs. 1 & 2.)

Scales in 15 rows. Abdominal plates —— ? Subcaudals —— ? Two anal plates.

Total length 13 inches, head $\frac{1}{2}$, tail $1\frac{3}{4}$.

Figs. 1 & 2.



Cacophis fordei.

Body elongate and rounded; head rather small, not distinct from trunk, flat, regularly shielded; vertical moderate, with a very sharp angle behind; superciliaries much smaller, occipitals slightly larger than the vertical; rostral rather depressed, with a groove on its lower edge; one anterior, two posterior oculars; one large and elongate temporal shield, with two others behind, the upper one being nearly as large as the first temporal; six upper labials, the third and fourth coming into the orbit; these shields increase from the first to the last, which is the largest; the lower labials are also six in number; the eye is small, with rounded pupil; scales hexagonal, about as broad as they are long, except the upper rows on the back, which are more elongate. The head is scarcely to be distinguished from the body, and for one-fourth of the whole length there is no increase in size; the body then gradually enlarges, being much stouter posteriorly, with a short and very distinct tail. In young and half-grown individuals these characters are not so clearly defined; the tail is nearly of the same size as in the adult, rather stout, but distinct from the body. The general colour is a kind of sepia-brown above, in adults much lighter anteriorly, a white or yellowish collar

dividing the head from the neck. This collar commences at the last labial shield, covers five scales in length by one (or at the angle two scales) wide; it then crosses the neck, the width of a scale or less, and joins the opposite angle. The shields on the side of the face are all more or less spotted with white, including the outer edges of the superciliaries, the rostral, and the first pair of frontals. The general colour of the body covers the outer margin of every abdominal plate, rather jagged and irregular in the middle, but sharply defined on the sides, particularly in young individuals; the inner margins of the two-rowed subcaudals are marked in the same way to the tip. The abdominal plates are otherwise of a clear straw-yellow, brighter in young individuals. The outer margin of each scale of the back is darkly shaded, with a light elongate spot in the middle, giving the body a keeled appearance.

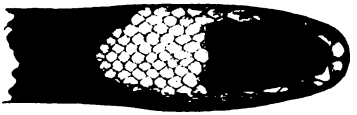
Hab. Mr. George Masters discovered this handsome little Snake at the Pine-Mountain, near Ipswich, Queensland, and states that it can be freely handled without offering to bite.

CACOPHIS HARRIETTÆ. (Fig. 3.)

Scales in 15 rows. Abdominal plates 193. Two anal plates. Subcaudals 35/35, or more.

Total length 12 inches, head $\frac{1}{2}$, tail $1\frac{1}{2}$.

Fig. 3.



Cacophis harriettæ.

Body rather elongate and rounded; head scarcely distinct from trunk, quadrangular, not much depressed; tail rather short and stout, distinct from the body. The vertical is rounded off behind, about as large again as the superciliaries; the occipitals are rather small and narrow, not much larger than the vertical (too large in my figure). The plates on the side of the face are similar to those of *C. fordei*; the third and fourth upper labials come under the eye, and the sixth and last is the largest; the temporal shields are one large one and two others of unequal size behind. The general colour is a kind of purplish brown above, each scale with a white central streak (except the outer row on each side), forming thirteen thin lines from nape to base of tail; head and neck white above, with a central spot (the colour of the body) covering part of posterior frontals, vertical superciliaries, and occipitals, and one row of scales surrounding the occipitals. The shields on the side of the face, the lower labials, and chin-shields are dark-spotted and blotched; eye small, pupil rounded. Abdominal plates uniform purplish brown, with a light outer edge; subcaudals with similar markings.

Hab. Warro, Port Curtis, Queensland. Discovered by F. A. Blackman, Esq.

CACOPHIS BLACKMANII. (Fig. 4.)

Scales in 15 rows. Abdominal plates 197. Two anal plates. Subcaudals 43/43, or more.

Total length 16 inches, head $\frac{5}{8}$, tail $2\frac{1}{4}$.

Fig. 4.

Cacophis blackmanii.

Body elongate and rounded; head distinct from neck, rather depressed, with obtuse muzzle. The vertical without the sharp angle behind would form a square; the superciliaries are very small, slightly larger than the anterior ocular; occipitals also of small size, and not as large again as the vertical; the hind part of the head rather thick; the vertical and occipitals depressed. Six upper labials, the two last of about equal size, with a large temporal shield wedged in between them; seven lower labials. Purplish brown above, lighter on the sides; all scales with a slightly transparent outer edge, but without any markings; ventrals straw-yellow, with darker spots in the corners. Head, from the muzzle to the occipitals, dark brown above; the upper margin of the upper labials tinted with the same colour, the rest of the lower labials yellowish; mental shield dark brown. The upper part of the head behind the occipitals light brown; a clear small spot in the corner of each superciliary yellow.

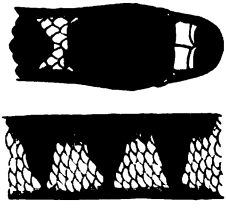
Hab. The Pine-Mountain, Queensland. Discovered by Mr. George Masters.

VERMICELLA LUNULATA. (Figs. 5 & 6.)

Scales in 15 rows. Abdominal plates 220, or more. Two anal plates. Subcaudals 26/26, or more.

Total length $8\frac{1}{2}$ inches, head less than $\frac{1}{4}$, tail $\frac{1}{2}$.

Figs. 5 & 6.



Vermicella lunulata.

Head very flat; rostral not quite so high as in *V. annulata*; vertical and occipitals more elongate. Head, body, and tail covered by fifty-nine elliptical spots, which, only in a few instances near the tail, join beneath, but very faint and scarcely a line in width. On the middle of the back these spots are about $\frac{1}{8}$ inch wide.

Hab. The Upper Burdekin. A single specimen in the Museum collection.

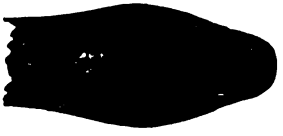
Denisonia, Krefft.

Head high and quadrangular, distinct from trunk, regularly shielded, but with a large loreal, which is absent in all other Australian venomous Snakes. Body not very elongate.

Denisonia ornata. (Fig. 7.)

The present species is a very peculiar form on account of the loreal shield, which in the venomous Colubrine Snakes is, I believe, generally absent. The head is rather thick, distinct from trunk, high, and quadrangular, with shelving snout; and in this respect resembles the genus *Acanthophis*. The markings of the upper and lower labials, the chin-shields, and the first ten or fifteen abdominal plates are almost identical with those of young Death-adders of the first year. The occiput is black from the posterior frontals to the commencement of the neck, leaving a mottled spot on the inner margin of the superciliaries, and another very small one at the posterior part of the vertical. The tips of the two occipitals and the scale between them are also light-coloured; and below these is another whitish spot formed by the inner portions of eight scales with a darker centre. The occipitals are slightly raised above the eye, and resemble in this respect the same scales in *Acanthophis*. The frontals are shelving downwards; and the rostral is very low, and not visible from above if the head is put in a horizontal position. Body and tail above lead-coloured, beneath whitish; the abdominals with brown spots in the corner of each plate, which become faint towards the tail.

Fig. 7.



Denisonia ornata.

Hab. Mr. Thomas Nobbs, a liberal donor to the Museum, discovered this new Snake near Rockhampton, in Queensland.

Emydocephalus, Krefft.

Anterior half of the trunk rounded, posterior part compressed; ventral plates well developed. Head shielded, gape of mouth short;

three upper and three lower labials, the middle one largest, covering nearly the whole upper and lower lip (scales large and much imbricated, in sixteen rows). Occipitals not much larger than the superciliaries, very irregular, with sometimes a plate between them, and much broader than long. Tail much compressed, ending in a large flat scale, with two or three denticulations and a strong keel on each side. Scales in sixteen or seventeen rows, hexagonal, much imbricated, and covered with from five to ten or more tubercles. Ventral plates much tuberculated, in particular those near the tail.

EMYDOCEPHALUS ANNULATUS.

Scales in 16 or 17 rows. Ventral plates 144. One anal plate. Subcaudals 36 (ending in a broad spine).

Total length 30 inches.

Scales large and imbricated. Head small, about as long as broad, covered with rounded plates, which are more or less raised in the middle and much tuberculated; one or two elongate shields wedged in between the superciliaries; the number of upper and lower labials reduced to three, a middle one of extraordinary size between two small scale-like shields, each scale and plate covered with many small tubercles, and the body encircled by thirty-five black and as many white rings. The white scales upon the back and sides more or less black, and some of the black rings white-spotted.

Hab. Probably the Australian seas. Two specimens in the Museum collection.

EMYDOCEPHALUS TUBERCULATUS.

Scales in 17 rows. Abdominal plates 135. One anal plate. Subcaudal plates 30.

Total length 32 inches, head 1, tail $5\frac{1}{2}$, girth 4.

Head short, but longer than in the previous species; neck rounded; all the other parts of the body compressed, very stout, with strongly compressed tail, ending in a large flat scale or spine divided into three segments. Scales very large, hexagonal, the greater portion fully one quarter of an inch wide, much imbricated and tuberculated. Abdominal plates large, with a fold or ridge in the middle, but not keeled; each plate covered with several elongated tubercles. Head shielded, the sutures of the frontals and nasals forming right angles; vertical nearly rounded; superciliaries large, five-sided; occipitals short, much broader than long. Three upper and lower labials, the middle one very large, covering nearly the whole gape; the middle lower labial shield very irregular in form, with one or two indentations. One anterior and two posterior oculars; eye of moderate size. General colour uniform purplish brown; some of the scales on the side mottled with lighter brown spots.

Hab. Probably the Australian seas. A single specimen in the Museum collection.

6. A Monograph of the Siliceo-fibrous Sponges. By J. S. Bowerbank, LL.D., F.R.S., F.Z.S., &c.—Part II.*

(Plates XXI.–XXV.)

Iphiteon, Valenciennes.

Iphiteon panicea, of the Museum, Jardin des Plantes, is distinctly a symmetrical structure. The skeleton is reticulated in a very remarkable manner. The whole consists of a series of regular areas, with pentagonal or hexagonal margins, from each angle of which a fibre passes in a direct line to the centre of the area, where they unite, forming a central, slightly protuberant mass. From each of these centres one or two fibres are given off at about right angles to the plane of the area, in opposite directions to each other, by which the adjoining areas above and below are connected. These connecting fibres always terminate at junctional angles of the nearest adjoining area, and the fibres thus projected never seem to unite with any other portions of the reticulating skeleton.

The appearance resulting from this mode of structure is very remarkable when we view a microscopical plane of this beautiful tissue. The effect is that all the areas present a singularly confluent appearance, each perfect in itself, and each forming, as it were, a part of a neighbouring area. Occasionally square spaces may be found; but these are only intervals of the reticulations.

In treating of the gemmules in my paper "On the Anatomy and Physiology of the Spongiadæ," I have figured a small portion of the skeleton of the specimen in the French Museum, said to be from Porto Rico (plate 34. fig. 17, Phil. Trans. for 1862), and I have there designated it as identical with Stutchbury's genus *Dactylocalyx*; but a more critical examination, with a view to the determination of its specific characters, has convinced me that I was in error in doing so. Neither *Dactylocalyx* nor *Iphiteon* appear in Lamarck's 'Animaux sans Vertèbres,' second edition, published in 1836, nor in Agassiz's 'Nomenclator Zoologicus,' published in 1848. Nor is there any notice of the subject in the list of the works of Prof. Valenciennes published in the 'Bibliographia Zoologiæ et Geologiæ,' by the Ray Society, 1854; we may therefore reasonably conclude that although named by Prof. Valenciennes in the Museum of the Jardin des Plantes, he never published any descriptive characters of the genus. The symmetrical arrangement of the skeleton-structures distinctly separates *Iphiteon* from *Dactylocalyx*, with which it has hitherto been confounded by other English naturalists as well as by me. I therefore propose the following characters for the genus

Iphiteon, Valenciennes.

Skeleton siliceo-fibrous. Fibre solid, cylindrical. Reticulations symmetrical. Areas rotulate, confluent.

Type *Iphiteon panicea* from Porto Rico, Museum of the Jardin des Plantes, Paris.

* For Part I. see *antea*, pp. 66–100.

IPHITEON PANICEA, Valenciennes.

Sponge cyathiform, slightly pedicelled. Surface of rigid skeleton even? Oscula, pores, and dermal membrane unknown. Skeleton symmetrically radial; radii short and stout; areas of the rete mostly six-sided, spaces within triangular; fibre cylindrical, incipiently spinous. Tension-spicula simple, hexradiate, slender, abundantly spinous; radii terminally more or less clavate. Retentive spicula spinulo-pentafurcated? hexradiate stellate, few in number. Gemmules simple, membranous, subspherical, irregularly dispersed, very numerous.

Colour in the living state unknown.

Hab. Porto Rico, 1799 (*Prof. Valenciennes*).

Examined in the state of skeleton.

The specimen designated *Iphiteon panicea* in the Museum of the Jardin des Plantes, Paris, is said to have been brought from Porto Rico in the year 1799. It is an irregularly cup-shaped sponge, the diameter of its distal margin being about equal to its height, which, to the best of my recollection, was from 7 to 8 inches. From the colour and general appearance of the specimen, I believe it to be the one from which Prof. Valenciennes gave a small fragment to Prof. Melville some years since, which he kindly transferred to me, and which fragment contains the gemmules *in situ*. I have so fully described the general structure of the skeleton in my description of the genus, as to render it unnecessary to dilate further on that portion of its history.

No fragments of the expansile dermal system could be detected; and we are therefore deprived of the most important specific characters.

I could not detect auxiliary skeleton-spicula, simulating hexradiate spicula, springing from the primary skeleton-fibres and anastomosing freely with each other, as in *Dactylocalyx*; but in lieu of them true simple hexradiate tension-spicula were frequently to be seen in groups in the interstitial spaces, but they never appeared to inosculate with each other or to deviate from their normal forms. These spicula are of comparatively large size; the radii are slightly and progressively attenuated, and entirely and acutely spinous, but they do not terminate in a point, but either in a group of acute spines or they are more or less subclavate.

The retentive spicula appear to be exceedingly few in number in the interstitial tissues; in several small masses of the skeleton abounding in sarcode and gemmules I found but two of them. The secondary radii were apparently five in number, but they were so much obscured by the surrounding sarcode as to render the determination of this character very uncertain.

The simple membranous subspherical gemmules are very like those of a halichondroid sponge; they are very numerous, somewhat variable in size and form, and are nearly all of them attached to the skeleton-fibres.

A portion of the skeleton with the gemmules is figured in the

illustrations to my paper "On the Anatomy and Physiology of the Spongiadæ" (Phil. Trans. for 1862, plate 34. figs. 17 & 18), and also in vol. i. of 'Monograph of British Spongiadæ' (plate 35. figs. 340 & 341). The latter figure in each of these quotations represents one of the gemmules filled with granular matter, × 666 linear. A small portion of the skeleton from the Porto Rico specimen is also figured in Plate XXII. fig. 1, of the present work, × 108 linear, to exhibit the abundance of these organs *in situ*. In this portion of the skeleton (fig. 1, Plate XXI., representing the general contour of the skeleton) the gemmules are very few in number, the original of the figure being from a different portion of the sponge.

IPHITEON BEATRIX, Bowerbank.

Aphrocallistes beatrix, Gray, Proc. Zool. Soc. 1858, p. 115, pl. xi.

Sponge fistulous, branching irregularly. Surface of the rigid skeleton undulating or tuberous. Oscula congregated, terminal. Pores and dermal system unknown. Skeleton symmetrically radial; radii short and stout; areas of the rete mostly six-sided, spaces within triangular; fibre cylindrical; central umbo of the areas spinous. Inhalant spaces of the skeleton-surface armed with stout elongo-conical, acutely terminated, and abundantly spinous defensive fibres. External defensive spicula of the skeleton acerate, distal portions incipiently recurvato-spinous, long and slender, very numerous; and also stout subfusiformi-cylindrical, entirely spinous spicula, few in number. Interstitial spicula attenuated rectangulated hexradiate, large and small; axial ray of the latter occasionally spinous at one or both of its terminations; spines very long and slender, curving towards the extremities. Spicula of the membranes:—Tension-spicula acerate, very slender. Retentive spicula acerate, verticillately spinous; verticilli few in number; spines large and acute, and also porrecto-spinulo-multiradiate spicula with slightly attenuated shafts; radii from three to six or more, slender and minute, few in number. Gemmules spherical, membranous, irregularly dispersed.

Colour in the living state unknown.

Hab. Malacca (*Admiral Sir Edward Belcher*).

Examined in the skeleton state.

Dr. Gray's description of this beautiful sponge in the 'Proceedings' of this Society for 1858 is inaccurate in several important points. In the first place he describes it as calcareous, whereas it is purely siliceo-fibrous. He also states the outer surface to be "formed of intertangled transparent spines which inosculate and unite with each other at the intersection," while the whole of the skeleton is formed of a symmetrical network of siliceous fibre. He further states that "the end of the main tube is closed with an open network formed of spicula," when in reality it is an intricate reticulation of siliceous fibre of a very remarkable structure. Subsequently the author writes, "in this genus the mass of the sponge is formed of small spicula, which inosculate and are united together, forming a hard mass pierced with numerous closed, small, uniform

hexangular pores, lined with a thin layer formed of elongate fusiform spicula, placed parallel in bungle in a more or less longitudinal direction round the inner mouth of the pores." The whole of this latter description of the structure of the sponge is remarkable for its inaccuracy. He repeats the fallacy that "the sponge is formed of small spicula," and describes their inosculation, when no such inosculation ever takes place among true spicula. He describes the pores in the total absence of the dermal membrane, evidently mistaking the incurrent orifices of the skeleton for those organs, and then he lines the cavities "with spicula placed parallel in bungle." What may be the mode of disposition of spicula in bungle I must leave my readers to imagine, as I really cannot conceive their arrangement under such circumstances, and especially as I have been totally unable to detect any such lining of spicula within the orifices described by Dr. Gray.

The sponge, of the natural size, and slightly magnified, has been beautifully represented in plate 11 of the 'Proceedings of the Zoological Society' for 1858.

The natural surface, and the whole of the dermal system of this sponge, have been entirely destroyed, and the pores are therefore unknown to us; but from the regularity of the size and mode of disposition of the incurrent orifices of the skeleton, it is very probable that they were congregated immediately above them. Within the sponge, on the surface of the great cloacal cavity, there are a series of large areas for the discharge of the excurrent streams into the cloaca; they are very like in size and form to those of the inhalant surface, but they are destitute of the elaborate defences that characterize the inhalant organs. Fig. 4, Plate XXI. represents one of these areas × 108 linear.

The form and mode of disposition of the oscular area readily indicates the congregation of the oscula after the same manner as that indicated in *Alcyoncellum speciosum*, and as exhibited in various species of *Geodia*. The reticulation-fibre closing this area in the sponge under consideration is remarkably complex and beautiful; each fibre of the oscular area is a compound structure. When a portion of it is immersed in Canada balsam, and viewed by a microscopic power of about 150 linear, it is seen to be a complete cylinder formed of a dense network of siliceo-fibrous structure, produced on the same radial principle as that which prevails in the skeleton of the sponge, but in consequence of the small elongate cylindrical space in which it is developed, its structure is necessarily very confused; yet the indication of radial fibres within it are sufficiently apparent to assure us of this fact. On the surface, and within the reticulations, there were a few very slender, smooth, acerate spicula which, from the mode of their disposition, are evidently the tension-spicula of the membranous tissues of the sponge. From the external surface of the compound fibre there were a few basal portions of, apparently, hexradiate auxiliary fibres projected; but none of them were developed to the extent of the production of the rectangulated lateral fibres. The external fibres of this beautiful com-

pound structure were incipiently spinous, but the internal ones were smooth. The portion of the compound fibre examined measured $\frac{1}{74}$ inch in diameter, and is represented by fig. 2, Plate XXII., $\times 108$ linear.

The structure of the skeleton of *Aphrocallistes beatrix*, Gray, is precisely in accordance with that of *Iphiteon panicea*; and if agreement in organic structure be an evidence of close alliance, the two must belong to the same genus, however different their external forms may be. The same description of symmetrical confluent areas of siliceo-fibrous structure forms the skeleton, the only difference being that the areas are rather less in their average diameter than those of *I. panicea*. In the latter species they average $\frac{1}{63}$ inch, while in the former they are $\frac{1}{74}$ inch; but in their general structural aspect they so closely resemble each other that, if it were not for the spinous umbonate centres of the areas in *I. beatrix*, they could not be distinguished when examined beneath the microscope. Fig. 2, Plate XXI. represents a section at right angles to the surface of the sponge. The view of the surface of the sponge does not exhibit distinctly the peculiar rotulate structure of the areas; and it is only when we obtain a section at right angles to the surface that this strikingly characteristic structure is to be seen in all its symmetry and beauty. But the surface view exhibits many of the specific characters in an extremely striking and beautiful manner. Here we observe large inhalant spaces, abounding in rectangulated hexradiate spicula, for the support and multiplication of the nutrient membranes of the sponge; and that the delicate tissues may be preserved from the ravages of minute annelids and other insidious enemies, the mouths of the apertures are abundantly defended by the projection into them of large elongate cones of fibre, profusely furnished with minute spines; and deeply imbedded amidst the skeleton-fibre we find an abundant supply of acerate tension-spicula, and of the short, acerate, verticillately spined retentive ones, and occasionally groups of two or three of the porrecto-spinulo-quaternate spicula with attenuating shafts (fig. 3, Plate XXI., $\times 108$ linear). The surface of the skeleton is furnished with a profusion of attenuated acerate external defensive spicula, the distal portions of which are abundantly spinous, the spines appearing as if notched upward out of the shaft of the spiculum, their acute points being all directed downward. The greater portion of these defensive organs are deeply immersed in the skeleton-mass beneath, their distal ends projecting not more than about one-fifth or one-sixth of their length beyond the general surface of the sponge. A section at right angles to the mass of the skeleton is necessary to exhibit distinctly their structure and position in the sponge. The auxiliary rectangulated hexradiate fibres of the skeleton are produced very sparingly in this species; they do not attain the full development of the shaft and lateral radiations as in *Dactylocalyx*, the lower half of the shaft only being produced; and this portion of it is abundantly spinous, and terminates hemispherically. In one portion of the skeleton, mounted in Canada balsam, their purpose in the economy of the animal is dis-

played in a very beautiful manner. Five of them are projected at different angles in about the same plane; and as it fortunately happens that the interstitial membrane is in a beautiful state of preservation, it is seen suspended on the points of the fibres, the margin curving gently from one to the other of them, in precisely the same manner as wet linen cloth would if it were supported on a series of short props for the purpose of being dried; and the resemblance is rendered the more complete by the doubling and folding of the membrane at the points of contact with the rough terminations of the supporting fibre; and in the space of membrane between two of these supporting props, we have one of the rectangulated hexradiate interstitial spicula, with its almost brush-like spinous axial spiculum, imbedded in the surface of the membrane, to contribute its share of support to that portion of the structure.

The attenuated hexradiate rectangulated interstitial spicula are comparatively small and delicate in their structure; the proximal and distal portions of the axial spiculum are very nearly equal. They have usually one or both of these parts furnished with very long and slender spines, which curve in the directions of the terminations of the shaft (fig. 3, Plate XXII.). But when this form of spiculum occurs in some of the larger interstitial cavities, they are increased in size in proportion to the necessities of the situation, and two or three of them are grouped so as mutually to support each other, as well as to perform the common office of supporting the membranous structures. In this case their radii appear to be entirely destitute of spines.

The slender acerate tension-spicula are few in number, and appear to abound more towards the surface of the sponge than in its deeper recesses.

The acerate verticillately spinous retentive spicula are exceedingly abundant in those parts where there are any remains of the membranous and sarcodous structures. The spinous verticilli are few in number; when in a fully developed condition there are frequently as many as four of them; but three is the more usual quantity, with perhaps a single intermediate spine to represent the fourth whorl. Sometimes they exhibit only two irregular terminal groups of spines and a smooth shaft intervening. The spines are long and acutely conical (fig. 4, Plate XXII., $\times 308$ linear).

The porrecto-multispinulate spicula are comparatively few in number. They do not appear to be irregularly dispersed, but occur in groups of two or three together. They agree very nearly in size, but the degree of expansion of their terminal radii differs considerably; nor do all the rays on the same spiculum agree in that respect. The number of the radii at their apices appears to vary considerably; those I have observed and figured in Plate XXII. figs. 5, 6, 7, 8, range from 3 to 6 spinulate radii. The shaft is long, slender, and attenuating to its base. Prof. Wyville Thomson, in describing this form of spiculum in his paper on Sponges in the 'Annals and Magazine of Natural History' for February 1868, p. 124, says, "no doubt these are the separate branches of a complex hexradiate spi-

cule, closely resembling those figured by Bowerbank ('British Sponges,' vol. i. figs. 190, 192)." I cannot agree with the learned Professor in this opinion. All the numerous specimens that I have seen, both separated from the sponge and *in situ*, have their natural basal terminations; and no indication whatever exists of any central hexradiate spiculum from which they may have been separated.

A few gemmules were observed adhering to the skeleton-fibres of the inner surface of the interstitial cavities of the sponge; they are similar in character to those of *I. panicea*, but in the specimen under consideration they are not nearly so numerous as in the Porto-Rico specimen of that species.

IPHITEON SUBGLOBOSA, Bowerbank.

Dactylocalyx subglobosa, Gray, P. Z. S. 1867, p. 506, plate xxvii. fig. 1.

Sponge massive, somewhat cyathiform, sessile. Surface uneven. Oscula and pores unknown. Dermal membrane—retentive spicula spiculated biternate, minute, very numerous? Skeleton symmetrically radial; areas confluent, somewhat irregular, mostly six-sided, spaces within triangular; skeleton-fibre at the external surface coarsely and irregularly tuberculated; fibre within the sponge minutely tuberculated; disposition of the tubercles sublinear. Auxiliary fibres rectangulated hexradiate, abundantly spinous; radii spinulate. External defensive spicula fusiformi-acerate, very large and long, distal terminations occasionally incipiently spinous. Interstitial spicula rectangulated hexradiate, very slender, radii subclavate, basal ray very long. Spicula of the membranes—retentive spicula spinulo-quadrifurcate and pentafurcate hexradiate stellate, numerous; margins of the spinulate terminations crenulate.

Colour in the living state unknown.

Hab. Malacca? (*Dr. J. E. Gray*).

Examined in the state of skeleton.

This sponge is in the collection at the British Museum. It is figured of the natural size in the 'Proceedings' of this Society for 1867, plate 27. fig. 1; and at p. 506 of the same volume, Dr. J. E. Gray gives the following brief description of it:—"Sponge subglobose, with a deep central concavity above; the outer surface with irregular anastomosing oscules.

"*Hab.* Malacca?"

The sponge is based on a fragment of coral, and has very much the form of a young and undeveloped specimen of one of the best description of Turkey sponges, in which the form of the cup is rather indicated than produced; and it is very probable that in its fully developed state it will be found to be a truly cyathiform species.

The expansile dermal system of the sponge has been entirely destroyed; the oscula and pores are therefore unknown to us; but on one fragment of the outer portion of the skeleton submitted to examination there was a very small piece of the dermal membrane adhering to the surface of the skeleton, and this was densely crowded

with minute spiculated biternate retentive spicula, and a few single ones were entangled in the adjoining interstices of the skeleton. As the colour of this small portion of the membrane was the same as that of minute portions of sarcode dispersed amidst the reticulations of the skeleton, there can be no reasonable doubt of its really belonging to the sponge.

These spicula are so minute that they require a microscopic power of about 700 linear to define them in a satisfactory manner, and in the present case they were only visible after having been immersed in Canada balsam. A detached specimen of one of these spicula is represented by fig. 11, Plate XXII.

The structure of the skeleton is stronger, larger, and more irregular than that of *I. panicea* or *I. beatrix*; but there is no doubt of its being truly an *Iphiteon*. The average diameter of the skeleton-fibre is $\frac{1}{500}$ inch. The surface-fibres are very closely tuberculated, the tubercles looking very like small extraneous patches of silex adherent to the surface; and clusters of these coarse tubercles are frequently accumulated on the umbones of the confluent areas of the skeleton-structures, as represented in fig. 10, Plate XXII., which represents a portion of the surface of the rigid skeleton. The tubercles of the interior fibres are much more regular in their form, and are frequently disposed in lines, consisting of five or six of them at nearly right angles to the axis of the fibre; and a very considerable number of the fibres have no tubercles upon them.

The rectangulated hexradiate auxiliary fibres were very abundant in some of the large interstitial spaces of the skeleton: when fully developed they are abundantly spinous, and the radii have spinulate terminations; in an early stage of growth they are frequently spineless, or only incipiently spinous, and in this condition, intermixed with the stouter and more developed ones, they may be readily mistaken for spicula; but their habit of anastomosing with each other, and their basal connexion with the parent skeleton-fibre, readily distinguish them. Fig. 12, Plate XXII., represents two of the auxiliary fibres in a less complicated form than they are usually met with in the interstitial spaces of the skeleton, and exhibiting distinctly their basement on the skeleton-fibre, and their subsequent inosculation.

The rectangulated hexradiate interstitial spicula are comparatively few in number; they are very slender, smooth, and their radii are clavate. The auxiliary fibres seem to have superseded them in their peculiar office of affording support to the interstitial membranes, and of multiplying the sarcodous surfaces of the interstitial spaces.

The external defensive spicula of the skeleton are remarkably large and long. I have not seen an entire one; but in a perfect condition they cannot be less than $\frac{1}{4}$ inch in length, and the diameter of the middle of one *in situ* was $\frac{1}{100}$ inch, more than twice the size of an average-sized skeleton-fibre. Their basal portions are deeply immersed in the external portion of the skeleton. The basal termination in a few cases appeared to be incipiently spinous; but this seemed to be rather the exception than the rule.

The retentive spinulo-quadrifurcate and pentafurcate spicula are very numerous, and the numbers of the two appear to be about equal. When a power of 700 or 800 linear is applied to them, their margins are seen to be regularly and closely crenulated. I do not remember to have seen this remarkable character in the corresponding spicula of any other species of siliceo-fibrous sponges.

IPHITEON INGALLI, Bowerbank.

Dactylocalyx pumicea, Gray, P. Z. S. 1867, p. 506, plate xxvii. fig. 2.

Sponge cup-shaped. Rigid skeleton—upper or exhalant surface with large intermarginal excurrent canals radiating irregularly from the centre towards the circumference. Under or inhalant surface with short radiating intermarginal canals. Surface even. Oscula, pores, and expansile dermal system unknown. Skeleton—fibre stout, more or less furnished with scattered warty tubercles. Auxiliary fibres abundantly tuberculated, terminating spinulately. Interstitial spicula rectangulated hexradiate, large; radii nearly equal, attenuated and acutely terminated. Retentive spicula spinulo-quadrifurcate hexradiate stellate; terminal radii long.

Colour in the natural state unknown.

Hab. St. Vincent's, West Indies (*Thos. Ingall, Esq.*).

Examined in the skeleton-state.

This sponge is figured by Dr. Gray, on the scale of one-eighth of its natural size, in plate xxvii. of the 'Proceedings' of this Society for 1867, and is erroneously designated *Dactylocalyx pumicea* in p. 506 of the same volume, but without any reference either to its internal or external characters, although the latter in *I. Ingalli* are strikingly different from those of the rigid skeleton of the former, as I have stated at length in my description of the surface-characters of *Dactylocalyx pumiceus*, *antea* p. 77.

Beside the difference in the surfaces of the rigid skeletons, there are such conclusive structural characters in their configurations that, had Dr. Gray taken the trouble to compare sections of the two sponges, he must have at once seen that they were not only different species, but distinct genera as well.

In the absence of the expansile dermal systems in both sponges, they agree in their external forms exceedingly well; but this character is common to so many and such discordant genera and species as to be of little or no value in their specific discrimination, even had they belonged to the same genus.

I have been unable to detect any characteristic fragments of the expansile dermal system of the type specimen of *I. Ingalli*.

The outer or inhalant surface of the sponge is covered in numerous places with a thin brown membrane adhering closely to the surface of the rigid skeleton, and dipping into and lining the incurrent orifices of the sponge. The membrane is completely covered by minute spherical vesicles; but I could not detect any imbedded spicula. From its close adherence to the surface of the rigid skeleton,

its delicate structure, and the total absence of dermal spicula, it is evident that it has formed no part of the expansile dermal system, and that it is truly the enveloping membrane of the rigid skeleton of the sponge thickly covered by sarcode.

Whether these minute molecules are the basal vesicles of the ciliary system is a question of considerable interest, to be hereafter determined by naturalists who have the opportunity of examining these interesting sponges fresh from their native element. Their situation and general character are very similar to the homologous organs in *Grantia compressa*, and their position in *I. Ingalli* is just that in which we should expect to find the ciliary system. We cannot hope to find any cilia remaining under such circumstances; those of *Grantia compressa* and other nearly allied species are rarely visible, except during the life of the animal and while in a state of activity.

In a small piece of the membranous structure of this sponge which I received from my friend Mr. Ingall, in March 1860, the appearances presented are widely different from those of the membrane I have described above. The colour and the sarcode are very similar; but there is a total absence of the minute spherical bodies. The field of view presents a very confused appearance. Numerous long, slender, and flexible attenuato-acerate spicula are confusedly matted together, and amongst them there are a considerable number of large rectangulated hexradiate spicula with radii of equal length, gradually attenuated from their proximal to their distal terminations; and amidst this complicated mass there are innumerable spinulo-quadrifurcate hexradiate stellate retentive spicula.

From what part of the sponge these portions of its structure have been derived it is difficult to conjecture; but it is evident that there are other forms of spicula than those we have observed *in situ* that belong to it, and that, although the spinulo-quadrifurcate retentive spicula are rather abundant in the interstices of the rigid skeleton, there are other parts of the sponge in which they are crowded to such a degree as to be innumerable.

The general appearance of the spinulo-quadrifurcate hexradiate spicula is very like that represented by fig. 2, Pl. XXIII.; and I have chosen a mutilated specimen which has only three of its primary rays remaining as best calculated to display its quadrifurcate structure. The configuration of the rigid skeleton is decidedly that of an *Iphiteon* of a somewhat delicate structure. The skeleton-fibres near the surface are rather strongly tuberculated; but those of the interior are very much less so, and in some parts they are almost smooth. The mouths of the incurrent canals on the surface of the rigid skeleton are numerous and frequently closely adjoining each other, the separation often not exceeding half of their own diameter. The auxiliary fibres at some distance within these canals are frequently abundant and much complicated in structure. They are stout, very rugged, with irregularly disposed tubercles, and their free terminations are spinulate. The rectangulated hexradiate interstitial spicula *in situ* are few in number, and their radii are gradually

attenuated to a sharp point. In size, compared with those I have previously described in a fragment of the membranous tissue, they are small and slender.

The genera of the two sponges *I. Ingalli* and *Dactylocalyx pumiceus* being distinctly different, it is unnecessary to enter into a long description of their differential characters to prove that Dr. Gray is in error in assigning the type specimen of the former to the latter genus; but it may be as well to state that none of the singular and beautiful forms of spicula which I have obtained from the type specimen of *D. pumiceus*, and have figured in Plate III., part 1, are to be found in the tissues of the type specimen of *I. Ingalli*.

IPHITEON CALLOCYATHES, Bowerbank.

Myliusia callocyathes, Gray, P. Z. S. 1859, p. 439, *Radiata*, pl. XVI.

Sponge sessile or slightly pedicelled, cyathiform. Upper surface of rigid skeleton even; under surface sinuously plicated and tubulated. Oscula and pores unknown. Expansile dermal system—dermal membrane pellucid, furnished abundantly with minute short, stout, acerate tension-spicula; connecting spicula furcated foliato-expando-ternate. Skeleton—fibre variable in diameter, verticillately spinous, spines small, acutely conical; interstitial spicula rectangulated hexradiate, axial and rectangulating radii nearly equal in length, slender, terminations subclavate; retentive spicula spinulo-multifurcate hexradiate stellate, terminations of each heptaradiate or octoradiate; of two sorts, one with terminal radii expanded, the other with terminal radii contracted into separate groups.

Colour in the natural state unknown.
Hab. West Indies (*Dr. M'Gee*).
Examined in the skeleton-state.

In the description of the external characters of this sponge it must be remembered that it is that of the rigid skeleton only, and that it is probable that both surfaces would be more or less smooth and even when covered by the expansile dermal system.

The arrangement of the skeleton is decidedly that of an *Iphiteon*; but the structural character of the fibres of which it is composed is strikingly distinct from any other species of the genus. They are variable in size to a considerable extent; but whatever may be their diameters, they are always furnished with numerous small sharply conical spines, which exhibit a strong tendency to a verticillate arrangement; and around the central umbones of the confluent areas of the skeleton they are frequently congregated on slightly elevated detached patches, each containing from seven to ten minute spinules.

These structural characters would have sufficed, in the present state of our knowledge of the species of this genus, to distinguish it from any other member of the group; but, by a careful examination of the type specimen, I fortunately obtained from near the base of the sponge on the inner surface a small piece of the expansile dermal system in connexion with a portion of the surface of

the rigid skeleton; but as these tissues on the exhalant surface are not nearly so distinct and regular in their structure as those of the inhalant surface, I could not find a piece that would have afforded a satisfactory figure, although when viewed beneath the microscope the nature and characters of the tissues were beyond a doubt. The furcated foliato-expando-ternate connecting spicula, when thus seen *in situ*, are so closely packed, and the terminations of their radii are so locked together, that they cannot be separated by the eye; and the small acerate tension-spicula so profusely scattered on the dermal membrane covering their apices tends greatly to confuse the aspect of the tissues beneath: it is only when we have one of them separated, as represented by fig. 6, Pl. XXIII., that we are enabled to comprehend their structure. But although ineligible for figuring, this fragment of the expansile dermal system clearly demonstrated the agreement in general structure of this species with those in which it is more amply and clearly exhibited.

The furcated foliato-expando-ternate connecting spicula are singular in their form, and are very characteristic of the species. Both the primary and secondary ramifications of their apices are very much depressed; they are very thin, and small short branches are projected from their edges so as greatly to increase their plane of support to the dermal membrane, which appears to have closely adhered to them in the living state, as I have not seen any separate spiculum of this form without a portion of the dermal membrane and its numerous tension-spicula closely adhering to its external surface.

The rectangulated hexradiate interstitial spicula appear to be few in number in the present condition of the sponge. They are small and slender, and the apices of the radii are slightly inclined to be clavate; the axial and rectangulating radii are usually of very nearly the same length,—a few of them only having the basal portions of the axial radii elongated to about twice that of a rectangulated ray.

There are two sorts of spinulo-multifurcate hexradiate retentive spicula, with seven or eight spinulate radii to each termination:—one in which the primary radii are short, and the secondary ones projected expansively, so as to form one great compound stellate spiculum, in which it is very difficult to separate with the eye the six sets of terminal spinulate radii; the other form in which the primary radii are longer and the terminal groups of spinulate spicula, usually six, rarely seven or eight in number, are projected contractedly so as to form six separate and very distinct groups of terminal spinulate spicula, as represented by fig. 7, Pl. XXIII. The first-mentioned form is very like that from *Dactylocalyx pumiceus*, represented by fig. 4, Pl. III., part 1, with the imaginary addition of as many more radii as are there represented.

MYLIUSIA, Gray, Proc. Zool. Soc. 1859, p. 439.

Skeleton siliceo-fibrous. Fibres solid, cylindrical. Rete symmetrical, disposed in a series of crypt-like layers parallel with the external surface, with intervening planes of perforated siliceous tissue.

The stratified character of the reticulating skeleton of the type sponge of this genus, when viewed in a section at right angles to its natural surface, with a microscopical power of 100 linear, at once separates it from the unsymmetrical structure of *Dactylocalyx*; and although participating with *Iphiteon* in the character of symmetrical arrangement of its skeleton, it is equally well distinguished from that genus by the total absence of the confluent areas that are so characteristic in those sponges.

In a paper read before this Society, November 22, 1859, by Dr. J. E. Gray, entitled "Description of *MacAndrewia* and *Myliusia*, two new forms of Sponges," and published in the 'Proceedings' of the Society for that year, page 437, the author has described his genus *Myliusia*, page 439, and has figured in plate xvi. *Radiata*, of the same volume, his species *Myliusia callocyathes* as the type of his genus; subsequently, in the 'Proceedings' of this Society for 1867, p. 506, in his "Notes on the Arrangement of Sponges," he has given the following characters as those of the genus:—"The sponge conical, cup-shaped, pierced with numerous short truncated tubes, forming raised folded anastomosing laminæ on the lower surface." This description applies only to the external characters of the skeleton, entirely omitting all the other anatomical peculiarities of the sponge. On microscopically examining the structures of the type specimen I found them to be identical with those of the genus *Iphiteon*, and I have therefore arranged Dr. Gray's *Myliusia callocyathes* as *Iphiteon callocyathes* in the present paper.

In Dr. Gray's "Notes on the Arrangement of Sponges," p. 506, he states that, "There are two small specimens in the British Museum which probably belong to the same species. The smaller one was collected by the Rev. L. Guilding at St. Vincent's in 1840; and the other was received from the West Indies by Mr. Scrivener in 1842." On examining microscopically the structures of the specimen collected by the Rev. L. Guilding at St. Vincent's, I found it to differ widely in the construction of its skeleton from either *Iphiteon* or *Dactylocalyx*, and I therefore propose to apply Dr. Gray's genus *Myliusia* to this species in place of the one to which he has erroneously attached it.

The specimen from "Mr. Scrivener in 1842" is identical in structure with Dr. Gray's type specimen of his genus *Myliusia*, both as regards generic and specific characters, and should therefore be arranged with that sponge as *Iphiteon callocyathes*.

MYLIUSIA GRAYII.

Myliusia callocyathes, Gray, P. Z. S. 1859, p. 439, et 1867, p. 506.

Sponge sessile, massive. Dermal surface unknown. Surface of rigid skeleton uneven and excavated. Oscula, pores, and expansile dermal system unknown. Skeleton stratified, forming a series of expanded crypt-like spaces. Fibre cylindrical, incipiently or minutely spinous. Interstitial spicula numerous, acerate, large and long, variable in size; disposed in lines at right angles to the strati-

fication in loose fasciculi of two to four or five together. Retentive spicula spinulo-multifurcate hexradiate stellate.

Colour of skeleton translucent white.
Hab. St. Vincent's, West Indies (*Rev. Lansdown Guilding*).
Examined in the skeleton-state.

The specimen proposed as the type of the genus *Mylinsia* has on the front of the board on which it is fixed *Myliusia*, St. Vincent's, Rev. L. Guilding, 40. 10. 23. 11." On the back of the board "Scrivener."

The sponge is sessile, the base being as wide as the specimen, which has a diameter of about three-fourths of an inch, and is about half an inch in height. The form of the mass is slightly oval; it is composed of a series of thin sinuous plates of skeleton-structure not more than one-third of a line in thickness. The sinuations of the plates form deep orifices in the substance of the sponge, which sometimes extend nearly to the base. By the aid of a lens of an inch focus, the stratified texture of the sinuous plates is distinctly visible. No sarcodous matter could be detected.

There are no visible remains of the expansile dermal system of the sponge. When viewed by the microscope the surface of the rigid skeleton has a very remarkable aspect. It is formed of a series of square or irregularly angular areas, the angles of which are filled in with thin perforated angle-plates with their inner margins curved, so that when combined they leave a large circular or oval orifice in the middle of each space; and the upper surface of each layer of vaulted structure presents as nearly as possible the same aspect as the external layer of the rigid skeleton. There is no uniformity, either of size or arrangement, in the perforations of these horizontal angle-plates; but combined they present to the eye the idea of the greatest amount of lightness, strength, and beauty that can well be conceived to exist in such a structure (fig. 8, Pl. XXIII.).

When we obtain a favourable section of the rigid skeleton at right angles to the surface of the sponge, we find that it is formed of a series of crypt-like layers of skeleton-fibre, each layer forming as it were a distinct and extensive crypt-like space with short, stout, cylindrical pillars with gradually expanded bases and capitals, the intervening portions of the shafts of the columns being irregularly studded with acutely conical incipient spines. Occasionally the regularity of the columnar arrangement is broken by the occurrence of large irregular interstitial spaces, into which short, stout, very spinous cylindrical or attenuating portions of fibre are projected, very like the basal portions of the auxiliary fibres that occur in several species of *Iphiteon*, but never appearing to throw off rectangulating lateral branches. These organs are evidently rather for defensive purposes than as auxiliary supporters of the sarcodous membranes, as beside them these spaces frequently have several long and slender acerate interstitial spicula traversing them in various directions; while in the crypt-like spaces a few only of such spicula are seen passing through them in diagonal directions (fig. 1, Pl. XXV.).

These interstitial spicula are very long and are frequently flexuous, and are sometimes extremely numerous and closely matted together. In this state they have probably belonged to the expansile dermal system; but in the present well-washed condition of the specimen the true position of these matted groups could not be determined. The probability, however, of their having belonged to the external surface is increased by the presence among them of fragments of a thin brown membrane and numerous grains of sand.

The skeleton-fibres are more or less spinous. The spines are acutely conical, and are irregularly dispersed over the surface; some parts of the skeleton have the fibres nearly spineless, while others are abundantly furnished with those minute organs.

The spinulo-hexradiate stellate spicula are found dispersed in all parts of the skeleton-tissues; but there are some little patches of intermingled remains of membranes and spicula in which eight or ten were in close conjunction, indicating the probability that in the natural condition of the sponge they were very numerously dispersed in the membranous tissues. I counted thirty rays in some of them; and we may therefore designate them as spinulo-multifurcate hexradiate stellate spicula.

The basal structure of the sponge is a remarkably beautiful tissue. It has on its surface an indistinct indication of irregular areas, similar to those of the skeleton-structure, when viewed at right angles to its surface; but the spaces of the open central areas are filled up by plates of siliceous structure perforated by numerous round or oval holes. The skeleton-structure immediately above it is an irregular modification of the ordinary skeleton-tissues, with dense patches of stout acerate spicula intermixed with it. A few patches of the basal membranous tissue remain *in situ*; in its present state it is of a brown amber-colour; no spicula could be detected imbedded in them.

Kaliapsis, Bowerbank.

Skeleton siliceo-fibrous. Basal fibres cylindrical and canaliculated; distal fibres non-canaliculated, compressed. Basal reticulations symmetrical and reversedly arcuate; distal reticulations unsymmetrical and continuously ramifying.

The structures of the sponge which is the type of this genus are remarkably anomalous, it combining in its skeleton both solid and canaliculated fibre, each having a separate and distinct mode of disposition in the animal. The terminations of the central canals of the basal cylindrical fibres are abrupt, and they are distinctly visible at the parts where the ramified skeleton commences. No evidence of central canals could be detected in any part of the upper ramifying portion of the skeleton-structure, which divides continuously as it approaches the surface, where the terminations spread horizontally in every direction, their extremities interlocking and forming a complicated and very beautiful lace-like surface to the rigid skeleton, a small portion of which is represented in Plate XXV. fig. 3.

These structures, and their modes of disposition, are so remarkable

as to cause this genus to be readily distinguished from any others with which we are acquainted among the siliceo-fibrous sponges.

KALIAPSIS CIDARIS, Bowerbank.

Sponge coating, parasitical, very thin. Oscula and pores unknown. Expansile dermal system furnished with foliato-peltate connecting spicula, peltate heads more or less mammillated, very various in form; shafts short and conical. Dermal membrane furnished abundantly with minute incipiently spinous fusiformi-cylindrical spicula, short and stout, dispersed. Skeleton—basal portion composed of stout canaliculated cylindrical fibre arranged symmetrically in a series of reversed semicircular confluent arches, from the crowns of which emanate short stout cidarate prehensile fibres with acutely conical terminations. Basal limbs of the arches attenuating and ramifying irregularly upwards, and terminating at the surface of the rigid skeleton in a plane of very complicated non-canaliculated retiform layer of depressed fibres.

Colour in the dried state white.

Hab. Parasitic on the base of *Oculina rosea*, from the South Seas (*J. S. Bowerbank*).

Examined in the dried state.

I found this singular and beautiful little sponge on the base of a specimen of *Oculina rosea* from the South Seas in 1855, and figured a portion of it in illustration of my paper on the "Anatomy and Physiology of the Spongiadæ" published in the 'Philosophical Transactions of the Royal Society' for 1862, plate 28. fig. 12, p. 759, as a specimen of prehensile sponge-fibre; and also in vol. i. of 'A Monograph of the British Spongiadæ,' plate 15. fig. 278, p. 80, for the same purpose.

I also figured seven specimens of the dermal connecting spicula in the 'Philosophical Transactions of the Royal Society' for 1858, plate 24. figs. 32–38 inclusive, in illustration of the foliato-peltate forms of connecting spicula, and described in detail the mode of their development from the simple discoid form to their mature and most complicated ramified condition. They are also figured in 'Monograph of British Spongiadæ,' plate 4. figs. 102, 103, and plate 5. figs. 104–108 inclusive, in illustration of the terminology.

The whole sponge, when attached to the base of the coral, did not exceed about 3 lines in diameter; and the largest portion obtained for examination is nearly square, 2 lines in length, and about $1\frac{1}{2}$ line in breadth, and not exceeding $\frac{1}{10}$ inch in thickness. Its peculiar structure is singularly illustrative of its parasitic habit. I have carefully examined many other specimens of *Oculina rosea*, but have never been fortunate enough to find another specimen.

On several portions of the largest piece of rigid skeleton I found one or two of the foliato-peltate spicula adherent and *in situ*; and in the material scraped from the coral matrix immediately surrounding the sponge, they were found in abundance in every stage of development, and along with them numerous very minute fusiformi-

cylindrical spicula, which had every appearance of belonging to the dermal membrane. With this indication, I mounted all the remaining fragments of the sponge in my possession, and I was fortunate enough to find a small piece of dermal membrane crowded with these minute spicula, and having several of the foliato-peltate spicula attached to its under surface, thus leaving no doubt remaining regarding the presence and nature of the expansile dermal membrane of this singular and beautiful species of siliceo-fibrous sponge (Pl. XXV. fig. 4).

The specific characters of the sponge, although few in number, combined with the peculiar and very striking ones derivable from the skeleton, which I have described in detail in treating of the genus, enable us readily to distinguish the species from any other siliceo-fibrous sponge. The cidarate prehensile fibres at the base of the sponge are remarkably curious organs; they proceed at right angles from the crowns of the reversed basal arches, and terminate in stout and acute cones; and intermediate between their origins and terminations each has a ring of stout round bosses admirably fitting them first to penetrate the fleshy external coat of the coral, and, when once inserted, to securely maintain their position. There is no mistaking the office of these curious and beautiful organs and the admirable adaptation to the nature of the basis on which they were destined to be parasitic (Pl. XXV. fig. 2).

The forms of the foliato-peltate heads of the connecting spicula are exceedingly various, passing through every gradation from simple circular plates to the most elaborate foliations. On some of the heads of the detached spicula groups of three or four of the minute fusiform-cylindrical retentive and defensive spicula were attached; but on some parts of the small fragment of the dermal membrane they were so numerous and so crowded together as to render their individual forms perfectly undistinguishable. The membrane is of a dark brown colour, and can scarcely be said to be transparent, in consequence of the number of the spicula and the density of the sarcode in which they are imbedded. I measured some of the largest and smallest of them, and found their average length not to exceed $\frac{1}{900}$ inch. The greatest diameter of a large one was $\frac{1}{6000}$ inch (Pl. XXV. fig. 5).

In these minute spicula the central canal was visible with a linear power of 666 throughout the whole of their lengths, and it occupied about one-sixth of the greatest diameter, so that its own diameter could not exceed about $\frac{1}{36000}$ inch.

FARREA OCCA, Bowerbank.

Sponge massive, pedicelled? Surface even? minutely hispid? Oscula and pores unknown. Dermis furnished with a quadrilateral smooth siliceo-fibrous network, armed at the angles oppositely, externally and internally, with short imbricated conical spicular defences. Skeleton—rete irregularly quadrilateral; fibre cylindrical, more or less minutely tuberculated or spined. Tension-spicula biternate, spiculated biternate, and furcated spiculated biternate,

and rarely attenuato-rectangulated triradiate spicula. Retentive spicula attenuato-stellate, very irregular in structure, minute, very numerous.

Colour in the living state unknown.
Hab. Seychelle Islands (*Capt. Etheridge, R.N.*).
Examined in the state of skeleton.

The remarkable sponge, the subject of the present description, is beautifully figured in the 'Transactions of the Linnean Society of London,' vol. xxii. plate 21, as the basal mass "of a coarse irregular siliceous sponge," upon which the subject of the paper, *Euplectella cucumer*, Owen, is based. The author very briefly notices the structure of this basal portion of his figure; and three small portions of its structure are represented by figures 8, 9, and 9*a*, with scarcely a sufficient amount of microscopic power to give an adequate idea of their structures.

The sponge is an irregular mass, 4 inches in length by about $2\frac{1}{4}$ inches in width, of siliceo-fibrous structure: about 2 inches of the basal portion of its length consists of a dense irregularly cylindrical stem about $\frac{1}{2}$ inch in diameter; from its surface-structure, as seen by the aid of a 2-inch lens, there appears to be no doubt of its being truly a portion of the sponge whence it is projected. The dense structure and mode of projection of this indurated portion of the sponge renders it probable that in the living state the animal was more or less elevated on a pedestal.

The greater portion of the body of the sponge is in a disrupted state, apparently from compression; but the whole of its structures are loosely bound together by the numerous long prehensile basal spicula of the *Euplectella*, which penetrate its substance and envelop it on every side. Fragments of the beautiful harrow-like tissue of the dermis are dispersed on various portions of the specimen; and in one place, partly hidden by what appears to be the small valve of a *Terebratula*, there is a portion of the harrow-like tissue about equal to half or three-fourths of a superficial square inch. The general distribution of the fibres of the skeleton is not readily to be determined, as the intermixture of the prehensile basal spicula of the *Euplectella* with its tissues is so abundant as to very much confuse its general aspect to the eye of an observer. The dermal structure of this sponge is very remarkable. It consists of a regular quadrilateral network of smooth siliceous fibre, from the angles of which a double set of short conical spiculum-shafts are projected, each about $\frac{1}{120}$ inch in length, and entirely covered with spines. Each set are at right angles to the plane of the network, one series pointing inward and serving the purpose of attaching the dermis to the body of the sponge beneath, while the other set are directed outward, serving as defensive weapons; so that a small piece of this tissue beneath the microscope closely resembles an agricultural harrow, with the difference that it has two sets of teeth in opposite directions instead of one. The dermal membrane has been nearly all destroyed; but entangled with the fibres of the skeleton there are some of the attenuato-stel-

late spicula, with which it is probable that the membrane was amply furnished as secondary defences against minute enemies.

This singular tissue is figured in the 'Philosophical Transactions of the Royal Society' for 1862, plate 32. fig. 7, and also in my 'Monograph of the British Spongiadæ,' vol. i. plate 21. fig. 311. I believe the portions presented to the eye in the pieces figured to be the external surface, as the fragments of the dermal membrane which remained all seemed to cover that side of the fibres of the network, and the presence of the external series of the spicular organs is strongly indicative of the minute hispidation of the surface of the sponge in its natural condition.

In the present condition of the sponge it is impossible to determine whether this singular harrow-like dermal structure was continuous over the whole of its surface when in the living condition; but the probability is, judging from the general structure of the expansile dermal system of every other known species of siliceo-fibrous sponge, that it was composed of detached sections, so as to allow of the usual amount of expansion and contraction that we observe to exist in every other such sponge.

The reticulation of the skeleton is always angular, but the areas vary from square into all imaginable varieties of the oblong figure. The fibre is stout and strong, with a well-defined central canal in its fully developed condition; a portion of it is represented in Plate XXIV. fig. 1, with numerous attenuato-stellate retentive spicula adhering to the fibres.

Occasionally in some portions of the skeleton-fibre we find two canals, neither of which are central: this abnormal form probably arises from two immature fibres, closely approximated in an early stage of their development, uniting longitudinally; and in one case I observed as many as three irregular portions of canals in one fragment of the fibre; but this irregularity of structure is the exception and not the rule. The spination of the skeleton-fibres is very slightly produced in the form of acute cones, and in some of the larger fibres it may be almost designated as incipient, while occasionally in some of the immature ones the spinules assume the forms of tubercles, which are sometimes more or less bifurcated.

The interstitial tension-spicula of this sponge are very remarkable organs. They are simple biternate, spiculated biternate, and furcated spiculated biternate. Sometimes one termination only is spiculated, sometimes both are thus furnished. One or two of the terminal radii are frequently furcated; but it is of rare occurrence that the whole of them are produced to that extent. They occur in groups entangled together; in several of these groups they were numerous and closely packed, much in the same manner in which we find the spinulo-trifurcated hexradiate spicula of the interstitial membranes of *Dactylocalyx pumicea* when seen *in situ*. They are stout and comparatively of large size (Pl. XXIV. figs. 5 & 6).

The attenuato-stellate retentive spicula are minute and very irregular in their structure and in the number of their radii. They have evidently been very numerous, as they are frequently found adhering

in considerable numbers around portions of the skeleton-fibres; and it is probable that the dermal and interstitial membranes were abundantly furnished with them (Pl. XXIV. figs. 2, 3, 4).

This remarkable sponge is in its skeleton-structures exactly like those of a *Verongia*, its siliceous nature constituting the only essential difference. The specimen is undoubtedly by far the most valuable of the two represented in the plate in the 'Transactions of the Linnean Society.' In conclusion, I must return my best thanks to my friend Dr. A. Farre for the repeated opportunities I have had of closely examining its structure.

PURISIPHONIA, Bowerbank.

Skeleton siliceo-fibrous, reticulate, unsymmetrical; fibres composed of concentric layers of solid silex, with a continuous central canal.

This genus is intermediate in its structure between *Dactylocalyx*, Stutchbury, and *Farrea*, Bowerbank. Like the latter, its fibres are continuously canaliculated; but it has not anything approaching the angulated symmetrical arrangement of its skeleton-fibres; on the contrary, it very closely simulates the mode of the distribution of the fibres that prevail in *Dactylocalyx*. The central canals in the fibres of the species of *Purisiphonia* on which the genus is founded occupy from about one-fifth to one-third of the entire diameter of the fibre; they are straight and uniform in their own diameter, and have little or no enlargements at their junctions with each other. The reticulations of the skeleton are frequently extremely close, so that the areas do not exceed, or sometimes even equal, the diameters of the fibres bounding them,

PURISIPHONIA CLARKEI, Bowerbank.

Sponge fistulous, branching; surface of rigid skeleton even. Oscula simple, dispersed over the inner surface of the fistulæ. Dermal structures unknown. Skeleton stout, closely reticulated. Interstitial cavities furnished with rectangulated hexradiate spicula.

Hab. Wollumbilla, Queensland, Australia (*Dr. Clarke*). Fossil.

There is much greater difficulty in the specific description of a fossil sponge than of a recent one, as a considerable portion of the most decisive specific characters are usually absent, in consequence of the decomposition of the softer parts of the organization previously to fossilization; and this is doubtless the case with the specimen under consideration; but although thus deprived of the use of many valuable descriptive characters, there are sufficient remaining to enable us to securely determine its specific identity.

It is difficult to say what has been the correct form of the specimen in its unmutilated state; but, judging by its present condition, it has originally been a large fistulous sponge, giving off fistular branches at irregular intervals. The large fistular body of the sponge has been split longitudinally, and a portion 4 inches in length, and of about half of the tube of the sponge, remains, and from the

surface of this the entire basal portions of two secondary fistular branches proceed. There are also the remains of another such branch at the margin of the primary fistula at the right-hand side. The outer surface of the sponge has an irregular reticulation of stout siliceous fibres, very similar to those of *Dactylocalyx* immediately beneath the dermis.

In all the recent species of this tribe of siliceo-fibrous sponges with which I am acquainted, there is an expansile dermal system attached to the stiff non-expansile skeleton beneath by connecting spicula cemented at their basal points more or less to the mass of the skeleton beneath by keratode only, and which would naturally be separated from the body of the sponge by maceration and by decomposition of the membranous and keratose matter a short period after its death; and none of the expansile dermal system, it is probable, would appear with the fossil unless it were to be enveloped and fixed in the matrix after its death—a result scarcely to be expected. This organized envelope usually affords the most distinct and determinative specific characters of the sponge, and it was very important to discover its remains if possible; but in this attempt I have been unsuccessful.

In its living condition this sponge would probably exhibit a smooth membranous surface; but in its present state we have large open areas exhibited *in lieu* of the smooth dermal membrane. These areas are, in fact, the distal ends of the intermarginal cavities, and are usually much larger than the interstitial spaces immediately beneath them. In the specimen under consideration, as in similarly organized recent sponges, the proximal terminations of the intermarginal cavities communicate immediately with the distal ends of the interstitial spaces, and these uniting increase in their size as they progress towards the inner parietes of the great cloacal cavity of the sponge, into which they finally discharge their streams through the oscula. In this organization they closely resemble the structures in the recent genera *Grantia*, *Verongia*, and many of the fistular keratose sponges of the West-Indian seas.

I have not detected any connecting spicula, and I have assigned the rectangulated hexradiate ones to the interstitial cavities on the faith of some very dilapidated remains of them, deeply immersed in the tissues, and rendered visible only by the penetrating power of the Lieberkühn—and by two other fragments, one detached, represented in Plate XXV. fig. 7, and the other *in situ*, in the portion of the skeleton figured at *a*, fig. 6, Plate XXV.

The nearest relations to this tribe of sponges among the fossil ones are decidedly the siliceo-fibrous sponges of the Flamborough Chalk; below that formation I am not aware of any such sponges having ever been found. The matrix of the Australian fossil also possesses much of the character of chalk; it dissolves completely in dilute hydrochloric acid, leaving only a small quantity of sandy residuum.

I may also observe that the similarity of form and structure between the Australian and the English Chalk fossil sponges in this

case is by no means a new fact, as there are abundant instances of similar close alliances existing among the recent Australian sponges and those of the chalk formation of England; and amongst the most prominent are the existing representatives of *Choanites* and *Ventriculites*.

ALCYONCELLUM SPECIOSUM, Quoy et Gaimard.

Euplectella aspergillum, Owen, Trans. Zool. Soc. iii. p. 203.
Euplectella cucumer, Owen, Trans. Linn. Soc. xxii. p. 117, pl. 21.

Sponge sessile, cylindrical, more or less curved, enlarging progressively from the basal to the distal extremity; upper portion furnished with numerous sharp ridges of interlacing fibres disposed diagonally and somewhat symmetrically; apex truncate, closed by a coarse, ventricose, fibrous network, and encircled by a strongly produced fibrous ridge or frill. Base furnished with numerous fasciculi of large and long prehensile spicula projected downward; spicula attenuato-quaternate, barbed alternately for about one-third of their length from the distal extremity. Oscula congregated, terminal. Pores congregated; inhalant apertures symmetrically equidistant, disposed in lines radiating from the base to the apex of the sponge. Dermal membrane abundantly spiculous; spicula acerate, long and slender, fasciculated; fasciculi compact, disposed in radiating or parallel groups. Skeleton symmetrical: primary lines radiating from the base to the apex, equidistant; secondary lines at right angles to the primary ones; interstitial structures interlacing diagonally. Spicula of the membranes—interstitial spicula rectangulated attenuated hexradiate, short and stout, rarely completely developed; also attenuated rectangulated triradiate apically spined. Spicula of the sarcode trifurcated attenuato-hexradiate stellate, and floricomo-hexradiate, very minute.

Colour amber-yellow?

Hab. Philippine Islands; Island of Bohol, 10 fathoms (*Mr. Hugh Cuming*); Island of Zebu, about 24 fathoms (*Mr. R. Geale*).

Examined in the skeleton-state.

There are several indications of a close alliance between *Alcyoncellum* and *Dactylocalyx*, *Iphiteon*, and the other genera of well developed siliceo-fibrous sponges.

The structure of the skeleton-fibres and their habit of anastomosing whenever they touch each other are precisely the same as they are in the genera I have named. The floricomo-hexradiate stellate retentive spicula of *Alcyoncellum*, Plate XXIV. fig. 11, and the beautiful spinulo-multifurcate hexradiate spicula of *Iphiteon callocyathes*, Plate XXIII. fig. 7, are so peculiar in their forms, and so similar in the mode of their construction and relative positions in the two sponges, as to at once lead us to the conclusion that the two species are in very close alliance with each other. A similar close alliance is indicated by the comparison of the slender attenuated rectangulated-hexradiate interstitial spicula of *Alcyoncellum* (Pl. XXIV. fig. 9) and those of *Iphiteon callocyathes* represented Plate XXIII.

fig. 5. These strongly marked points of resemblance in form and identity in relative situation and office between the auxiliary spicula, in addition to those of the skeleton, irresistibly lead us to the conclusion that these sponges, however different in their forms, are structurally members of the same family. Strongly marked differences in form are apt to lead our judgments astray when superficial observations only are made of the specimens before us; but when we see such extraordinary variations of form occurring in the same species under different circumstances and amounts of development as those we observe in sponges with the habits of which we are perfectly familiar, as, for instance, in our protean species *Halichondria panicea*, we should be prepared to admit, as in truth we ultimately must do, the same latitude of variation among the nearly allied species and individuals of the same species of the siliceo-fibrous sponges.

In all the numerous specimens of *Alcyoncellum* with which I am acquainted, the skeleton is composed of rigid inosculating siliceous fibre, as I have stated in my paper on *Alcyoncellum speciosum*, Proc. Zool. Soc. 1867, p. 351, in my description of the generic character in p. 353, in the following terms:—"Skeleton siliceo-fibrous; primary lines radiating from the base in parallel, straight, or slightly spiral lines; secondary lines at right angles to the primary ones." I will not reiterate here the full details of the structure of these beautiful sponges that I have given in my paper as quoted above; and such a repetition is the more unnecessary as they have been imported so abundantly of late as to place specimens for microscopical examination within the reach of almost every one interested in the subject. The sponges have also been figured in Trans. Zool. Soc. vol. iii., and in Trans. Linn. Soc. London, xxii. pl. 21, and also in the Ann. & Mag. Nat. Hist. for Feb. 1868, pl. iv.; but in none of these plates is there any delineation of the skeleton-structure with a high microscopical power, and it is this want that I purpose at the present time to supply, that we may be enabled to arrive at a sound conclusion as regards its true skeleton-structure, and also as to such of its specific characters as have not hitherto been figured or described.

Dr. Gray, in his "Notes on the Arrangement of Sponges," Proc. Zool. Soc. 1867, p. 492, has, at p. 504, described the *Euplectelladæ* (*Alcyoncellum*, Quoy et Gaimard) as having a "skeleton composed of longitudinal, transverse, and oblique bundles of spicules intersecting each other and forming a network;" and Prof. Wyville Thomson, in his paper on the "Vitreous" Sponges, Ann. & Mag. Nat. Hist. for Feb. 1868, p. 114, at p. 126, in his description of his proposed new genus "*Habrodictyon*," has adopted the error into which Dr. Gray has fallen by describing the skeleton as consisting "of a perfectly irregular network of siliceous needles loosely and irregularly arranged in sheaves crossing one another at low angles, and connected by a small quantity of soft mucilaginous sarcode." These descriptions of the skeleton are, in both cases, completely erroneous, as can be readily demonstrated by boiling portions of the

skeleton in nitric acid, when it will be immediately apparent that no disintegration of the reticulated structure results from this operation, which would inevitably be the case if it were formed of fasciculi of spicula held together by sarcode only. On the contrary, the whole of the skeleton is formed of an irregular network of solid siliceous fibres approaching each other and anastomosing with more than the usual frequency in such sponges.

Very few, if any, of the secondary fibres in either the transverse or diagonal portions of the skeleton are simple in their structure. They seem always to be composed of two or more simple fibres running parallel to each other and anastomosing at short distances. Sometimes the anastomosing points of two parallel fibres are so close to each other that the two thus combined have the appearance of a narrow tape or ribbon with thickened margins and a line of nearly uniform pinhole perforations running down the middle of it.

Amidst these complicated anastomosing lines of the skeleton numerous stout rectangulated hexradiate and triradiate spicula are irregularly mixed; they appear as if they were simply entangled amidst the tissues supporting and supported by the interstitial membranes of the sponge. None of them under these circumstances have any permanent connexion with the skeleton; neither do the spicula of the numerous bundles of long prehensile organs so abundant towards the base of the sponge ever anastomose with the skeleton-fibres or with each other. No marks of such an attachment can be detected upon any part of them; and, in truth, their recurved spinous appendages and their long and flexible shafts imbedded in the tough membranous integuments of the dermal tissues renders such anastomsis of the organs with the rigid skeleton quite unnecessary; and if we measure the probability of the possession of such dermal integuments by *Alcyoncellum* in a living state with what we know of the dermal structures of *Dactylocalyx Masoni, Prattii,* &c., little doubt can remain in our minds that its dermal integuments are much of the same nature as those of the rest of the rigid siliceo-fibrous sponges. The structure of the stout network of the oscular area is very similar to that of the corresponding organ in *Iphiteon beatrix*. Each fibre of the net is compounded of a condensed mass of simple skeleton-fibres anastomosing in every direction as in that of *I. beatrix*. In truth, the more searchingly we examine the skeleton-structures of the beautiful subject under description the more closely we find its alliances to be to the great family of the siliceo-fibrous sponges.

It is much to be regretted that, amidst the large number of specimens that have recently been imported, there does not appear to have been any one of them preserved in the living state as when taken from the sea; nor have we any well authenticated report by a competent naturalist of their condition when thus obtained. But if we may reason from the analogies presented by other siliceo-fibrous sponges preserved in the state in which they were taken from the sea, we should expect to find *Alcyoncellum* with a stout and somewhat coriaceous enveloping dermal membrane; and I have in my possession a fragment of such a membrane about 2 lines in length,

and ½ in breadth, which was shaken off a specimen of *A. speciosum* that I purchased of Mr. Geale in January 1867.

This fragment of membranous tissue is, comparatively speaking, of considerable thickness, and abounds in amber-coloured sarcode, and there appear to be two well-defined layers of tissue. In the external one there are numerous fasciculi of long slender acerate spicula, the number in each being much too numerous to be counted, and they are very compactly disposed. In one part of the surface the fasciculi radiate from a common basal point, while in two other parts they are nearly parallel to each other. On reversing the specimen the internal layer presented a rudely cellulated appearance, abounding in sarcode, in which two of the most characteristic auxiliary spicula of *Alcyoncellum* were deeply imbedded—one of them, an incompletely developed stout rectangulated hexradiate interstitial spiculum, exactly represented by fig. 181, plate 7, Mon. Brit. Spongiadæ, vol. i., and the other a rectangulated hexradiate one, represented by fig. 198, plate 9, of the same work; and there is also a slender rectangulated hexradiate spiculum, like the one represented by fig. 10, Plate XXIV., illustrating the present paper. With these indications, I think there is little doubt that the structure I have described is a portion of the dermal system of *Alcyoncellum*, and that, when we obtain a specimen in the condition in which it is taken from the sea in the living state, we shall find the beautiful skeleton entirely enveloped by such a dermal membrane as I have described from the fragment in my possession.

Should these ideas prove correct, a slight addition would become necessary in my description of the specific characters of *Alcyoncellum speciosum* in the Proc. Zool. Soc. for March 28, 1867, p. 354, line 12 of the specific character, where the dermal membrane is described as "unknown," in place of which should be added, "Dermal membrane abundantly spiculous; spicula acerate, long and slender, fasciculated; fasciculi compact, disposed in radiating or parallel groups."

In this description of the dermal structure of the sponge, it will be observed that there are no connecting spicula present; and we may therefore infer that the genus *Alcyoncellum* is not furnished with an expansile dermal system as in the massive rigid skeletons of *Dactylocalyx* and other similar siliceo-fibrous sponges. The fistular construction of the skeleton in *Alcyoncellum* renders such a provision as an expansile dermal system quite as unnecessary as it would be in the genus *Grantia* and numerous other fistulous sponges.

I obtained also two fragments of the skeleton in which there was a considerable quantity of sarcode; and immersed in this substance numerous rectangulated triradiate and rectangulated hexradiate spicula of the slender descriptions were intermixed without any apparent arrangement. Every one of the interstices of the fibrous skeleton, large or small, was abundantly supplied with them. The well-washed specimens of the sponge now so numerous afford no adequate idea of the profusion of these descriptions of spicula that exist in the sponge in its natural condition.

There were also numerous indications of the presence of floricomo-

hexradiate stellate spicula amidst the sarcode; but the density of that substance rendered them almost invisible.

In some of the specimens that I have recently examined, I have observed a remarkable habit of some of the rectangulated hexradiate spicula—that is, that one of the axial radii is more or less sheathed or enveloped by branches of skeleton-fibre, so as to give the spiculum a firm and permanent position; and this appears to be more frequently the case with those which are projected into the inhalant areas. This attachment of the spiculum by the fibre is not a fusing of one into the other, as when two fibres touch each other, but it is simply a partial envelopment of a portion of one of the radii, so as to give it a secure basal point of attachment to enable it to perform its appointed office of sustaining the interstitial membranes of the sponge under peculiar circumstances, or to protect the orifice over which it is projected. The portion of the ray thus enveloped may frequently be traced within the enveloping fibre. It is a very remarkable fact that none of the other auxiliary spicula, although large and strong, are ever seen to be thus agglutinated by the fibres. This singular habit of the rectangulated triradiate spicula assimilates them in their office in some measure to the auxiliary fibres in the skeletons of *Dactylocalyx* and *Iphiteon*. Although thus agglutinated by the fibre, they really form no essential part of the true rigid skeleton of the sponge, but are in reality neither more nor less than auxiliary supports to the interstitial membranes under certain conditions.

APPENDIX (May 25, 1869).

Since the preceding portion of this paper was written, I have seen several specimens of *Alcyoncellum speciosum* that were sent home in spirit in the condition they were in when taken from the sea. There were five specimens, all as nearly as possible in the same condition. They were of a dark dirty colour, and looked very much as if they had been dipped into thin mud and then dried. On mounting slices from the surface, and fragments of the entire structure of the skeleton, this dirty-looking substance, when immersed in Canada balsam, proved to be the remains of the membranous and sarcodous tissues; but I could not find any traces of a dermal membrane, such as might naturally be expected to be present if the sponges were in a living condition when taken from the sea. The largest specimen in spirit had a considerable portion of one side of it entirely deficient of the sarcodous and membranous structures that were abundant in the other parts of the specimen. This circumstance, the deficiency of dermal membrane, and the condition of the sarcode and interstitial membranes in the whole of the specimens, appears to lead to the conclusion that these specimens were dead sponges in a state of partial decomposition, and that we have yet to acquire specimens which were in the living state when brought up from the bottom of the sea.

Although not in so satisfactory a condition as may have been desired, they were still in such a state of preservation as to afford some interesting points of information regarding the structural pecu-

liarities of the animal. Thus the true natural positions and mode of arrangement of the stout attenuated rectangulated hexradiate spicula, the full series of the varieties of which are figured in the 'Philosophical Transactions,' 1858, plate 25. figs. 24–33, and in Mon. Brit. Sponges, vol. i. plate 7. figs. 174–183, are well exhibited *in situ*, which I have never yet seen in any of the well-washed specimens with which we are now so familiar. In the large lateral orifices of such specimens they are sometimes entirely wanting, or a few only of them are found in the neighbourhood of the large circular area. In the specimens in which they are held in their natural positions by the sarcodous and membranous tissues, they are regularly disposed around the circular area, forming a compact marginal ring, their stout radii projecting in every direction among the surrounding portions of the skeleton, but not within the circular area; so that where one of the radii would, by the natural laws of development, have been found, its production is arrested, and it is represented by only a slight tumefaction on the axis of the spiculum; hence it is that we find such numerous varieties of form among these remarkable spicula. All the other radii immersed in the surrounding structures are completely developed, crossing each other in every direction; so that although unconnected by siliceous cementation with the fibrous skeleton, they form a strong but somewhat expansile marginal band to the circular area. We are thus enabled to perceive the reason of the numerous cases of the suppression of frequently several of the radii of these marginal spicula, and to read the important fact from their positions and modifications that their production is as much regulated and modified by the structural necessities of the organs in which they form important parts, as are the bones and other organic structures of the most highly constituted animals.

The true positions of the slender rectangulated hexradiate spicula with elongated basal axial rays are also well determined in these specimens; they are seen in considerable numbers in the interstitial cavities of the sponge, supporting the interstitial membranes, and vastly increasing the amount of surface in those vital organs.

The trifurcated attenuato-hexradiate and floricomo-hexradiate spicula are not very numerous; they are irregularly dispersed on the sarcodous membranes of the sponge, and are completely immersed in the sarcode, and without the aid of Canada balsam are usually invisible.

DESCRIPTION OF THE PLATES.

PLATE XXI.

Fig. 1. A portion of the rigid skeleton of *Iphiteon panicea* from the specimen from Porto-Rico, in the Museum of the Jardin des Plantes, Paris, exhibiting the confluent structure of the rotulate areas of the skeleton, rectangulate hexradiate spicula, and a few gemmules *in situ*, ×108 linear.

Fig. 2. A section at right angles to the surface of *Iphiteon beatrix*, exhibiting the confluent rotulate structure of the rigid skeleton, the fasciculi of acerate spicula, and the verticillately spinous retentive spicula *in situ*, ×108 linear.

Fig. 3. One of the inhalant areas on the external surface of the rigid skeleton of *I. beatrix*, exhibiting the elongo-conical defensive fibres and numerous verticillately spined retentive spicula *in situ*, ×108 linear.

Fig. 4. One of the large excurrent orifices on the side of the great cloacal cavity within the sponge of *I. beatrix*, ×108 linear.

Plate XXII.

Fig. 1. A small portion of the rigid skeleton of *Iphiteon panicea* from Porto Rico, exhibiting the abundance of the gemmules in some parts of the sponge, ×108 linear.

Fig. 2. A portion of one of the fibres forming the oscular area of *Iphiteon beatrix*, exhibiting the compound reticulate nature of its structure and a few of the slender acerate spicula *in situ*, ×108 linear.

Fig. 3. One of the attenuated rectangulated hexradiate interstitial spicula with one of the shaft-radii spinous, from *I. beatrix*, ×308 linear.

Fig. 4. A retentive verticillately spined spiculum from *I. beatrix*, ×308 linear.

Figs. 5, 6, 7, 8. Four of the porrecto-multiradiate retentive spicula from *I. beatrix*, ×308 linear.

Fig. 9. One of the subfusiformi-cylindrical entirely spinous spicula from *I. beatrix*, ×108 linear.

Fig. 10. A portion of the surface of the rigid skeleton of *Iphiteon subglobosa*, exhibiting the umbonal clusters of coarse tubercles, rectangulated hexradiate interstitial spicula *in situ*, and numerous spinulo-quadrifurcate and pentafurcate hexradiate stellate retentive spicula dispersed amidst the interstices of the skeleton, ×108 linear.

Fig. 11. One of the minute spiculated biternate retentive spicula of the dermal membrane of *I. subglobosa*, ×666 linear.

Fig. 12. Two of the rectangulated hexradiate auxiliary fibres from *I. subglobosa*, based on a portion of a fibre of the rigid skeleton, anastomosing by their radii, ×175 linear.

Fig. 13. One of the pentafurcate hexradiate stellate retentive spicula of *I. subglobosa*, ×666 linear.

Plate XXIII.

Fig. 1. A small portion of the surface of the rigid skeleton of *Iphiteon Ingalli*, exhibiting its confluent rotulate structure with quadrifurcate hexradiate stellate spicula amidst the fibres opposite *a*, *a*, *a*, *a*, ×108 linear.

Fig. 2. One of the quadrifurcate hexradiate stellate retentive spicula of *I. Ingalli*; three of the primary radii having been broken off, the quadrifurcate structure of the remaining radii is very distinctly displayed: ×530 linear.

Fig. 3. One of the rectangulated hexradiate interstitial spicula of *I. Ingalli*, ×108 linear.

Fig. 4. A small portion of the surface of the rigid skeleton of *I. callocyathes*, exhibiting the more or less verticillate disposition of the minute spines of the skeleton-fibre, ×108 linear.

Fig. 5. One of the rectangulated hexradiate interstitial spicula of *I. callocyathes*, ×175 linear.

Fig. 6. A furcated foliato-expando ternate connecting spiculum of *I. callocyathes*, covered by the minute, short, stout acerate tension-spicula of the dermal membrane, ×183 linear.

Fig. 7. A very perfect and beautiful example of a spinulo-multifurcate hexradiate stellate retentive spiculum of *I. callocyathes*, ×666 linear.

Fig. 8. A view of portions of two of the intervening planes of perforated siliceous tissue parallel with the external surface of the rigid skeleton, and which divide the layers of crypt-like tissue of the skeleton of *Myliusia Grayii* from each other, with their numerous circular orifices of intercommunication between the upper and lower strata of the skeleton, ×108 linear.

PLATE XXIV.

Fig. 1. A small portion of the rigid skeleton of *Farrea occa*, exhibiting its angulated structure and central canals in the fibres, on which are dispersed numerous small attenuato-stellate retentive spicula, ×108 linear.

Figs. 2, 3, & 4. Three of the small attenuato-stellate retentive spicula from *F. occa*, showing some of their numerous variations in form, size, and the number of their radii, figs. 2 & 3 ×400, & fig. 4 ×666 linear.

Fig. 5. A spiculated biternate interstitial spiculum from *F. occa*, ×45 linear.

Fig. 6. A furcated spiculated biternate interstitial spiculum from *F. occa*, ×65 linear.

Fig. 7. A portion of the harrow-shaped quadrilateral siliceo-fibrous dermal structure of *F. occa* oppositely armed at its angles, ×50 linear.

Fig. 8. A fragment of the siliceo-fibrous skeleton of *Alcyoncellum speciosum*.

Fig. 9. A slender attenuated rectangulated hexradiate interstitial spiculum with nearly equal radii from *A. speciosum*, ×175 linear.

Fig. 10. A slender attenuated rectangulated hexradiated interstitial spiculum with elongated basal shaft from *A. speciosum*, ×108 linear.

Fig. 11. A very fine specimen of floricomo-hexradiate stellate retentive spiculum from *A. speciosum*, ×666 linear.

PLATE XXV.

Fig. 1. A portion of a section of the rigid skeleton of *Myliusia Grayii*, at right angles to the surface, exhibiting the crypt-like arrangement of the skeleton, ×108 linear.

Fig. 2. A section at right angles to the surface of the skeleton of *Kaliapsis cidaris*, from the surface to the basal prehensile organs, exhibiting the change of the structure from the basal canaliculated fibres to the imperforate and ramifying ones of the superior mass of the skeleton, ×183 linear.

Fig. 3. A portion of the minute ramifications of the fibrous structure of the surface of the rigid skeleton of *K. cidaris*, ×308 linear.

Fig. 4. Three of the foliato-peltate connecting spicula of the expansile dermal system of *K. cidaris*, one of them (*a*) having upon it a group of minute incipiently spinous fusiformi-cylindrical spicula, ×175 linear.

Fig. 5. Two of the minute incipiently spinous fusiformi-cylindrical spicula of the dermal membrane of *K. cidaris*, ×666 linear.

Fig. 6. A portion of the rigid skeleton of *Parisiphonia Clarkei*, exhibiting the irregular mode of disposition of the canaliculated siliceo-fibrous structure, and one of the rectangulated hexradiate interstitial spicula *in situ*, opposite (*a*), ×108 linear.

Fig. 7. An imperfect rectangulated hexradiate interstitial spiculum from *P. Clarkei*, ×175 linear.

7. On the Genus *Alcyone*.

By R. B. SHARPE.

I propose to give short synopses of some of the more obscure genera of the family *Alcedinidæ*, in order that the various species, before appearing in my 'Monograph,' may be brought under the notice of ornithologists, and thus my arrangements and synonymy may be fairly exposed to criticism. It is my wish to make the Monograph of the Kingfishers as complete as possible; and I therefore invite the criticisms of all my friends, in order that I may be able to take advantage of them in my larger work.

Having already (P. Z. S. 1868, p. 587) treated of the genus *Ceyx*, I propose in the present paper to discuss the genus *Alcyone*, which has only three toes, and is otherwise closely allied to *Ceyx*. The genus *Alcyone* was founded in 1837 by Swainson (Classif. of Birds, ii. p. 336), and at present contains seven species.

The two most distinct and clearly characterized are *Alcyone pusilla* and *A. cyanopectus*; but the other five are very closely allied and hard to distinguish. I believe that the following synoptic table will materially assist in their identification :—

A. Torque pectorali lazulino ..... 1. *A. cyanopectus.*
B. Torque pectorali nullo.
  a. Abdomine rufo.
    a'. Rostro robustiore.
      a''. Supra saturate ultramarina..... 2. *A. lessoni.*
      b''. Supra lætissime ultramarina ..... 3. *A. affinis.*
    b'. Rostro tenuiore.
      a''. Rostro breviore: pileo nigro indistincte fasciato ..... 4. *A. diemensis.*
      b''. Rostro longiore: pileo haud fasciato.
        a'''. Hypochondriis rufis..... 5. *A. azurea.*
        b'''. Hypochondriis pulcherrime ultramarinis ..... 6. *A. pulchra.*
  b. Abdomine albo ..... 7. *A. pusilla.*

The first on the above list, *Alcyone cyanopectus*, serves to connect the genus *Alcyone* with *Ceyx*, as it is very closely allied to *Ceyx philippinensis*, Gould; and, on the other hand, another link is discovered in *Alcyone pusilla* and *Ceyx solitaria*, both of which species are closely allied. The principal difference between the genera *Ceyx* and *Alcyone* is in their habits. Whereas the *Ceyces* are almost entirely insectivorous, the members of the genus *Alcyone* feed almost entirely on fish. The geographical distribution of each genus is also in favour of their direct affinity. *Ceyx* is an Indian genus strictly speaking, extending all over the Indian peninsula and Malayasia, being also distributed over the Malay archipelago, where, however, a different form of the genus (with bright blue back) is met with. On the other hand, *Alcyone* is essentially a typical Australasian genus, being widely distributed over the whole Australian continent, and thence extending northwards, through the Austro-Malayan subregion, to the Philippines. In these islands the aberrant species *Alcyone cyanopectus* occurs; and in every respect as regards plumage this species is a true *Ceyx*. In form of bill, however, it is an *Alcyone*—although, but for the distinct pectoral band and blue flanks, it might be mistaken for *Ceyx philippinensis*. My friend Dr. Salvadori has written to me, calling in question the propriety of my placing this latter bird in the genus *Ceyx*; but in my opinion the species really belongs here. *Alcyone cyanopectus* should probably also be included in the genus *Ceyx* as an aberrant species forming the point of union between the two genera, and I should not be at all surprised to find this view adopted by some future systematist. But no satisfactory conclusion can be obtained until we know more of the habits and geographical distribution of these two

Philippine species. The arrangement proposed above, viz. of uniting *Alcyone cyanopectus* to *Ceyx philippinensis* under one and the same genus, would be more natural, as we should then have all the three-toed Kingfishers with bright backs under the genus *Ceyx*; and all those having the upperside uniform under *Alcyone*. No one who saw the specimens from which I described and figured the species in my 'Monograph' would doubt for an instant that I had placed them in the proper genera, from a study of their external form.

The following I believe to be the correct synonymy of the various species of *Alcyone*, specimens of all of which are at present before me:—

1. ALCYONE CYANOPECTUS. Blue-girt Kingfisher.

Ceyx cyanopectus, Lafr. Rev. Zool. 1840, p. 33; Gray, Gen. of Birds, App. p. 5 (1848).

Alcyone cyanopectus, Jard. Contr. to Orn. 1850, p. 82; Sharpe, Monogr. *Alced.* pt. 4 (1869).

Alcyone cyanipectus, Bonap. Consp. Gen. Av. i. p. 158 (1850); Reich. Handb. *Alced.* p. 7, t. 396. f. 3060 (1851); Bonap. Consp. Vol. Anis. p. 10 (1854); Hartl. Journ. f. Orn. 1854, p. lxiv.

Alcedo cyanipectus, Schleg. Mus. Pays-Bas, *Alced.* p. 18 (1863).

Alcyone cincta, Jard. Contr. to Orn. 1850 (plate only).

A. *torque pectorali lazulino lato: mandibula nigricante, maxilla aurantiaca.*

Hab. in insulis Philippinis.

Head deep bluish black, irregularly banded with bright blue, more thickly on the nape; the whole of the back rich shining cobalt; scapularies and wing-coverts black, broadly washed with dark blue, the latter also spotted with bright cobalt; wing-feathers brownish black, the secondaries narrowly edged with indigo; tail black, washed with indigo; cheek indigo, spotted with cobalt; a spot in front of the eye, a patch of feathers at the side of the neck, throat and upper part of the breast, whitish tinged with pale sienna; a band across the upper part of the breast and the flanks deep indigo, tinged with brighter blue on the latter; abdomen and under wing-coverts rufous; bill brownish black, the lower mandible tinged with orange. Total length 5 inches, of bill from the front 1·4, from gape 1·7, wing 2·5, tail 0·7, tarsus 0·3, middle toe 0·3, hind toe 0·2.

Hab. Philippine Islands (*Mus. T. C. Eyton*).

The description and measurements are from Mr. Eyton's specimen, the same described by Sir William Jardine and kindly lent me by Mr. Eyton.

2. ALCYONE LESSONI. Lesson's Kingfisher.

Alcyone lessonii, Cass. Proc. Phil. Acad. 1850, p. 69; *id.* Cat. Halc. Phil. Mus. p. 5 (1852); Sclater, Journ. Proc. Linn. Soc. 1858, p. 156.

Alcyone azurea, var. *lessonii*, Gray, P. Z. S. 1859, p. 155; *id.* P. Z. S. 1861, p. 433.

Ceyx azurea, Less. Voy. Coq. Zool. i. p. 690 (1826).
Alcyone azurea, Rosenb. Journ. f. Orn. 1864, p. 118.

A. *torque pectorali nullo: abdomine rufo: rostro robustiore: supra saturate ultramarina.*

Hab. in Nova Guinea et in insulis dictis "Aru."

Above deep rich ultramarine; wing-coverts deep blue-black edged with ultramarine; quills blackish, the inner web very light rufous from the base, the secondaries broadly edged with rich ultramarine; tail deep ultramarine above, black beneath; a minute loral spot rufous; a longitudinal patch of feathers along the sides of the neck white tinged with pale orange; throat whitish tinged with pale rufous; cheeks, sides of the neck, and a large patch of feathers on the sides of the upper part of the breast deep rich ultramarine extending a little on to the flanks; rest of the under surface of the body deep rufous, with a rich lilac shine upon the flanks; bill jet-black; feet red. Total length 7 inches, of bill from front 1·7, from gape 2·1, wing 2·85, tail 1·2, tarsus 0·3, middle toe 0·5, hind toe 0·25.

The above description is taken from a very beautiful male procured in the Aru Islands, and kindly lent to me by Mr. Wallace. Another male specimen from New Guinea, collected by Mr. Wallace, for the loan of which I am indebted to the Viscount Walden, is apparently a younger bird, and differs in having the tips of both mandibles ivory-white, and the whole under surface paler, especially on the throat, which is nearly pure white. To this specimen Mr. Wallace has attached a MS. note on the spot, as follows:—"feet vermillion; bill black, tipped with white; eyes dark brown; length 6·6 inches." The measurements of this bird agree exactly with the Aru-Island specimen described above.

3. ALCYONE AFFINIS. Allied Kingfisher.

Alcyone affinis, Gray, P. Z. S. 1860, p. 348.

A. *torque pectorali nullo: abdomine rufo: rostro robustiore: supra lætissime ultramarina.*

Hab. in insulis "Batchian" et "Gilolo" dictis.

Above brilliant ultramarine, brightest on the back; wing-coverts black washed with ultramarine; quills blackish, the inner web light rufous from the base, the outer web of the secondaries narrowly edged with ultramarine; a very small loral spot faint rufous; throat and a longitudinal patch of feathers along the sides of the neck whitish tinged with orange-rufous, paler on the chin; cheeks, ear-coverts, and a patch of feathers on the sides of the upper part of the breast brilliant ultramarine; under surface of the body rufous, with a rich lilac lustre on the flanks; feet red; bill brownish black, towards the tip whitish. Total length 6·7 inches, of bill from front 1·6, from gape 2·0, wing 3·85, tail 1·2, tarsus 0·3, middle toe 0·5, hind toe 0·25.

Hab. Batchian, Gilolo (*Wallace*).

From *Alcyone lessoni* this species differs in being slightly smaller,

and in having the back of a much more brilliant blue than in the New-Guinea bird. The description and measurements are from a bird kindly lent me by Mr. Wallace, and procured by him in Gilolo.

4. ALCYONE DIEMENSIS. Van Diemen's-Land Kingfisher.

Alcyone diemensis, Gould, P. Z. S. 1846, p. 19; *id.* Introd. Birds of Austr. p. 31 (1848); Gray, Gen. of Birds, i. p. 82 (c. 1844); Kaup, Fam. *Alced.* p. 18 (1848); Reich. Vög. Neuholl. p. 278 (1850); Cab. & Heine, Mus. Hein. Th. ii. p. 143 (1860); Gould, Handb. Birds of Austr. i. p. 141 (1865).

A. *torque pectorali nullo: abdomine rufo: rostro tenuiore, breviore: pileo nigro indistincte fasciato.*

Hab. in Tasmania.

Above deep blue, a little brighter on the rump, the head having the appearance of being indistinctly banded with dusky black; cheeks, ear-coverts, scapularies, and wing-coverts black washed with blue; wing-feathers blackish, the inner web light rufous from the base, the outer web distinctly washed with blue; tail blue above, black beneath; a small loral spot, a patch of feathers along the sides of the neck and the throat white tinged with rufous; the whole of the under surface of the body deep rufous, with a very faint lilac lustre on the flanks; a large patch of feathers on the sides of the upper part of the breast black, with a slight blue shine; bill black; feet red. Total length 6 inches, of bill from front 1·4, from gape 1·9, wing 3·1, tail 1·35, tarsus 0·3, middle toe 0·55, hind toe 0·25.

Hab. Tasmania (*Gould*).

This species is rare in collections; and I have only met with one specimen, which I purchased of Verreaux. It is allied to *A. azurea*, but is much smaller and not nearly so brightly coloured, while on the back, as Mr. Gould justly observes, there is a slight greenish tinge in some lights. There are also some obscure black bands on the head. The description and measurements are taken from the specimen in my collection mentioned above.

5. ALCYONE AZUREA. Azure Kingfisher.

Alcedo azurea, Lath. Ind. Orn. Suppl. ii. p. xxxii (1801); Swains. Zool. Illustr. 1st ser. pl. 26 (1820); Schl. Mus. Pays-Bas, *Alced.* p. 17 (1863).

Ceyx azurea, Steph. Gen. Zool. xiii. p. 106 (1826); Jard. and Selb. Ill. Orn. ii. pl. 55. f. 1.

Alcyone azurea, Gray, Gen. of Birds, i. p. 82 (c. 1844); Gould, Birds of Austr. ii. pl. 25 (1848); *id.* Intr. to Birds of Austr. p. 31 (1848); Gray, Cat. Fiss. Brit. Mus. p. 65 (1848); Blyth, Cat. Birds Mus. As. Soc. Beng. p. 50 (1849); Bonap. Consp. Gen. Av. i. p. 158 (1850); Reich. Vög. Neuholl. p. 278 (1850); *id.* Handb. *Alced.* p. 7, t. 397. f. 3064, 3065 (1851); Cass. Cat. Halc. Phil. Mus. p. 5 (1852); Macgill. Voy. Rattl. ii. p. 356 (1852); Bonap. Consp. Vol. Anis. p. 10 (1854); Pelz. Voy. Novara Vög. p. 50 (1865); Gould, Handb. Birds of Austr. i. p. 139 (1865).

Alcedo tribrachys, Shaw and Nodd. Nat. Misc. pl. 281 (1804).
Ceyx tribrachys, Cuv. Règn. Anim. i. p. 417 (1817).
Ceyx cyanea, Less. Traité d'Orn. p. 241 (1831).
Alcedo australis, Swains. Classif. of Birds, ii. p. 336 (1837).

A. *rostro tenuiore, longiore: pileo haud fasciato: hypochondriis rufis.*

Hab. in Australia.

Above bright ultramarine; wing-coverts blackish, edged with ultramarine; quills blackish, the inner web light rufous at the base, the secondaries externally edged with faint blue; tail deep ultramarine above, black beneath; a loral spot pale rufous; throat and a longitudinal patch of feathers along the sides of the neck white tinged with orange; cheeks, ear-coverts, and sides of the upper part of the breast bright ultramarine; rest of the under surface of the body rufous, with a lilac shine on the flanks and under tail-coverts; bill black; feet red. Total length 6·8 inches, of bill from front 1·8, from gape 2·25, wing 2·8, tail 1·1, tarsus 0·3, middle toe 0·5, hind toe 0·2.

Hab. Australia: New South Wales, and Southern Australia (*Gould*); Cape York (*Cockerell*); Queensland (*Mus. R. B. Sharpe*).

This species, which is the commonest of all the genus, is intermediate between *A. diemensis* and *A. pulchra*, which replace it in Tasmania and Northern Australia respectively. It is a beautiful species, yielding in this respect only to *A. pulchra*.

6. ALCYONE PULCHRA. Resplendent Kingfisher.

Alcyone pulchra, Gould, P. Z. S. 1846, p. 19; Gray, Gen. of Birds, i. p. 82 (c. 1844); Gould, Intr. to Birds of Austr. p. 31 (1848); Reich. Vög. Neuholl. p. 278 (1850); *id.* Handb. *Alced.* p. 7 (1851); Cass. Cat. Halc. Phil. Mus. p. 5 (1852); Elsey, P. Z. S. 1857, p. 25; Gould, Handb. Birds of Austr. i. p. 141 (1865).

A. *torque pectorali nullo: abdomine rufo: rostro tenuiore, longiore: pileo haud fasciato: hypochondriis pulcherrime ultramarinis.*

Hab. in Australia septentrionali.

Above very brilliant ultramarine, a little deeper on the wing-coverts; wing-coverts brownish black, edged with ultramarine; wing-feathers brownish, the inner web very light rufous at the base, the secondaries externally edged with ultramarine; tail deep blue above, black underneath; a small spot in front of the eye light rufous; throat and a patch of feathers along the sides of the neck white tinged with orange; cheeks and ear-coverts brilliant ultramarine; sides of the body also brilliant ultramarine, extending on to the flanks; rest of the under surface of the body deep rich rufous, with a lilac shine on the abdomen and under tail-coverts; bill deep black; feet orange. Total length 6·5 inches, of bill from front 1·95, from gape 2·2, wing 3·0, tail 1·3, tarsus 0·3, middle toe 0·5, hind toe 0·2.

Hab. Australia, Cape-York peninsula (*Mus. R. B. Sharpe*); Victoria River and Port Essington, N. W. Australia (*Gould, Elsey*).

Prince Bonaparte, following Mr. G. R. Gray, has united this species to the foregoing, in my opinion erroneously, and I can only believe that they have not seen a specimen. Mr. Gould and Mr. Cassin, both of whom have examined the type specimens (now in the Philadelphia Museum), have separated the two as distinct, and I entirely agree with their decision. I have in my collection two beautiful specimens of *A. pulchra*, and I certainly consider it one of the most clearly characterized of all the species of *Alcyone*. The brilliant hue of the whole plumage and the extension of the blue from the sides of the breast down on to the flanks distinguish it from any of the allied species. Both of my specimens have a slight blue edging to the feathers of the breast, one of them showing this peculiarity more than the other; in fact it almost forms a pectoral band in this specimen.

7. ALCYONE PUSILLA. Little Blue Kingfisher.

Ceyx pusilla, Temm. Pl. Col. 595 (1836); Müll. Verh. Ethn. p. 22 (1839); Gray, P. Z. S. 1858, p. 172.

Alcyone pusilla, Gould, Birds of Austr. ii. pl. 36 (1848); Reich. Handb. *Alced.* p. 7, t. 398. f. 3068, 3069 (1851); Cass. Cat. Halc. Phil. Mus. p. 5 (1852); Macgill. Voy. Rattl. ii. p. 356 (1852); Sclater, Journ. Proc. Linn. Soc. 1858, p. 172; Rosenb. Journ. f. Orn. 1864, p. 118; Gould, Handb. Birds of Austr. i. p. 142 (1865); Ramsay, P. Z. S. 1868, p. 383.

Alcedo pusilla, Schl. Mus. Pays-Bas, *Alced.* p. 18 (1863); *id.* Vog. Ned. Ind. *Alced.* pp. 12, 48, pl. 3 (1864).

Nu-réa-bin-mo, of the natives of the Coburg peninsula (*Gould*).

A. *torque pectorali nullo : abdomine albo.*

Hab. in Australia septentrionali, in Nova Guinea, et insulis Moluccensibus.

Above rich ultramarine, having a greenish tinge in some lights on the head, cheeks, and wing-coverts; quills blackish, the inner web lighter at the base, the outer web distinctly washed with greenish blue, especially on the secondaries; tail blue above, black beneath; a loral spot and a patch of feathers along the sides of the neck white, the latter slightly tinged with orange; entire under surface white, with a greenish gloss on the breast in some lights; shoulders, sides of the breast, and flanks rich ultramarine; bill and feet black; irides dark blackish brown. Total length 4·8 inches, of bill from front 1·15, from gape 1·4, wing 2·0, tail 0·85, tarsus 0·25, middle toe 0·45, hind toe 0·2.

Hab. Australia: N. Australia (*Gould*); Rockingham Bay (*Ramsay*); New Guinea (*Müller*); Aru Islands (*Wallace*); Gilolo (*Wallace*).

This little species, though everywhere rare, is widely distributed. My description and measurements are from a Gilolo specimen lent to me by Mr. Wallace.

8. On three new Species of Australian Marine Shells.

By James C. Cox, M.D., Sydney, New South Wales.

(Plate XXVI.)

Cypræa thatcheri, n. sp. (Plate XXVI. figs. 1, 1 *a*.)

Shell pyriformly ovate, rather thin, markedly ventricose, base almost flat; sides steep, deeply notched; anterior end contracted and prominent; posterior end produced, narrow; aperture almost straight, except in front, rather open; teeth thick, obtuse, faint purplish white, about twenty-four on the outer edge, and confined to the margin of the aperture; on the columellar side the teeth are short, oval, blunt, and larger, becoming almost obsolete in front; cream-coloured with a cinnamon tinge, smooth and polished, variegated with rather large orange-brown spots of irregular size and irregularly distributed; the cinnamon tinge is slightly deeper at the ends; base white and perfectly smooth, sides light; extremities rather recurved; interior pinkish white.

Length 3 inches, breadth $1\frac{5}{8}$, height $1\frac{1}{8}$.

Hab. Dampier's Archipelago, West coast of Australia.

The two specimens of this beautiful species now before me, one of which I send to be figured, were obtained by Mr. C. R. Thatcher, from a fisherman who took them at the locality above recorded, about ten years ago; and, so far as I know, no other specimens have yet been found. The two specimens are exactly alike in every way, and in a fine state of preservation. The surface of the shell is uniformly covered with a smooth shining enamel, showing no trace of a dorsal opening.

Voluta harfordi. (Plate XXVI. figs. 2 *a*, 2 *b*.)

Shell elongated, ovate, thick; spire acuminate, short, apex papillary; whorls smooth, slanting, strongly excavated or channelled at the suture; columella four-plaited, pinkish white; aperture elongated, lip simple; pinkish white, shining, longitudinally striated by fine waved brown lines, ornamented by four bands of squarely elongated orange-brown spots on the body-whorl, and by a band of round spots of the same colour about the centre of the shell, between the upper and lower rows of squarely elongated markings.

Length $1\frac{9}{16}$ inch, breadth $\frac{11}{16}$, height $\frac{9}{16}$.

Hab. Wreck Reef, near Lady Elliott's Island.

This species in general aspect much resembles *Voluta maculata* of Swainson, but is at once distinguished from that or any other species by its channelled or excavated suture, elongated striation, and regular squarely elongated orange-brown markings.

Voluta sclateri. (Plate XXVI. fig. 3.)

Shell pyriformly oblong, ponderous; spire rather short, obtuse, papillary; whorls smooth, porcellanous, the last tending to be angled or protuberant round the upper part; columella strongly five-

plaited, the top and second plait semibifurcated, pure white, shining and porcellanous, as is also the interior of the mouth and the under part of the shell; aperture elongated, lip simple, not thickened; of a dull whitish-brown colour above.

Length 3 inches, breadth 1½, height 1$\frac{4}{10}$.

Hab. Banks's Straits.

This beautiful species, of which I have two specimens in my cabinet, is at once distinguished from any other species by its dense, white, shining, porcellanous interior and under surface.

DESCRIPTION OF PLATE XXVI.

Figs. 1, 1*a*. *Cypræa thatcheri*, p. 358.
2*a*, 2*b*. *Voluta harfordi*, p. 358.
Fig. 3. *Voluta sclateri*, p. 358.
4. *Haliotis hargravesi* *, p. 49.

9. Some further Remarks on the Cuckoos found in the Neighbourhood of Sydney, and their Foster-parents. By E. P. Ramsay, C.M.Z.S.

(Plate XXVII.)

In some former remarks on the Cuckoos found in the neighbourhood of Sydney (P. Z. S. 1865, p. 460), it will be remembered that the species recently termed by Mr. Gould *Lamprococcyx plagosus* and *L. basalis* (Gould's Handb. B. Austr. i. pp. 623, 626) were regarded as one species under the name of *Chalcites lucidus* (Gould's Birds of Austr. iv. pl. 89), and that I described their eggs as two varieties of the egg of the same species. At that time my remarks were so far correct. Now, however, as most ornithologists agree in considering *L. plagosus* and *L. basalis* distinct species (and *L. lucidus* from New Zealand as a third), it will be necessary to make a few remarks on the subject. My reasons for treating *L. plagosus* and *L. basalis* as varieties of the same species were manifold. The young on leaving the nest are scarcely (if at all) to be distinguished from one another; their notes are for the most part exactly alike; the colouring and marking of the eggs are not constantly different; and, lastly, the plumage of one is merely a shade lighter or darker than that of the other. The only differences of any value are the thinness of the bill in *L. basalis*, and the much deeper tint and greater extent of the rufous on the second and third outer tail-feathers; for it must be remembered, although seemingly overlooked by Mr. Gould, that the two tail-feathers next to the outer one on either side are distinctly marked with rufous in *L. plagosus*.

But, however slight the differences between these two species may be, either in the eggs, the young on leaving the nest, or in the fully adult birds, there is one fact that sets the question at rest, viz. that the young, about three months old, have the same characteristic

* For the description of this shell see Dr. Cox's previous paper, *antea* page 49.

markings as their parents, which fully proves that *L. basalis* cannot be the young of *L. plagosus*.

A young bird of *L. plagosus* now before me, shot in September and supposed to have been hatched in June, distinctly shows the wavy bands on the chest, breast, and flanks, also the rufous blotches, to the same extent as the adult, on the second and third outer tail-feathers on either side.

The accompanying coloured drawings represent the eggs of the various Cuckoos found in the neighbourhood of Sydney, and the eggs of their most usual foster-parents, as spoken of in my former paper. They are all taken from fresh specimens.

EXPLANATION OF PLATE XXVII.

Fig. 1. Egg of *Lamprococcyx plagosus*.
2. " —— *basalis*.
3. " *Cuculus inornatus*.
4. " —— *cineraceus*.
5. " *Acanthiza lineata*.
6. " —— *pusilla*.
Fig. 7. Egg of *Acanthiza nana*.
8. " *Geobasileus reguloides*.
9. " *Smicrornis brevirostris*.
10. " *Stipiturus malacurus*.
11. " *Chthonicola minima*.
12. " *Ptilotis auricomis*.

May 27, 1869.

W. H. Flower, Esq., F.R.S., in the Chair.

Mr. J. E. Harting, F.Z.S., exhibited a skin of a rare wading bird, *Anarhynchus frontalis*, from New Zealand, together with three bills of the same species which had been saved from birds eaten by the natives, and remitted through the kindness of M. Jules Verreaux. He remarked that the chief peculiarity in this bird lay in the form of the bill, which was curved, not downwards as in *Numenius*, nor upwards as in *Recurvirostra*, but to one side, and that he had good grounds for believing that this peculiarity was constant. He had seen six examples of the bird, and had heard of others, in all of which the bill was curved as described. He had no doubt, from its general appearance, that its habits resembled those of *Strepsilas*, although it differed in other respects from the only two species known of this genus. He believed that its nearest ally would be found in another New-Zealand bird, *Thinornis novæ zealandiæ*, of which genus *Thinornis* another species, *Thinornis rossii*, had been found in the Auckland Islands. The bird now exhibited had been described so long ago as 1830 by MM. Quoy and Gaimard in their zoology of the 'Voyage de l'Astrolabe' (i. p. 252, pl. 31. fig. 2), and had since been noticed by Mr. G. R. Gray, in 'Dieffenbach's Travels in New Zealand' (ii. p. 196), in the 'Voyage of the Erebus and Terror' (Birds, p. 12), and in 'The Ibis' (1862, p. 234).

Mr. Harting proposed at some future time to offer some further remarks on this curious bird.

The following papers were read :—

1. On a Collection of Birds made by Mr. H. S. le Strange near the city of Mexico. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, F.L.S.

Mr. H. S. le Strange, during his residence in Mexico, as attaché to the British Legation in 1865 and 1866, formed a considerable series of bird-skins, principally in the vicinity of the capital itself and in the upper parts of the valleys which fall towards the Atlantic. Mr. le Strange having kindly submitted this collection to our examination, we have had great pleasure in determining the species contained in it (which are 262 in number), and beg leave to offer to the Society some notes on a few of the rarer species, made during our examination of the specimens.

1. Pipilo maculatus, Sw. Phil. Mag. 1827, i. p. 434.

Three skins of this bird are in the collection. Mr. le Strange notes that it is found in the tierra fria, in the barrancas, and that its Mexican name is "*Chalmero.*"

It seems to us very doubtful whether it will not be necessary to unite under this name *Pipilo arcticus*, Sw., *P. oregonus*, Bell, and *P. megalonyx*, Baird. The northern specimens are mostly blacker on the back; but a skin sent to Sclater by Prof. Baird as *P. megalonyx* from South California, and another as *P. arcticus*, are not, in our opinion, separable from Mexican specimens. This bird descends as far south as the highlands of Guatemala, and was obtained by Salvin near Quezaltenango ('Ibis,' 1866, p. 193).

2. Pipilo macronyx, Sw. Phil. Mag. 1827, i. p. 434.

We have usually called the species in our collections *Pipilo virescens*, under which name it was described by Hartlaub, 'Journ. f. Orn.' 1863, p. 169. But upon referring to Swainson's characters there can be no doubt that the same bird is his *Pipilo macronyx*. It is easily known from the preceding (*P. maculatus*) by the olive-green edgings of the back- and wing- and tail-feathers; but Mr. le Strange has not distinguished the two species in his MS. Sclater has one of the original specimens of *P. virescens* in his collection, received from Dr. Hartlaub, also examples collected by Boucard during his last expedition, and a skin obtained by Mr. White near the city of Mexico.

3. Pipilo fuscus.

Pipilo fusca, Sw. Phil. Mag. 1827, i. p. 434, et Anim. in Men. p. 347; Bp. Consp. p. 487; Cab. J. f. Orn. 1862, p. 474.

Pipilo mesoleucus, Baird, Pr. Ac. Phil. vii. p. 119, et B. N. A. p. 518; Sclater, P. Z. S. 1856, p. 304.

There is no doubt that, as pointed out by Cabanis, the present

species (called by Baird *P. mesoleucus*) is the true *P. fuscus* of Swainson, and that the Californian bird (called *P. fuscus* by Baird and others) should be termed *P. crissalis*. Sclater's collection contains an original specimen of *P. mesoleucus*, collected by Kennicott in New Mexico, which agrees perfectly with the skins in Mr. le Strange's collection, and with others obtained in Mexico by Boucard and De Saussure. Mr. le Strange notes that this bird is "common in the valley of Mexico."

4. CARPODACUS CASSINII, Baird, B. N. A. p. 414.

Three specimens (2 ♂ and 1 ♀) of this species, obtained by Mr. le Strange, are the first of it we have seen. As stated by Baird, it is most like *C. purpureus*, but remarkable for the large size and elongation of the bill. Baird's specimens were from New Mexico.

5. CHRYSOMITRIS PINUS (Wils.); Baird, B. N. A. p. 425; Sclater, P. Z. S. 1864, p. 174.

Three skins of what we believe to be this North-American species, agreeing with one in Sclater's collection from the same locality. We much doubt the distinctness of *C. macroptera*, Du Bus (Esq. Orn. t. 23), which appears to be the same bird.

6. ICTERUS BULLOCKII, Sw. Ph. Mag. 1827, i. p. 436; Baird, B. N. A. p. 549.

Examples of both sexes of this species, which is stated to inhabit the tierra fria, and is called "*Calandria nogalera*."

7. ICTERUS ABEILLÆI (Less.); Sclater, P. Z. S. 1860, p. 252, et 1864, p. 175; Cat. A. B. p. 130.

A pair of this species, stated to have been brought in alive and kept in a cage for some time. Mexican name "*Calandria mielera*." The female does not appear distinguishable from that of *I. bullockii*; the males are readily separable by the black sides and uropygium of the present species.

8. CYANOCITTA CALIFORNICA (Vig.); Sclater, Cat. A. B. p. 143.

Aphelocoma floridana, Bp. C. R. xlii. p. 956.
Cyanocitta floridana, Scl. P. Z. S. 1856, p. 300.

Mr. le Strange's skin (obtained in the tierra fria) agrees well with a Californian specimen in Sclater's collection, and with the characters whereby Baird distinguishes *C. californica* from *C. woodhousii*. It is white without any bluish tinge below, and the crissum is nearly pure white. It is probable, therefore, that Prof. Baird has wrongly referred his specimen no. 8465, from Mexico, to *C. woodhousii*.

We have little doubt that Sallé's specimen (no. 186 of his first collection), referred by Sclater (following Bonaparte) to *C. floridana*,

was really of this species. Salvin has received a skin of this *Cyanocitta* from the vicinity of Oaxaca, collected by Mr. A. Fenochio.

9. PSILORHINUS MORIO (Wagler).

Two skins of this bird, marked ♂ et ♀, and coloured alike, obtained from the tierra caliente of the Atlantic, where Mr. le Strange says they are "very common, and often follow the passer-by, taking short flights from tree to tree, and making a harsh and discordant noise."

This bird has long been confounded with the *Psilorhinus mexicanus* of Rüppell, which is immediately distinguishable by its white belly and the broad white terminations of the rectrices. Rüppell gives the locality of his species as Tamaulipas; but all the Mexican specimens of *Psilorhinus* which have come under our notice have belonged to the black-tailed *Ps. morio*, while all the Guatemalan and more southern examples have been of the (so-called) *Ps. mexicanus*. Under these circumstances it is not unlikely that there may have been some mistake in Rüppell's locality.

The two species (if such they be) will stand as follows:—

PSILORHINUS MORIO.

Pica morio, Wagl. Isis, 1829, p. 751.
Pica fuliginosa, Less. Traité d'Orn. p. 333.
Psilorhinus morio, Bp. Consp. p. 381; Cab. Mus. Hein. p. 226; Baird, Birds N. Am. p. 592; Scl. P. Z. S. 1856, p. 300, and 1859, pp. 57, 365.

Diagn. *Ventre cinerascente; rectricibus totis concoloribus.*
Hab. S. Mexico, Cordova (*Sallé*), Jalapa (*de Oca*).

PSILORHINUS MEXICANUS.

Corvus morio, fem. et juv., Wagl. Isis, 1829, p. 751.
Psilorhinus mexicanus, Rüpp. Mus. Senck. ii. p. 189, t. 11. f. 2.
Psilorhinus morio, Scl. & Salv. Ibis, 1859, p. 22; Taylor, Ibis, 1860, p. 113; Cab. Journ. f. Orn. 1861, p. 83; Scl. Cat. Am. B. p. 145; Lawr. Ann. Lyc. N. Y. ix. p. 104.

Diagn. *Ventre albicante, rectricum lateralium apicibus latis albis.*
Hab. Guatemala (*Salvin*), Honduras (*Taylor*), Costa Rica (*Arcé*), "Tamaulipas, Mexico (*Rüpp.*)."

10. SITTASOMUS OLIVACEUS (Max.).

We have already given our reasons for using this name for the bird usually called *S. sylvioides* (*cf.* P. Z. S. 1868, p. 630).

11. CHÆTURA RUTILA (Vieill.), Sclater, Cat. A. B. p. 283.

Mr. le Strange's collection contains a pair of this beautiful Swift from the tierra fria, the first Mexican specimens we have seen of it. Mr. Lawrence has lately presented to Sclater an Ecuadorian skin of the bird, which agrees perfectly with Mexican and Guatemalan examples.

12. CENTURUS ALBIFRONS (Sw.).

Picus albifrons, Sw. Phil. Mag. 1827, i. p. 439; Sund. Pic. p. 52; Cab. Journ. f. O. 1862, p. 324.

Centurus santacruzi, Bp. P. Z. S. 1837, p. 116; Sclater, Cat. A. B. p. 343.

We have hitherto called this species by Bonaparte's name; but there can be no doubt that, as pointed out by Cabanis, it is the *P. albifrons* of Swainson. It is common in Southern Mexico and Guatemala.

13. BUTEO ELEGANS, Cassin; Baird, B. N. A. p. 28.

Mr. le Strange's collection contains a single skin of this Buzzard, agreeing with Texan specimens collected by Mr. Dresser. We have also seen an example of it in a collection recently sent to M. Sallé from Orizava by M. Botteri.

14. ORTALIDA VETULA, Wagler, Isis, 1830, p. 1112, et 1832 p. 1227; Sclater, P. Z. S. 1859, p. 391.

O. poliocephala, Sclater, P. Z. S. 1856, p. 310.

Mr. le Strange's collection contains a single skin of this *Ortalida*, which he found "very common" in the tierra caliente of the Atlantic. He shot many on the road to Tampico, in April 1866. We believe that the Texan bird called by the American ornithologists *O. vetula*, *O. poliocephala*, and *O. maccalli* is probably referable to this species.

15. ORTALIDA POLIOCEPHALA, Wagler, Isis, 1830, p. 1112, et 1832, p. 1227.

Two skins of this species, in Mr. le Strange's collection, are the first we have met with. It is immediately distinguishable from the preceding by its larger size, longer tail, whiter belly, and the much broader terminal bands of the tail-feathers, which are fulvous and not pure white.

2. Notes on the Species of the Genus *Micrastur*. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.L.S.

As in case of the *Asturinæ*, to which we have lately called the Society's attention*, some of the members of the genus *Micrastur* are at present in a state of great confusion. We trust that the following remarks may serve to render the species of the group with which we are acquainted more readily distinguishable.

The genus *Micrastur*, established by Mr. G. R. Gray in 1841†

* See P. Z. S. 1869, p. 129.

† List of Genera of Birds, p. 6.

(in the place of *Brachypterus* of Lesson, previously employed), embraces a series of American Hawks with the general structure of *Accipiter*, but distinguished by their short toes and more rounded tail. We have examined specimens of seven species of it, which may be shortly distinguished as follows:—

A. Majores: subtus albi fere unicolores.
  a. major, supra nigricans ..... 1. *M. semitorquatus.*
  b. minor, supra cinereus ..... 2. *M. mirandollii.*
B. minores: subtus albi, dense transfasciati.
  a. dorso rufo: pileo cinereo:
    a''. minor: dorso dilutiore rufo ..... 3. *M. ruficollis.*
    b''. major: dorso saturatiore rufo ..... 4. *M. zonothorax.*
  b. dorso cinereo: pileo concolore:
    a''. ventre imo et crisso albis immaculatis ..... 5. *M. gilvicollis.*
    b''. ventre imo et crisso cinereo transfasciatis:
      a'''. dorso dilutiore cinereo ..... 6. *M. leucauchen.*
      b'''. dorso saturatiore cinereo ..... 7. *M. guerilla.*

1. MICRASTUR SEMITORQUATUS.

Sparvius semitorquatus, Vieill. N. D. x. p. 322, et Enc. Méth. p. 1263.

Sparvius melanoleucus, Vieill. N. D. x. p. 327, et Enc. Méth. p. 1267.

Falco brachypterus, Temm. Pl. Col. 116 (jr.) et 141 (adult.).

Micrastur brachypterus, Pelz. Orn. Novara, p. 12, et Orn. Bras. p. 7.

Micrastur semitorquatus, Scl. et Salv. Ibis, 1859, p. 218; Lawrence, Ann. L. N. Y. ix. p. 134.

Climacocercus brachypterus, Burm. Syst. Ueb. ii. p. 88.

Falco leucomelas, Licht. Doubl. p. 62.

Carnifex naso, Lesson, Rev. Zool. 1842, p. 379.

Falco percontator, Cabot, Boston Journ. iv. p. 462.

Hab. Rio Janeiro (*Natt.*); Mato Grosso (*Natt.*); Borba (*Natt.*); Rio Negro et Rio Brancho (*Natt.*); Costa Rica (*Zeledon*); Guatemala (*Salvin*); Yucatan (*Cabot*).

This species, well known by the figures of the adult and young in Temminck's 'Planches Coloriées,' is widely distributed throughout Tropical America, from Yucatan to Paraguay. It does not, however, appear to occur in the wood-region of Eastern Brazil, nor have we yet seen specimens from New Granada and Ecuador. In Guatemala it seems to be rare, as Salvin only obtained one specimen from Retaluleu, in the forest-region bordering the Pacific. Another Guatemalan specimen, in the Norwich Museum, is probably from Vera Paz.

The large size of this bird renders it easily distinguishable from every other species of the genus.

2. MICRASTUR MIRANDOLLII.

Astur mirandollii, Schl. Ned. Tijdschr. i. p. 130, et Mus. de P.-B. *Astures*, p. 27.

Micrastur macrorhynchus, Natt. MS.; Pelz. Orn. Novara, p. 21, et Orn. Bras. p. 7.

Micrastur mirandollei, Scl. et Salv. P. Z. S. 1867, p. 759.

Hab. Eastern Peru, Chyavetas (*Bartl.*); Rio Negro et Rio Brancho (*Natt.*); Barra do Rio Negro (*Cast. et Dev.*).

This bird is most nearly allied to the preceding species, but is easily recognizable by its smaller size and slaty-grey upper plumage.

The only example of it in this country is, as far as we know, the specimen obtained by Mr. E. Bartlett in Eastern Peru, noticed in our article, P. Z. S. 1867, p. 759. As already mentioned there, Sclater has compared the typical specimen of *Astur mirandollii* in the Leyden Museum with an example of v. Pelzeln's *Micrastur macrorhynchus* in the same collection, and has little doubt of their being identical.

In the Paris Museum there is a specimen of this bird collected by Castelnau and Deville at Barra do Rio Negro.

In its range this species appears to be restricted to the district of Upper Amazonia.

3. MICRASTUR RUFICOLLIS.

Sparvius ruficollis, Vieill. N. D. x. p. 322, et E. M. iii. p. 1263; Puch. R. Z. 1850, p. 91.

Micrastur ruficollis, Strickl. Orn. Syn. p. 122.

Falco xanthothorax, Temm. Pl. Col. 92.

Climacocercus xanthothorax, Burm. Syst. Ueb. ii. p. 85.

Micrastur xanthothorax, Pelz. Orn. Bras. p. 7.

Hab. S.E. Brazil (*Burm.*); S. Paulo (*Natt.*); Goyaz (*St.-Hilaire*).

The adult of this species is well figured in Temminck's 'Planches Coloriées,' no. 92. It is easily recognizable by its deep rufous, almost chestnut breast. In younger specimens this colour is only partially apparent, and the bars on the belly are much wider apart; but in all stages we have seen the reddish-brown back is more or less persistent, thus distinguishing it from *M. leucauchen*.

Our specimens of this bird are from Rio and Bahia. Natterer obtained it in the Province of San Paulo, and St.-Hilaire in that of Goyaz.

4. MICRASTUR ZONOTHORAX.

Climacocercus zonothorax, Cab. J. f. O. 1865, p. 406.

Micrastur zonothorax, Scl. et Salv. P. Z. S. 1869, p. 253.

Hab. Puerto Cabello; Bogota.

Dr. Cabanis has lately separated this bird as a northern representative of the preceding, stating that it differs in its larger size, stouter bill, and in the darker reddish-brown of the upper surface, also in having the red-brown on the lower surface confined to the throat and not extending over the breast.

We have not yet met with the adult of this species, but have referred to it a bird in immature plumage collected by Mr. Goering in the coast-region of Porto Cabello, which is the same district as that whence Cabanis's type specimens were derived. A second immature bird, in the collection of Salvin and Godman, is from Bogota.

5. MICRASTUR LEUCAUCHEN.

Falco leucauchen, Temm. Pl. Col. 306.
Micrastur leucauchen, Strick. Orn. Syn. p. 123.
Micrastur gilvicollis (adult.), Pelz. Orn. Nov. p. 10.
Hab. Brazil; Bahia (*Wucherer*); Mato Grosso (*Natt.*).

This *Micrastur* is immediately distinguishable from *M. ruficollis* by its grey back and by the entire absence (in the adult bird) of any rufous colouring upon the throat and breast. In specimens not quite mature there is a rufous tinge upon the breast, which has apparently caused the species to be confounded in most collections with *M. ruficollis*. As in the latter bird, the belly is regularly banded continuously down to the crissum. This character and its paler upper surface serve to distinguish it from *M. gilvicollis*.

In his 'Planches Coloriées' (no. 306) Temminck has figured his *Falco leucauchen*, which has been regarded by most writers as being the young of the same author's *Falco xanthothorax* (=*Micrastur ruficollis*, Vieill.). Temminck does not expressly say whether his figure was taken from a specimen in the Paris Museum or in that of Vienna, both of which he states contain examples of this bird; but according to Schlegel (Musée des Pays-Bas, *Astures*, p. 51) Temminck's type is one of Natterer's specimens now in the Leyden Museum. To determine positively whether Temminck's figure is applicable to the young of the present species or to that of *M. ruficollis*, reference must be made to this type specimen, which we have not yet had an opportunity of doing. But to avoid the unpleasant necessity of giving a fresh name to the present bird, which is certainly a most distinct species, we propose for the present to use Temminck's name for it, bearing in mind that M. Pucheran, a very accurate observer, has stated that in his opinion naturalists have erred in considering Temminck's two names synonymous*.

Three specimens of this Hawk, in the collection of Salvin and Godman, are from Bahia, and were received from Dr. Wucherer. An example which we regard as the adult, and of which we shall speak subsequently, was obtained by Natterer in Mato Grosso.

6. MICRASTUR GUERILLA.

Micrastur guerilla, Cass. Proc. Ac. Phil. iv. p. 87, et Journ. Ac. Phil. vol. i. p. 295, t. 40; Bp. Consp. Av. p. 30.
Micrastur concentricus, Scl. P. Z. S. 1856, p. 285.
Micrastur gilvicollis, Scl. et Salv. Ibis, 1859, p. 218; Scl. P. Z. S. 1858, p. 96; Scl. P. Z. S. 1860, p. 96; Lawr. Ann. L. N. Y. vii. p. 317.
Micrastur xanthothorax, Scl. P. Z. S. 1859, p. 368.
Hab. Mexico, Jalapa (*Cassin*); Cordova (*Sallé*); Guatemala (*Salvin*); Veragua (*Arcé*); Western Ecuador, Nanegal (*Fraser*).

We have long been well acquainted with this *Micrastur*; Salvin obtained specimens of it in every stage of plumage during his expeditions to Guatemala, and it is also common in Mexican collections;

* Rev. Zool. 1850, p. 91.

but we have hitherto wrongly referred it to its southern representative *M. gilvicollis*, in which other authors have followed us. In its plumage above, this present bird very much resembles that species; but beneath the narrow grey bands are closer together, and are continued regularly over the thighs, belly, and crissum, whereas in *M. gilvicollis* they gradually disappear, leaving these parts nearly white. In the adult of *M. guerilla* also there appear to be three distinct white tail-bands besides the narrow terminal band; in the adult *M. concentricus* the normal number seems to be one, or sometimes two.

Cassin founded his *Micrastur guerilla* upon immature specimens obtained by Mr. Pease near Jalapa in Mexico, and has figured the bird in this plumage. As already stated, we have seen other examples in the numerous collections recently made in the same district. In Guatemala Salvin found it common in all the lowlands of the Atlantic slope. From Veragua Arcé has transmitted individuals both in the adult and immature plumages. We have not yet seen it from Panama; but it certainly extends as far south as Western Ecuador, where Mr. Fraser obtained an adult specimen in 1859. This bird is now in the collection of Salvin and Godman.

7. MICRASTUR GILVICOLLS.

Sparvius gilvicollis, Vieill. N. D. x. p. 323, et Enc. Méth. p. 1264; Puch. Rev. Zool. 1850, p. 91.

Micrastur gilvicollis, jr., Pelz. Orn. Novara, p. 10, et Orn. Bras. p. 7; Scl. et Salv P. Z. S. 1867, p. 590.

Nisus concentricus, Less. Tr. d'Orn. p. 60; D'Orb.Voy. Ois. p. 88.

Climacocercus concentricus, Cab. in Tsch. F. P. pp. 18, 98, et in Schomb. Guian. iii. p. 735; Burm. Syst. Ueb. ii. p. 87.

Hab. Cayenne (*Less.*); Eastern Peru (*Tsch.*); Bolivia (*D'Orb.*); Rio Negro, Barra and Para (*Natt.*).

Vieillot's *Sparvius gilvicollis* was founded upon a specimen in the Paris Museum, which Pucheran, in one of his articles upon Vieillot's types, declares to be the same as *M. concentricus*. Now, although *Falco concentricus* is an old MS. name of Illiger's, it was first published by Lesson, and based upon a specimen brought by Poiteau from Cayenne, likewise in the Paris Museum. It follows that M. Pucheran, having had the two types before him, had an excellent opportunity of arriving at the result which he came to.

Our worthy friend Herr von Pelzeln, of Vienna, has, however, recently come to a different conclusion, and, in his treatise on the birds of the Novara Expedition, has treated *M. gilvicollis* and *M. concentricus* as different species. This caused us no small perplexity, until, with his usual kindness, Herr v. Pelzeln transmitted to us for examination the whole series of specimens of these two supposed species upon which he had founded his remarks. We trust that our good friend will pardon us, if, in the interests of science, we state that, after inspection of the specimens and comparison of them with others now before us, we have arrived at a somewhat different conclusion.

It is certain that the bird from Mato Grosso, which Herr v. Pelzeln regards as the adult of his *M. gilvicollis*, is distinct from his *M. con-*

centricus; but, as we have already stated, we believe that this bird should be referred to the Brazilian species which we have termed *M. leucauchen*. The younger specimens, called *M. gilvicollis* by Herr v. Pelzeln, in spite of the number of tail-bands, we consider referable to the present bird, which he calls *M. concentricus*.

One of the main points which Herr v. Pelzeln urges as distinguishing his *M. gilvicollis* from his *M. concentricus* is that the former has in every age and sex, besides the termination, three white tail-bands, whereas the latter has usually only one, but sometimes two. But we do not consider this character altogether to be relied upon, it being notoriously variable in other species of Accipitres. When it is discarded there is, as far as we can see, nothing to prevent us associating the two immature female birds from the Amazonian district, which Herr v. Pelzeln refers to *M. gilvicollis* (as distinguished from *M. concentricus*), with the present species.

We may also urge that this interpretation is more consonant with the phenomena of geographical distribution, it being *primâ facie* unlikely that two so closely allied species should be found maintaining their distinctive characters in the same area.

All the specimens of the present species which have come before us with ascertained localities have been either from Guiana or from some part of Amazonia, which we regard as belonging to the same fauna. Natterer's specimens were collected at Para and upon the Rio Negro. Other specimens we have seen are from Cayenne and the Lower Amazon. Tschudi's Peruvian specimens have no doubt been correctly referred by Cabanis to the present bird; but we have not yet had an opportunity of ascertaining to which species D'Orbigny's Bolivian examples belong.

3. On the Fishes of Orissa.

By Surgeon Francis Day, F.Z.S., F.L.S.—Part II.*

Amongst the Siluroids, I captured one small specimen of a *Hara* in Orissa, which I left undescribed; I have since taken many more, and compared them with those in the Calcutta Museum. It is the

78. Hara buchanani, Blyth.

D. $\frac{1}{6}|0$. P. $\frac{1}{6}$. V. 6. A. $\frac{3}{7}$. C. 15.

Length of head $\frac{1}{4}$, of caudal $\frac{1}{5}$ of the total length. The bases of the first dorsal and anal fins are of the same length, and equal the distance from the posterior margin of the orbit to the end of the snout. The length of the base of the adipose dorsal is only equal to one-half of that of the anal. Height of body equals the length of the head; the width of the head opposite the opercles equals $1\frac{1}{2}$ its length.

Eyes small, situated in the posterior half of the head.

Gill-openings narrow, the skin confluent with that of the isthmus.

* See P. Z. S. 1869, p. 292.

Maxillary barbels dilated at their bases; they extend as far as the pectoral fin. The four mandibular barbels are on a transverse line; the two outer the longest, reaching the gill-opening. Nostrils placed close together and divided by a short barbel. The occipital process is about three times as long as wide at its base, and has another parallel bony process on either side. Basal bone considerably dilated. Humeral process rugose, elongate, and with two ossicles posterior to it.

Teeth villiform in the jaws and also in a fine band on the palate.

Fins. Dorsal spine stout and nearly as long as the head, serrated posteriorly. Pectoral spine one-fourth longer, flattened, strongly serrated internally, and with finer serrations externally but arranged in a very peculiar manner, each alternate tooth being directed anteriorly or posteriorly. Pectorals reaching ventrals. Caudal deeply forked.

Skin covered with little rough elevations, which in the posterior part of the body are in parallel lines. This roughness is also seen on the cheeks.

Lateral line proceeds direct towards the centre of the base of the caudal fin, but ceases before arriving so far.

Colours. Brownish, banded with a darker shade. Fins banded with black. Barbels annulated with black.

This little fish grows to about $2\frac{1}{2}$ inches in length, and lives amongst weeds or in very muddy parts of rivers.

The *Cyprinidæ* are extensively represented in Orissa.

79. CATLA BUCHANANI, Cuv. & Val.

Barkur (Ooriah).

B. iii. D. $\frac{3-4}{14}$. P. 21. V. 9. A. $\frac{3}{5}$. C. 19. L. l. 40–43. L. tr. $\frac{7\frac{1}{2}}{9}$. Vert. $\frac{17}{18}$.

The gill-rakers in the adult are long, moderately strong, and set rather widely apart.

The *Cyprinus abramioides*, Sykes, may be this species, which abounds in the river Kistna.

80. AMBLYPHARYNGODON MOLA, H. Buch.

Morara (Ooriah).

B. iii. D. $\frac{2}{7}$. P. 15. V. 9. A. $\frac{3}{5}$. C. 20. L. l. 71–75. L. tr. 20.

Dr. Günther observes that the engraving of *Leuciscus melettinus*, Cuv. & Val., is incorrect; for he considers the lateral line, instead of being continued to the base of the caudal fin as delineated, ought to cease, which would make it an *Amblypharyngodon*. Might not the drawing be correct, and the species be a *Thynnichthys*, as I have taken one in India? Mr. Blyth (Journ. Asiat. Soc. of Bengal, 1860, p. 164) observed of his genus *Mola*, of which he made this species his type, "The (*Leuciscus*) *harengula* and (*L.*) *melettina* of Valenciennes should also range in the same division, even if the lateral line be

continuous as represented in the figures of those species." The correctness of placing *Amblypharyngodon* and *Thynnichthys* as distinct genera is, I think, questionable; and I am the more confirmed in this belief by an examination of the *A. atkinsonii*, Blyth (not *A. pellucidus*, M'Clelland), from Burmah, in which the lateral line is continued for one-third of the length of the body of the fish, or for 19 scales, thus reaching nearly as far as the base of the ventral fin, from which it is divided by six rows of scales.

81. CIRRHINA MRIGALA, H. Buch.

Mrigale, Mirrgah (Ooriah).

B. iii. D. $\frac{3}{15}$. P. 17. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 40–43. L. tr. $\frac{8-9}{9}$.

Differs from the *C. leschenaultii*, Cuv. & Val., by only having the rostral barbels. In Orissa it appears entirely to supersede the *C. leschenaultii*, which is a species very common in Madras.

Amongst the fishes brought to Calcutta by the late expedition to China are specimens of the *C. mrigala*, H. Buch., probably identical with *C. chinensis*, Günther.

82. CROSSOCHEILUS BATA, H. Buch.

Crossocheilus rostratus, Günther (immature).

Dunguda porah (Ooriah). *Dommarci batta* (Bengali).

B. iii. D. $\frac{2-3}{9}$. P. 19. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 36–38. L. tr. $\frac{5\frac{1}{2}-6\frac{1}{2}}{6-7}$.

This species I obtained throughout Orissa, as well as from the Cossye, where Dr. Günther's specimen, 4 inches long, was captured. I have therefore no doubt respecting its identity, although he remarks of the *genus*, "Barbels two or four; if two, the upper only are present:" and of the *species*, "two barbels, only shorter than the eye;" whereas in this fish it is the maxillary ones which exist.

It loses the black spots on the lateral line more or less completely when it attains a mature state. Being largely domesticated, however, it is subject to certain variations. In one specimen, 10 inches long, the snout was covered with elevated pores, whilst another of the same size, taken along with it, was destitute of them.

The number of rows of scales between the lateral line and base of the ventral fin sometimes alters with age. Thus in the immature there are generally four series, but in the adult five. This fish grows to two feet in length.

83. CROSSOCHEILUS GOHAMA, H. Buch.

Kala batta (Bengali).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 38–40. L. tr. $\frac{6}{6}$.

This fish has a distinct lateral lobe to the snout.

Hab. Cossye river, at Midnapore.

84. Crossocheilus reba, H. Buch.

Chetchua porah (Ooriah). *Batta* (Bengali).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 35–38. L. tr. $\frac{7}{4}$.

The *Chondrostoma boggut*, Sykes, appears to be identical with this species, which is common in the Kistna river.

85. Labeo fimbriatus, Bloch.

Labeo leschenaultii, Cuv. & Val.
Bahrum (Ooriah).

B. iii. D. $\frac{4}{16-17}$. P. 15. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 44–48. L. tr. $\frac{9-10}{8-9}$.

Hab. Found in rivers and tanks.

The *Varicorhinus bobree*, Sykes, appears to be this species, which is abundant in the Kistna.

86. Labeo gonius, H. Buch.

Labeo microlepidotus, Cuv. & Val.
Labeo dussumieri, part.?, Günther.
Cursua (Ooriah).

B. iii. D. $\frac{3}{13-14}$. P. 17. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 64–74. L. tr. $\frac{14}{15}$.

Length of head $\frac{2}{11}$, of pectoral $\frac{2}{3}$, of base of dorsal $\frac{2}{9}$, of base of anal $\frac{1}{16}$, of caudal $\frac{2}{11}$ of the total length. Height of head $\frac{1}{5}$, of body $\frac{1}{4}$, of dorsal fin $\frac{2}{11}$, of ventral $\frac{1}{6}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Diameter $\frac{2}{9}$ of length of head, $1\frac{1}{2}$ diameter from end of snout, $2\frac{1}{2}$ diameters apart.

No lateral lobe to snout, which is covered with fine pores. Two pairs of very short barbels, the maxillary being slightly the longest. Lips thick, with a distinct fold, and also fringed.

Teeth pharyngeal, with flattened crowns, 5, 4, 2/2, 4, 5.

Fins. Dorsal commences much nearer to the snout than to the base of the caudal fin, and anterior to the ventral.

Scales. Nine and a half rows between lateral line and base of the ventral fin, in large specimens from Burmah eight and a half.

As food this fish is said to be indifferent. Many specimens were taken in the rivers of Orissa up to $13\frac{2}{10}$ inches in length.

The species is very closely allied to, if not identical with *Labeo cursa*, H. Buch., which, however, is said to have 11 or 12 rows between the lateral line and base of ventral fin.

87. Labeo calbasu, H. Buch.

Cirrhinus affinis, Jerdon, Madras Journ. Lit. & Sc.
Kala beinse (Ooriah).

B. iii. D. $\frac{3}{14-15}$. P. 19. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 41–44. L. tr. $\frac{7\frac{1}{2}}{9}$.

In one specimen taken in the Cossye the scales were spotted with red.

Hab. Rivers and tanks in Orissa.

88. LABEO ROHITA, H. Buch.

Ruhu (Ooriah).

B. iii. D. $\frac{3}{12-13}$. P. 17. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 41. L. tr. $\frac{6\frac{1}{2}}{9}$.

Hab. Rivers and tanks in Orissa.

89. LABEO RICNORHYNCHUS, M'Clelland.

Kul-ka-batta (Bengali).

B. iii. D. $\frac{3}{10}$. P. 17. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 42. L. tr. $\frac{8}{9}$.

Pharyngeal teeth 5, 4, 2/2, 4, 5.

I am doubtful whether this fish should not be referred to *Cyprinus musiha*, H. Buch., which, however, Dr. Günther considers to be the *Labeo morala*; and he remarks, "four barbels as long as the eye;" whereas Buchanan observes, "it (*Cyprinus musiha*) differs from the description of the *morala* in nothing but the want of tendrils."

90. LABEO BOGA, H. Buch.

Kala battali (Ooriah).

B. iii. D. $\frac{2-3}{11}$. P. 17. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 42. L. tr. $\frac{7\frac{1}{2}}{7}$.

My reason for being unable to accept the genus *Tylognathus*, Günther, is, that "the separation of this genus from *Labeo* is artificial," being defined in its having nine or less branched rays, down to which number *Labeo* is included. Thus the existence of an extra ray in the dorsal fin, or whether the last double dorsal ray is regarded as one or two might alter the *genus* of the species. The same author has observed respecting the genus *Barbus*, which has been subdivided into several genera and subgenera, "Nothing would more be contrary to the idea of natural genera, the transition from one extreme species to the other being perfect" (p. 84).

Hab. Rivers and tanks of Orissa.

Dr. Günther notices how the subgeneric forms of the genus *Barbus*, as *Barbodes* with two pairs of barbels, *Capoeta* with one pair, and *Puntius* destitute of any, pass gradually from one into another. But in specimens from India I do not think it will be of common occurrence to find barbels abnormally increased or decreased in numbers. I have tried, but hitherto unsuccessfully, to obtain such specimens. Even if such were frequent, their abnormal or accidental absence will scarcely be considered a sufficient reason against accepting such natural *subgeneric* divisions of this exceedingly extensive genus.

Dorsal ray serrated.

91. BARBUS (BARBODES) CHAGUNIO, H. Buch.

Barbus beavani, Günther.

Jerruah (Bengali).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{3}{5}$. C. 19. L. l. 44. L. tr. $\frac{11}{11}$.

Many of the young of this species were taken in the Cossye river, at Midnapore, up to 3½ inches in length; it is said, however, to attain to 18 inches. A specimen 11 inches long exists in the Calcutta Museum.

92. BARBUS (BARBODES) SARANA, H. Buch.

Barbus chrysopoma, Cuv. & Val.
Barbus russellii, Günther.
Sarana (Ooriah and Bengali). *Kunnaku* (Telugu).

B. iii. D. $\frac{3-4}{8}$. P. 15. V. 9. A. $\frac{3}{5}$. C. 19. L. l. 28–32. L. tr. $\frac{6}{5}$.

This species is subject to slight variations in accordance with age, the locality it inhabits, and the sex of the specimens. I obtained it from Trichinopoly in the south, to the Hooghly in the north, and have received it from Yunam in China.

Dorsal ray entire.

93. BARBUS (BARBODES) TOR, H. Buch.

? *Cyprinus mosal*, H. Buch.

B. iii. D. $\frac{3}{9}$. P. 18. V. 9. A. $\frac{2}{5}$. C. 18. L. l. 23–27. L. tr. $\frac{4}{2}$.

Some young specimens of the species or variety with the thick labial lobes were taken in the Mahanuddi. The fish is said to grow to 3 or 4 feet in length at the base of the hills.

Dorsal ray entire.

94. BARBUS (CAPOËTA) CHOLA, H. Buch.

Barbus sophoroides, Günther.
Kerrundi (Bengali).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 25–26. L. tr. $\frac{5\frac{1}{2}}{5}$.

Hab. Cossye river.

Dorsal ray serrated.

95. BARBUS (PUNTIUS) AMBASSIS, Day.

Bunkuai (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 11. V. 9. A. $\frac{2}{5}$. C. 19. L. l. 36.

Hab. Rivers of Orissa.

96. BARBUS (PUNTIUS) GELIUS, H. Buch.

Cutturpoh (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{3}{5}$. C. 19. L. l. 25. L. tr. 9.

Lateral line incomplete, only extending along 5 or 6 scales.
Hab. Tanks in Orissa.

97. Barbus (Puntius) ticto, H. Buch.

Kudji kerundi (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{2}{6}$. C. 19. L. l. 23. L. tr. $\frac{5}{6}$.

Lateral line incomplete.
In some specimens the fins are black.
Hab. Rivers and tanks.

98. Barbus (Puntius) phutunio, H. Buch.

Kudji kerundi (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. $\frac{3}{5}$. C. 19. L. l. 20–23. L. tr. 8–10.

The dorsal ray in some specimens, apparently in all in Orissa, undergoes a very curious change in this species. Serrated in the young, the teething decreases as age advances, so that when the fish is about 2 inches in length the ray is quite smooth. This I do not find to be the case in specimens from Burmah, five fine ones of which are in the Calcutta Museum, up to 2 inches in length. Their lateral line has 23 scales, and their lateral transverse 5/5. Mr. Blyth remarked upon these specimens in the 'Journ. Asiat. Soc. Beng.' 1860, p. 159, considering them, and I believe correctly, to be of this species. Dr. Günther has named some specimens from Ceylon *B. cumingii* and *B. nigrofasciatus*, the one having two, the other three vertical bands, a very common occurrence in this species —adding also that the latter have one more row of scales, and are scarcely striated, which is not the case in those he has seen of the former. Dr. Bleeker appears to have considered the Ceylon and Indian forms identical; but, without comparing specimens from the two localities, it must be exceedingly difficult to offer an opinion, especially as this fish is subject to considerable variations, and the Indian form does not appear to be in the British-Museum collection. Some of my Orissa specimens have six striæ on each scale, others four, whilst in some no striæ are observable. Many have twenty-one rows of scales on the body.

Dorsal ray entire.

99. Barbus (Puntius) stigma, Cuv. & Val.

Systomus sophore, M'Clelland.
Puntius modestus, Kner.
Patia kerundi (Ooriah).

B. iii. D. 3/8. P. 17. V. 9. A. 3/5. C. 19. L. l. 25. L. tr. 5/4. Vert. $\frac{15}{14}$.

Kner's fish shows a coloration which is very common, denoting the specimen to be out of season, in bad health, or that it has been macerated some time.

I gave my reasons, in the P. Z. S. for 1868, p. 198, for not accepting Dr. M'Clelland's fish as identical with Hamilton Buchanan's. In the old collection of the fishes of the Asiatic Society of

Bengal I find the true species still exists, but without any label; it is as follows:—

BARBUS (BARBODES) SOPHORE, H. Buch.

B. iii. D. 3/9. P. 15. V. 9. A. 2/5. L. l. 25. L. tr. $\frac{3\frac{1}{2}}{4\frac{1}{2}}$.

Length of head $\frac{1}{4}$ of length of body. Height of body rather more than the length of the head.

Eyes. Rather more than $\frac{1}{3}$ of length of head, 1 diameter from end of snout, 1 diameter apart.

Barbels four, the rostral ones reaching the anterior margin of the orbit, the maxillary ones extending to below the middle of the eye. Cleft of mouth extending to under orbit.

Fins. Dorsal arises midway between the snout and the base of the caudal; its third ray is rather weak, osseous, smooth, and as long as the head without the snout. The ventral arises a little posterior to the dorsal.

Scales. Two and a half rows between the lateral line and the base of the ventral fin.

The specimen is $3\frac{1}{2}$ inches to the base of the caudal fin, which is injured from pressure. The specimen is bleached.

100. BARBUS (PUNTIUS) COSUATIS.

B. iii. D. 3/8. P. 13. V. 9. A. 2/5. C. 19. L. l. 22. L. tr. 6.

Lateral line incomplete, ceasing on the fourth scale.

Hab. This little species I took in the Midnapore district.

101. BARBUS (PUNTIUS) VITTATUS, Day.

Putti (Ooriah).

B. iii. D. 2/8. P. 12. V. 9. A. 2/5. C. 20. L. l. 20–22. L. tr. $\frac{4}{5}$.

Lateral line incomplete.

Hab. Rivers and tanks in southern Orissa.

102. BARBUS (PUNTIUS) TERIO, H. Buch.

Kakachia kerundi (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 15. V. 9. A. 3/5. C. 18. L. l. 21. L. tr. 5/5.

Lateral line incomplete.

Hab. Tanks in Orissa.

103. RASBORA DANICONIUS, H. Buch.

Dundikerri (Ooriah).

B. iii. D. 2/7. P. 15. V. 9. A. 3/5. C. 19. L. l. 33–34. L. tr. 5/3.

Hab. Rivers and tanks.

104. NURIA DANRICA, H. Buch.

Dundikerri (Ooriah).

B. iii. D. 2/6. P. 12. V. 9. A. $\frac{2-3}{5}$. L. l. 32–34. L. tr. $\frac{5-6}{2}$.

Hab. Rivers and tanks.

105. ASPIDOPARIA MORAR, H. Buch.

Aspidoparia sardina, Heckel.

Bayi (Ooriah). *Morari* (Bengali).

B. iii. D. 3/8. P. 15. V. 8. A. 2/10. C. 19. L. l. 42. L. tr. $\frac{5\frac{1}{2}}{2\frac{1}{2}}$. Vert. $\frac{14}{21}$.

This species is very common in Orissa, but still more so in the Cossye river, where it attains $4\frac{1}{2}$ inches in length. I obtained one adult specimen in which the anal fin was entirely absent.

106. DANIO (PARADANIO) DEVARIO, H. Buch.

Bonkuaso (Ooriah).

B. iii. D. $\frac{2}{13-14}$. P. 13. V. 6. A. $\frac{3}{14}$. C. 17. L. l. 41. L. tr. $\frac{11}{3\frac{1}{2}}$.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of base of dorsal $\frac{1}{7}$, of base of anal $\frac{1}{8}$, of caudal $\frac{1}{4}$ of the total length. Height of head $\frac{2}{11}$, of body $\frac{1}{3}$, of dorsal fin $\frac{1}{5}$, of ventral $\frac{1}{7}$, of anal $\frac{1}{7}$ of the total length.

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

Posterior extremity of upper jaw extends to beneath the anterior margin of the orbit. The lower jaw is the longest. Third suborbital bone broad. Barbels absent.

Fins. Dorsal commences midway between the anterior margin of the orbit and the base of the caudal fin. Pectoral reaches the ventral, which last extends nearly to the anal. The anal commences below about the third dorsal ray. Caudal lunated.

Scales. Two and a half rows between the lateral line and the base of the ventral fin.

Colours. Superiorly greenish, becoming silvery white on the abdomen. The anterior portion of the body is reticulated in its centre with steel-blue lines, divided from one another by narrow yellow bands. Three bluish lines are continued towards the caudal fin, where the two lower coalesce, and passing upwards become lost on the upper half of the caudal fin.

Hab. Salundee river, in Orissa.

This species varies but slightly from the *D. devario*, H. Buch., of which I consider it a variety. Some five specimens of the *D. devario* have been received from Assam at the Calcutta Museum, and they have A. $\frac{3}{16}$, but do not otherwise differ from the Orissa fish.

107. BARILIUS (PACHYSTOMUS) COSCA, H. Buch.

Bahgra bahri (Ooriah).

B. iii. D. $\frac{2}{7}$. P. 13. V. 9. A. $\frac{2}{7-8}$. C. 18. L. l. 42. L. tr. $\frac{9}{3}$.

Hab. Common in rivers in Orissa.

108. Barilius (Pachystomus) lineatus, Day.

Poncha geraldi (Ooriah).

B. iii. D. $\frac{2}{7}$. P. 13. V. 8. A. $\frac{3}{12}$. C. 19. L. l. 28. L. tr. 6.

Lateral line absent.

This fish I have placed as a *Barilius* instead of *Danio*, in accordance with Dr. Günther's division of the two genera. I find in the Calcutta Museum several specimens obtained from the Hooghly by Mr. Blyth, and labelled *Cyprinus rerio*, H. Buch. It may therefore turn out to be this latter species, which I shall shortly be able to determine in the locality where the original species exists; the *C. rerio* is said to have D. 8, V. 7, A. 16.

109. Barilius (Bendilisis) barila, H. Buch.

Gilland (Bengali).

B. iii. D. $\frac{2}{7}$. P. 13. V. 9. A. $\frac{3}{10}$. C. 19. L. l. 44–46. L. tr. $\frac{6\frac{1}{2}}{4}$.

This species has two very fine rostral barbels, whose existence has been overlooked.

Teeth. Pharyngeal 5, 4, 3/3, 4, 5.

Hab. Cossye river, where it attains 4 inches in length.

110. Barilius (Barilius) barna, H. Buch.

Bahri (Ooriah).

B. iii. D. $\frac{2}{7}$. P. 13. V. 9. A. $\frac{3}{10}$. C. 19. L. l. 42. L. tr. 9/4.

Dorsal fin rather higher than long; its last ray is over the anal, and only extends halfway to the base of the caudal. A variety exists in the Mahanuddi which has the dorsal rays rather more elevated, the eye slightly larger, and the cleft of the mouth a little greater.

111. Barilius (Barilius) papillatus, sp. n.

B. iii. D. 3/7. P. 15. V. 9. A. $\frac{3}{10-11}$. C. 21. L. l. 39. L. tr. $\frac{7\frac{1}{2}-8\frac{1}{2}}{6\frac{1}{2}}$.

Length of head $\frac{1}{5}$, of pectoral $\frac{2}{11}$, of base of dorsal $\frac{2}{11}$, of base of anal $\frac{2}{11}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{2}{7}$, of dorsal fin $\frac{2}{11}$, of anal $\frac{1}{8}$ of the total length.

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

Third suborbital bone thrice as deep as the cheek below it; humeral process rather narrow. No barbels.

Fins. Dorsal arises midway between the posterior margin of the orbit and the base of the caudal fin; its base is as long as the fin is high; the last ray is thickened and divided to its root; it reaches as far as the base of the caudal fin. The pectoral extends to beyond the origin of the ventral, and the latter fin to the base of the anal; its inner rays are thickened and rather stiff. The caudal is forked in its posterior two-thirds, and the lower lobe is rather the longest; the ends of both are rounded.

Scales in regular rows, each scale having a few round elevated spots upon it. Three and a half rows between the lateral line and the base of the ventral fin.

Lateral line first curves gently downwards; subsequently it is continued to just below the centre of the base of the caudal fin.

Colours. Canary-colour, with the back stained grey, and from seven to nine broad and deep blue bands extending from the back to the abdominal profile. Dorsal fin stained with grey in its upper third, as is also the caudal in its posterior third.

Hab. Cossye river, attaining 3 inches in length, and said not to be common; however, I obtained eleven specimens. A variety exists in the Mahanuddi, the eye being somewhat smaller, opercle less wide, but otherwise similar.

Genus Opsarius.

Opsarius, sp., M'Clelland.

Bola, Günther, preoccupied by Genus VI. in Hamilton Buchanan's 'Fishes of the Ganges,' p. 73.

112. Opsarius goha, H. Buch.

Leuciscus salmonoides, Blyth.
Bugguah (Bengali).

B. iii. D. $\frac{3}{7}$. P. 13. V. 9. A. $\frac{3}{10}$. C. 19. L. l. 88. L. tr. $\frac{12}{9}$.

Hab. Cossye river at Midnapore.

Genus Bohtee, Sykes, 1841.

Osteobrama, Heckel, 1842.

113. Rohtee vigorsii, Sykes.

Osteobrama rapax, Günther.
Gollund (Ooriah).

B. iii. D. $\frac{3}{8}$. P. 19. V. 10. A. $\frac{3}{22\text{-}23}$. C. 19. L. l. 75. L. tr. $\frac{18}{19}$.

Dr. Günther considers that Colonel Sykes's species is identical with *Rohtee* (*Cyprinus*) *cotio*, H. Buch.; but if the two figures pl. 39. f. 93, 'Fishes of the Ganges,' and t. 63. f. 3, of Sykes's 'Fishes of the Dekkun,' are compared, the distinction is apparent. In the former the ends of the jaws are even in front; in the latter the lower jaw projects. Besides this I obtained numbers of this species in the Kistna river, from one of whose tributaries some of Col. Sykes's specimens were probably procured; on the other hand I could not find the *R. cotio* in that river. Col. Sykes appears to have written 29 instead of 26 rays for the anal fin, but a few more or less does not seem to have been considered of great moment, especially as the drawing gives 36.

Hab. Rivers and tanks in Orissa.

114. ROHTEE ALFREDIANA, Cuv. & Val.

Gunda, Gollund (Ooriah).

B. iii. D. $\frac{3}{7}$. P. 13. V. 10. A. $\frac{2}{30}$. C. 19. . L. l. 57–60.

Hab. Rivers and tanks in Orissa.

Genus PERILAMPUS, M'Clelland.

Cachias, Günther.

115. PERILAMPUS ATPAR, H. Buch.

Perilampus macropodus, Jerdon.

Bonkuaso (Ooriah).

B. iii. D. 2/7. P. 10. V. 5–6. A. $\frac{2-3}{19-21}$. C. 19. L. l. 55. L. tr. $\frac{10-12}{4}$.

This fish in some rivers and tanks appears to entirely supersede the *Rasbora*.

116. PERILAMPUS LAUBUCA, H. Buch.

Bankoe (Ooriah).

B. iii. D. 2/9. P. 13. V. 6. A. $\frac{2}{17-20}$. C. 19. L. l. 34. L. tr. 7/5.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{3}$, of base of dorsal $\frac{1}{8}$, of base of anal $\frac{1}{5}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{3}$, of body $\frac{1}{4}$, of dorsal $\frac{1}{3}$, of ventral $\frac{1}{2}$, of anal $\frac{1}{3}$ of the total length.

Eyes. Upper margin near the dorsal profile, diameter $\frac{1}{3}$ of length of head, nearly 1 diameter from end of snout, $1\frac{1}{4}$ diameter apart.

Body somewhat elevated to the base of the dorsal fin, with a slight concavity over the occiput. The whole of the body much compressed, with the abdominal edge cutting from the pectoral to the anal fin.

Teeth pharyngeal, 5, 4, 1/1, 4, 5.

Fins. Dorsal arises slightly posterior to the origin of the anal. Pectoral ray elongated and reaching as far as the base of the anal. The outer ray of the ventral slightly elongated. Caudal deeply forked.

Scales. Three and a half rows between the lateral line and the base of the ventral fin.

Colours. Silvery, with some vertical golden stripes, which disappear after death. The whole of the body with fine black dots, and a black mark, shot with green, above the base of the pectoral fin, and another at the base of the caudal.

This fish is common in Orissa, growing to 3 inches in length, and is without doubt Hamilton Buchanan's species delineated by M'Clelland at t. 45 (erroneously also marked 56), and t. 4 (erroneously marked 10)*. Many specimens received from different localities exist in the Calcutta Museum, and have been correctly labelled *Perilam-*

* See M'Clelland, 'Indian Cyprinidæ,' p. 314.

pus laubuca, H. Buch., by Mr. Blyth. Dr. Günther has evidently received a very different fish from the Hooghly (? *Cyprinus dancena*, H. Buch.); for it is referred to the genus *Chela*, under which head I perceive he has also placed the *Perilampus fulvescens*, Blyth, whose two typical specimens I have examined in the Calcutta Museum, and which do not belong to the genus *Chela*, H. Buch., but to *Perilampus*, M'Clelland.

117. CHELA PHULO, H. Buch.

B. iii. D. 2/7. P. 13. V. 9. A. 3/17. C. 19. L. l. 87. L. tr. 12/6.

Hab. Rather common in rivers and tanks in Orissa.

118. CHELA UNTRAHI, sp. n.

Untrahi (Ooriah).

B. iii. D. 2/7. P. 13. V. 7. A. 3/17. C. 17. L. l. 52. L. tr. 7/5.

Length of head $\frac{1}{4}$, of pectora $\frac{1}{5}$, of base of dorsal $\frac{1}{15}$, of base of anal $\frac{1}{6}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{3}$, of body $\frac{1}{3}$, of dorsal $\frac{1}{3}$, of ventral $\frac{1}{3}$, of anal $\frac{1}{3}$ of the total length.

Eyes. Upper margin near the profile, diameter $\frac{1}{3}$ of length of head, $\frac{2}{3}$ of a diameter from end of snout, nearly 1 diameter apart.

Dorsal profile nearly horizontal, abdominal profile with a cutting-edge from opposite the base of the pectoral fin.

Mouth very oblique, knob or symphysis minute. The lower jaw in advance of the upper, and the maxilla extends to under the anterior margin of the orbit. Suborbital ring of bones moderately wide.

Fins. Pectorals reaching ventrals, and a dilated humeral supporting a smooth thoracic edge. Dorsal arises midway between the posterior margin of the orbit and the posterior extremity of the caudal fin, and is situated over the anterior anal ray. Caudal lobed, the lower the longest.

Scales deciduous, extending as far forwards on the nape as to opposite the posterior margin of the orbit.

Lateral line descends rather abruptly to opposite the posterior third of the pectoral fin, whence it is continued along the lower margin of the abdomen, ceasing a little beyond the posterior extremity of the anal fin. One row of scales between it and the origin of the ventral.

Colours. Silvery.

Hab. Mahanuddi, grows to 5 inches in length.

119. CHELA GORA, H. Buch.

Hum catchari (Ooriah).

B. iii. D. 3/7. P. 15. V. 9. A. 2/13. C. 19. L. l. 140–160.

The scales on the top of the head extend as far forwards as the nostrils.

This species I first obtained at Jellasore, in Orissa, on the frontier of the Midnapore district. It grows to 9 inches in length.

120. CHELA BACAILA, H. Buch.

Jellahri (Ooriah).

B. iii. D. 2/7. P. 13. V. 9. A. $\frac{2}{12-13}$. C. 19. L. l. 110.

Hab. Common in rivers and tanks, attaining 9 inches in length.

Dr. Jerdon, in the Madras Journ. of Lit. & Sci. 1849, p. 327, expressed his doubts whether a species of *Chela* which he obtained in the Canvery, and termed *Pelecus flavipinnis*, might not be identical with the *Leuciscus novacula*, Val. Having taken the former in the Canvery, I find the fins rays to be as follows:—

B. iii. D. 2/7. P. 13. V. 9. A. $\frac{3}{14-16}$. C. 19. L. l. 65. L. tr. 9/5.

The *Chela novacula* is said to have the following:—

B. iii. D. 9. A. 17. L. l. 60. L. tr. 15/3.

121. NEMACHEILUS BOTIA, H. Buch.

B. iii. D. 3/11. P. 13. V. 8. A. 3/5. C. 19. L. l. 70–80. L. tr. 14/15.

The variety existing in Orissa is that without any projection below the skin in the præorbital region (*N. bilturio*, H. Buch.), whilst in all the Assam specimens I have examined this prominence is more or less distinct (*N. botia*, H. Buch.).

Hab. Orissa, and in the Cossye river at Midnapore, where it attains 2½ inches in length.

122. NEMACHEILUS MUGAH, sp. n.

Mugah (Bengali).

B. iii. D. 2/7. P. 11. V. 8. A. $\frac{2}{5-6}$. C. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{7}$, of base of dorsal $\frac{1}{6}$, of base of anal $\frac{1}{12}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{8}$, of body $\frac{2}{13}$, of dorsal fin $\frac{2}{13}$, of ventral $\frac{2}{15}$, of anal $\frac{2}{15}$ of the total length.

Eyes. Small, diameter $\frac{1}{5}$ of length of head, 2 diameters from end of snout, 1½ diameter apart.

Body fusiform, with compressed sides. The free portion of the base of the caudal as long as high.

Snout pointed, overhanging the jaws. Nostrils much nearer to the orbit than to the end of the snout. No enlargement of the præorbital. The two pairs of rostral and the maxillary barbels all about as long as the eye. A rather deep central longitudinal groove extends from opposite the posterior margin of the orbit to the end of the occiput.

Fins. Dorsal arises midway between the snout and the base of the caudal fin, its upper margin is straight. Pectoral extends more than halfway to the base of the ventral, which latter is situated under the anterior third of the dorsal, whilst the fin reaches halfway to the base of the anal. The anal is situated in the posterior two-fifths of the total length. Caudal emarginate in its last fifth.

Scales small but very distinct; twelve rows exist between the

lateral line and the dorsal profile, and thirteen between it and the base of the ventral fin.

Lateral line arises by two roots close to the head; they soon join, when it goes direct to the centre of the base of the caudal fin.

Air-bladder small, enclosed in a bony capsule.

Colours. Yellowish, with a tinge of green. About fifteen brown bands, one-third as wide as the ground-colour, pass across the back and descend on either side below the lateral line; a few near the head, and some in the posterior third of the body, are interrupted. Upper surface of head marbled with black. Fins immaculate; but the first two rays of the anal are black anteriorly, and there are also slight black marks near the end of the ventral and on the outside of the pectoral. Rostral barbels orange.

Hab. Cossye river at Midnapore, where it attains 2 inches in length.

123. COBITIS GUNTEA, H. Buch.

Kondaturi, Jupkari (Ooriah).

B. iii. D. $\frac{2}{6-7}$. P. 9. V. 8. A. $\frac{2}{5}$. C. 17.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{5}$, of base of dorsal $\frac{1}{11}$, of base of anal $\frac{1}{13}$, of caudal $\frac{1}{6}$ of the total length. Height of head $\frac{1}{5}$, of body $\frac{1}{6}$, of dorsal fin $\frac{1}{7}$, of ventral $\frac{1}{5}$, of anal $\frac{1}{9}$ of the total length.

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

Body strongly compressed.

A free bifurcated suborbital spine arises opposite to, but below, the anterior margin of the orbit, and extends to below its centre. The posterior extremity of the upper jaw does not extend so far as to beneath the orbit. Barbels large, well developed, and all six longer than the eye.

Fins. Dorsal arises midway between the posterior margin of the orbit and the base of the caudal; its first three or four rays are anterior to the ventral fin. Caudal generally entire; but its centre rays are sometimes the longest, occasionally the shortest.

Scales very conspicuous.

Lateral line absent.

Colours. Generally dirty yellowish, with a dark band extending from the centre of the snout, and ending in a black ocellus just above the centre of the base of the caudal fin. Along this dark band are a series of indistinct but nearly black blotches, whilst the back has similar dark stains. Dorsal and caudal with blackish rows of dots.

Hab. Rivers and tanks throughout Orissa, growing to nearly 4 inches in length.

124. LEPIDOCEPHALICHTHYS BALGARA, H. Buch.

Jubbi cowri (Ooriah).

B. iii. D. $\frac{2}{6}$. P. 7. V. 7. A. $\frac{2}{5}$. C. 16.

I have not seen the armed pectoral ray in this species, which

otherwise appears very similar to the Madras one; however, I have no specimen from that locality with me so as to be able to compare the two.

Dr. Günther remarks, in 'Catalogue of Fishes,' vol. vii. p. 365, that in my drawing in the 'Proceedings' of this Society and in the 'Fishes of Malabar,' the pectoral fin of the latter fish is "erroneously represented," as the semiosseous spine is attached to the fin by the usual interradial membrane, and not detached. *The drawing was a correct one* of my single specimen, which was not in a good state of preservation, and which I placed in the British Museum. My reason for not delineating the membrane, which normally exists, was simply because it was absent; and I merely copied correctly from what I saw before me, without adding to or subtracting from it.

125. ENGRAULIS BŒLAMA, Forsk.

B. xi. D. $\frac{3}{11}$. P. 13. V. 6. A. $\frac{1}{31}$. C. 19. L. l. 40. L. tr. 9.

Teeth. Five in both jaws, vomer, and palatines. The serrated abdominal scales extend from the gill-openings, there being fifteen anterior to the base of the ventral, and nine posterior to it. One specimen $5\frac{1}{2}$ inches long from the sea at Chanderpore.

126. ENGRAULIS PURAVA, H. Buch.

Tampara, Pussai (Ooriah).

B. xii. D. $\frac{3}{10}$. P. 15. V. 6. A. $\frac{3}{40}$. L. l. 46. L. tr. 12.

Hab. Taken in numbers in the sea at Chanderpore.

127. ENGRAULIS RHINORHYNCHUS, Bleeker.

B. xi. D. $\frac{3}{10}$. P. 13. V. 7. A. $\frac{3}{33-34}$. C. 19. L. l. 37. L. tr. 9.

Hab. Many specimens up to 4 inches in length were taken in the sea at Chanderpore.

128. ENGRAULIS TATY, H. Buch.

B. xiii. D. $\frac{1}{14}$. P. 16. V. 7. A. $\frac{2}{51-54}$. C. 19. L. l. 42–46. L. tr. 12.

Hab. Rivers in Orissa within tidal influence.

129. ENGRAULIS TELARA, H. Buch.

Pencha (Bengali). *Tampara* (Ooriah).

B. xiii. D. $\frac{3}{10}$. P. 15. V. 7. A. $\frac{2}{70-75}$. C. 19. L. l. 52. L. tr. 14.

Hab. Rivers in Orissa within tidal influence.

130. COILIA RAMCARATI, H. Buch.

Oorialli (Ooriah).

B. xi. D. $\frac{1}{13}$. P. $\frac{6}{11}$. V. 7. A. 110. L. l. 70–76.

Dr. Günther observes, "Abdomen not serrated in front of the ventrals," and apparently has four specimens to describe from. However, I have not been fortunate in obtaining any such as he records; for out of 28 specimens in Orissa and at Coconada, all were serrated anterior to the ventrals, with 4 sharp scales, and with from 8 to 11 posterior to it.

I obtained a very curious malformation in one of these fishes. The caudal end of the fish is superseded opposite the 44th scale of the lateral line, and an entirely new description of tail exists, being a long forked one, nearly $\frac{1}{4}$ of the total length of the fish.

Hab. Orissa, from the sea.

131. CHATOËSSUS MANMINA, H. Buch.

? *Clupanodon cortius*, H. Buch.

Mackundi (Ooriah).

B. vi. D. $\frac{2}{12}$. P. 17. V. 8. A. $\frac{3}{19-21}$. C. 21. L. l. 58–60. L. tr. 22.

Hab. Grows to about 8 inches in length, and is found in rivers and tanks in Orissa.

132. CLUPEA CHAPRA, H. Buch.

C. indica, Gray.

Having been favoured with an examination of the MS. drawings of Hamilton Buchanan, of which he was deprived when leaving India, I find the *Clupea chapra* of Hardwicke's illustrations is traced from the *Clupanodon chapra* of Hamilton Buchanan, and is the same as the species described by Dr. Günther as *Clupea indica* (Gray). Hamilton Buchanan's description is at pp. 248, 383, of his work on the fishes of the Ganges. On the back of the original drawing is written "*Clupanodon chapra*," leaving no question of doubt as to its identity.

133. CLUPEA PALASAH, Cuv. & Val.

Clupanodon ilisha, H. Buch.

Ilisha (Ooriah), *Hilsa* or *Ilisha* (Bengali), *Pulasu* (Telugu), *Oolum* (Tamil).

B. vi. D. $\frac{3}{15-16}$. P. 15. V. 9. A. $\frac{2}{17}$. C. 19. L. l. 45–49. L. tr. 17.

Having for the last few months been examining the fisheries of this and other species of fish, I have no hesitation in most positively asserting that Russell's fish and Hamilton Buchanan's are identical. I have specimens from 2 inches in length to 19 inches.

This fish ascends the rivers to breed, and I have seen it taken in thousands from the Hooghly to the Canvery.

Genus CORICA, H. Buch.

Clupeoides, Bleeker.

134. CORICA SOBORNA, H. Buch.

Cutwal alise, Godhaee (Ooriah).

D. $\frac{3}{15}$. P. 13. V. 8. A. $\frac{2}{11}$ ii. C. 19. L. l. 40. L. tr. 10.

Both this genus and species, as given in the 'Fishes of the Ganges,' appear to have escaped Dr. Günther's observation.

Length of head $\frac{2}{11}$, of pectoral $\frac{2}{11}$, of base of dorsal $\frac{1}{4}$, of base of anal $\frac{1}{4}$, of caudal $\frac{2}{11}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{1}{4}$, of dorsal fin $\frac{1}{3}$, of ventral $\frac{1}{8}$, of anal $\frac{1}{8}$ of the total length.

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

Abdominal edge cutting, having 11 serrated scales between the base of the pectoral and ventral fins, and 6 more posterior to the ventral.

Lower jaw the longest. Posterior extremity of the maxilla extending to beneath the centre of the orbit.

Fins. Origin of dorsal rather nearer to the base of the caudal than to the snout, the origin of the ventral being slightly anterior to it. The anal commences under the last dorsal rays. Caudal forked in its posterior third, the lower lobe the longest.

Colours. Silvery.

Hab. Mahanuddi river.

135. PELLONA DUSSUMIERI, Cuv. & Val.

Paunia puiee (Ooriah).

B. vi. D. $\frac{3}{15}$. P. 19. V. 6. A. $\frac{3}{46}$. C. 21. L. l. 46. L. tr. 12.

Hab. Chanderpore, in the sea.

136. PELLONA MOTIUS, H. Buch.

Ursi (Ooriah).

B. vi. D. $\frac{2}{14-15}$. P. 15. V. 6. A. $\frac{3}{36}$. C. 19. L. l. 45. L. tr. 13.

Hab. Rivers and tanks in Orissa, growing to 4 inches in length.

137. RACONDA RUSSELLIANA, Gray & Hard.

P. 13. A. 92. C. 19. L. l. 64. L. tr. 12.

Hab. Specimens from 2 to 10 inches in length taken in the sea at Chanderpore.

138. MEGALOPS CYPRINOIDES, Brouss.

Naharm (Ooriah).

B. xxiv.–xxvi. D. $\frac{3}{16-17}$. P. 15. V. 10. A. 24. C. 19. L. l. 39. L. tr. $\frac{6}{6}$.

Hab. Rivers and tanks in Orissa.

139. CHIROCENTRUS DORAB, Forsk.

Kunda (Ooriah).

B. viii. D. $\frac{3}{13-14}$. P. 15. V. 7. A. $\frac{3}{30-31}$. C. 19.

Hab. Sea at Chanderpore.

140. NOTOPTERUS CHITALA, H. Buch.

Chitul (Ooriah).

B. viii.–ix. D. $\frac{1}{7\text{-}9}$. P. 19. V. 6. A. 110–125. C. 11. L. l. 180. Cæc. pyl. 2.

Hab. Rivers and tanks in Orissa.

141. NOTOPTERUS KAPIRAT, Lacép.

Pulli, "a slice" (Ooriah).

B. vi.–viii. D. $\frac{1}{8}$. P. 17. V. 6. A. 100–108. C. 13. L. l. 225. Vert. $\frac{15}{54}$.

Hab. Fresh waters of Orissa.

142. SYMBRANCHUS CUCHIA, H. Buch.

Hab. This Eel is not rare in the rivers of Orissa.

143. TRYGON UARNAK, Forsk.

Sankush (Ooriah).

This fish ascends the Mahanuddi as high as Cuttack. The spine on its tail is very much dreaded by the fishermen.

144. MICROPHIS CUNCULUS, H. Buch.

Kunnur dant (Ooriah), "Crocodile's tooth.

The Ooriah natives say that these little pipefishes have some mysterious connexion with the teeth of the Crocodile, some fishermen asserting them to be vivified teeth, others that they are rejected tooth-picks.

145. TETRODON POTOCA, H. Buch.

Bheng pulli (Ooriah).

Hab. Found at Cuttack in rivers and tanks.

146. TETRODON GULARIS, H. Buch.

Teepah benki (Ooriah).

This species is still more common than the preceding, and at long distances inland.

Besides the foregoing, I took several specimens of the Common Ganges Shark as far inland as Cuttack, and a species of *Pristis*, which I have not as yet identified.

4. Additional Remarks on the *Megascolex diffringens*.

By W. BAIRD, M.D., F.R.S. &c.

Since I sent to the Society, last January*, a short account of a new species of Earth-worm (*Megascolex diffringens*), found in the hot-bed for stove-plants in the garden of Plas Machynlleth, in

* Vide *anteà* p. 40.

North Wales, I have had several specimens of the same species of worm forwarded to me from a similar habitat, viz. a stove-bed for hothouse plants in the garden of Lady Cullum, at Hardwick House, near Bury St. Edmunds, in Suffolk. I am indebted to the kindness of Mr. Maxwell Masters, editor of the 'Gardeners' Chronicle,' for the first intimation of the creature's existence in Suffolk; and since then, a letter from the intelligent gardener at Hardwick House, Mr. D. S. Fish, explains to me the particular localities in which he has found this worm, and gives some very interesting information with regard to its habits and manners. In his letter to me Mr. Fish says that he has known the worm for about twenty years, and that from its peculiar motions he has always called it the *eel-worm*. This name applies very well to its particular wriggling movements, and answers exactly to the description given by my first correspondent, Mr. Johnstone, of Machynlleth. Mr. Fish says, in the letter mentioned above, "I first made acquaintance with this worm, twenty years ago, at Glevering Hall, near Woodbridge, in the eastern division of this county. I have only met with it there and at this place (Hardwick House). It was found among tropical plants, and is limited in its range by the temperature. I have not found it among greenhouse plants, and it seems incapable of subsisting out of doors. It differs from other worms in the following particulars. At night it will come out and travel along bare walls and clean stones with great rapidity, and without apparent inconvenience. When disturbed it vanishes at once, and is thus difficult to destroy. Again, on turning out a plant infected with worms of the common sort, they are readily brought to the surface of the ball by tapping or vibrating the mass of earth. We imagine that the worms anticipate *moles*, and so rush to the surface to escape; they thus become a ready prey to us. But these worms, unless seized at once, make for the centre of the ball the moment they are disturbed, and thus avoid detection and destruction. Again, you will observe they differ wholly in the rate and manner of their locomotion. They are also much more destructive. I cannot say that they eat the roots: I think not; but they speedily render the soil incapable of supporting them in health. They appear to eat out its centre stamina, causing it to undergo a species of putrefaction. They seem fonder than the common worm of getting down among the potsherds and crocks at the bottom of the pots, and they speedily work down among them to the complete destruction of the drainage. Lastly, the plants show signs of distress sooner under the infliction of these worms than any other. The roots decay, the leaves turn yellow, and the whole life becomes as it were paralyzed. It seems to affect their vitality somewhat as heart-disease affects animal life. Every vital function loses force; and unless the worms are destroyed, the contest ends in the destruction of the plant.

"It is most difficult to eradicate this worm. It is evidently of foreign origin and is far from common; but once established it breeds rapidly in heat, and is not easily destroyed by the usual remedies of lime-water &c." Mr. Fish's supposition that this

worm is a foreign importation is what I have already, in my previous paper, suggested. The chief habitats for worms of this peculiar genus are Ceylon and India. We have specimens also of a species from Australia. In a second letter from Mr. Fish, dated April 9th, he further says, as to its foreign origin, "I think it probable the worms come from the Cape of Good Hope, or some part of Africa. The proprietor of Glevering Hall, where I first met them, was a great fancier of bulbs and imported a good many; and it was in a large *Crinum-amabile* pot that I first found the worm. My theory is that they came from Glevering here (Hardwick House), as it is quite possible that plants may have been exchanged between the two places." "They seem to have no fear of moles, as when disturbed they rush inwards, and not outwards as our common worm always does." Mr. Fish, in repeating that he has known this worm for twenty years, says that he has observed it for the last fourteen years at Hardwick House.

I have very little doubt that this curious worm will be found in various gardens throughout Great Britain.

5. On Dr. Gray's Genus *Theonella*.

By J. S. Bowerbank, LL.D., F.R.S., F.Z.S., &c.

On October the 23rd, 1868, I visited the British Museum for the purpose of reexamining some of the Siliceo-fibrous Sponges before sending my paper on that subject to this Society; and I then saw, for the first time, the specimen from Formosa sent by Mr. Swinhoe. I pointed it out to Dr. Baird, and expressed my wish to examine it. He forthwith conveyed it to the entomological department, where I closely inspected its structures and satisfied myself that it was a specimen of my previously named *Dactylocalyx Prattii*; and as such I have alluded to it in the first part of my paper on the Siliceo-fibrous Sponges, which was read at the meeting of this Society, January 28, 1869. I was not then aware that Dr. Gray had read a paper on the Formosan Sponge on November 12, 1868, immediately after my inspection of it at the British Museum. I received my copy of the 'Proceedings' of the Society on the 28th of April last, and I then saw Dr. Gray's description of the Formosan specimen under the designation of "Note on *Theonella*, a new genus of Coralloid Sponges from Formosa," P. Z. S. 1868, p. 565, and a very excellent woodcut of the sponge, p. 566.

Having previously become well acquainted with the specimen, I was somewhat surprised to see it designated as a new genus. The author's generic characters are ample enough it is true, as he embraces not only external form and the skeleton-structure, but every other character with which he became acquainted; but unfortunately he describes the anatomical structure so incorrectly as to inevitably lead the student into doubt and difficulty in the very first stage of

his researches. Thus in the second line of his generic description he says:—"Internally formed of netted spicules arranged so as to leave an hexangular mass; the spicules subcylindrical, united at the inosculation of the network by a siliceous callosity." This is certainly the most incomprehensible description of a purely siliceo-fibrous network that can possibly be imagined; and the figure he has given of the reticulations of a portion of the skeleton-structure, P. Z. S. 1868, fig. 2, p. 566, at once contradicts his description. Throughout the remainder of his description he continues to describe the siliceo-fibrous structure as spicula.

In the first paragraph, p. 565, the author writes:—"The sponge in some external characters is like the genus *Macandrewia* (*Dactylocalyx*, Stutchbury), but it differs from that sponge in not having any stellate spicula." It is quite true that the Formosan sponge has no "stellate spicula;" but neither has the Doctor's *Macandrewia azorica*; so that it is not "the only sponge of the family in which they are not discovered."

The author describes the long slender interstitial spicula intermixed with the fibrous skeleton; but it is a singular circumstance that he appears to have entirely failed in detecting the remarkable forms of connecting spicula on the dermis, which I have designated as irregularly furcated patento-ternate, and which were first figured in the Phil. Trans. R. S. 1858, plate xxix. fig. 8, *in situ*, and fig. 9 as separated by nitric acid; and they are also represented in P. Z. S. 1869, Plate V. fig. 9, *in situ*, and figs. 9, 10 & 11 in the separate condition; and it is stated in the first part of my paper on the siliceo-fibrous sponges that they belong to my *Dactylocalyx Prattii*. These spicula certainly form the most prominent specific characters of the sponge, and they are so abundant in the expansile dermal system of the animal that it appears singular that any approach to a careful examination of its structure should fail to immediately discover them; nor has the author observed the minute entirely spined fusiformi-cylindrical spicula which are so abundantly dispersed on the surfaces of the dermal and other membranes of this species of sponge, and which are represented in Plate V. fig. 7, P. Z. S. 1869. Thus the author has been led into the error of believing the sponge to be the type of a new genus by merely abstaining from a careful and proper examination of the structural peculiarities of the specimen under consideration. I will not reiterate the description of the Formosan specimen that I have given in my paper, P. Z. S. 1869, in my history of *Dactylocalyx Prattii*; I will quote only a few lines comparing the two specimens under consideration:—"The sponge is fortunately in very nearly as fine a state of preservation as when taken from the sea; and every organ that is found in the type specimen appears in abundance in the one from Formosa. In truth, portions of the structures taken from the one specimen cannot, by microscopical examination, be distinguished from those mounted from the other."

6. On the Representatives of the Malleus and the Incus of the *Mammalia* in the other *Vertebrata*. By T. H. Huxley, F.R.S.

In the course of the last two years, Professor Peters has contributed to the 'Monatsberichte' of the Berlin Academy a series of papers in which he advocates what I may term, for brevity's sake, the "Okenian" doctrine of the homologies of the *ossicula auditûs* of Mammals and of the quadrate bone of the other *Vertebrata*. According to this view, the *ossicula auditûs* of *Mammalia* are completely represented by the auditory *columella* in other *Vertebrata*, while the tympanic is the homologue of the quadrate bone. In supporting it, Professor Peters necessarily argues against the doctrine originally put forward by Reichert, and subsequently adopted by myself, that the auditory *columella* of the lower *Vertebrata* does not answer to all the *ossicula auditûs* of the *Mammalia*, but only to the *stapes*—the *incus* being represented by the quadrate bone, the *malleus* by the articular; while the homologue of the tympanic is only to be found occasionally, in ossifications of the fibrous frame of the tympanic membrane.

In the first two papers of the series, Prof. Peters bases his argumentation upon the anatomical relations of the lower jaw and the tympanic bone in the *Marsupialia* and *Monotremata*; but as these facts are, undoubtedly, capable of being interpreted as well upon the Reichertian as upon the Okenian hypothesis, I did not conceive it necessary to enter, at present, upon any discussion of them.

On the 19th November, 1868, however, Prof. Peters made a third communication to the Berlin Academy, "Upon the Auditory Ossicles and the Meckelian Cartilage in Crocodiles," which was followed on the 7th January, 1869, by a fourth, "Upon the Auditory Ossicles of Chelonia, Lizards, and Ophidia, as well as upon the cavities of the Lower Jaw of the Crocodile," which seemed to me to demand immediate attention; for the quadrate bone of the Crocodile cannot possibly represent either the incus, or the malleus, if the statement of anatomical facts made by Prof. Peters is correct.

I therefore proceeded to the verification of his descriptions with much interest and a little anxiety; but after dissecting the skulls of several young Crocodiles with great care, I must declare my conviction that Prof. Peters is in error as to the facts, and, therefore, that the argument he bases upon them falls to the ground.

The able anatomist Stannius first drew attention to the pneumaticity of the lower jaw in the Crocodile, in the following terms:—

"The *os articulare* of the lower jaw is distinguished by its pneumaticity; its great hollow cells communicate, by a canal which lies at the back of the *os tympanicum* [quadratum], with the air-chambers of the cranial bones. The lowest part of the canal in question forms a groove in the dry skull. This, in the fresh skull, is converted into a soft tube; and a free membranous tube leads into a hole placed on

the inner side of the surface of the *os articulare*." (Stannius, 'Handbuch d. Zootomie,' Zweiter Theil. Amphibien, p. 58, 1856.)

Prof. Peters adds to this account of the matter the following statements (Monatsberichte, 1869, pp. 593, 594):—

That Meckel's cartilage, which persists throughout life in the Crocodile, becomes very slender posteriorly, and passes through the hole in the *os articulare*; that this slender cartilage then ascends upon the posterior and upper face of the quadrate bone enclosed in a membranous sheath; that, having reached the posterior edge of the membrana tympani, "it becomes connected with a cartilaginous plate, the narrow middle part of which is bent inwards towards the *columella auris*, with the external end of which it is connected by a joint. The broadest part of this cartilaginous plate is shaped like an axe-head, is directed perpendicularly against the *membrana tympani*, and forms, at the anterior end of its convex outer edge, a little plate which lies in the middle of the *membrana tympani*. It causes this region of the membrane to project slightly outwards, in the adult as well as in the young, and gives attachment to a filiform tendon which proceeds from the posterior boundary of the tympanic cavity. The other part of the cartilaginous plate bends away at an obtuse angle from the former, and has also the form of an axe-head, the convex edge of which, however, is narrower, and is applied below the posterior and inner part of the tympanic membrane to the cartilaginous margin of the tympanum." Prof. Peters considers that the last mentioned triangular cartilage is the homologue of the *malleus*.

In another embryo 20½ centimetres long, Prof. Peters finds (*l. c.* p. 594) a "little, short, cylindrical, intermediate cartilage," which connects the columella [*stapes*] and this so-called malleus, and which he compares to the *incus*, or the *os lenticulare*.

In a subsequent communication (7th January, 1869, Monatsberichte, pp. 6–8) "On the cavities of the Lower Jaw in the Crocodile," Prof. Peters repeats the assertion that his so-called "*malleus*" is connected by a cartilaginous cord with the posterior end of Meckel's cartilage, and states that he is unable to find the duct by which (as Stannius states) the pneumatic cavity of the *os articulare* is placed in communication with that of the quadrate bone.

Nevertheless the description given by Stannius is perfectly correct, and I am puzzled to comprehend how the pneumatic duct, which places the air-cavities of the quadrate and articular bones in communication, can be confounded with a cartilaginous rod surrounded by a membranous sheath. The fact is that there is no direct connexion between the posterior part of Meckel's cartilage and the so-called "*malleus*;" and thus, I cannot but think, the whole foundation of Prof. Peters's argument collapses.

Before particularly describing the very curious and instructive character of the outer extremity of the stapes (or so-called *columella auris*) and of the parts connected with it in the Crocodile according to my own observations, it is proper to remark that both Cuvier and Windischmann observed, though they did not quite rightly interpret, its structure.

Cuvier (Ossemens Fossiles, ix. p. 177) states of the stapes of the Crocodile, that "it consists of a long narrow elliptical plate, attached to the *fenestra ovalis*, from which passes a long and slender stem, which goes, becoming a little softer, to attach itself to the tympanic membrane; it then bends back and follows it, being fixedly attached thereto and taking a cartilaginous consistency, as far as its posterior margin. From the posterior wall of the tympanum a muscular filament proceeds and becomes attached to the stem of the bone at about a third of its length [from the tympanic membrane]; and a fold of the internal lining of the tympanum forms a triangular ligament which extends to the same point, and thus contributes to fix the stem to its recurved and tympanic portion."

Windischmann observes, "Ossiculum auditorium Scarpa delineavit, fere quatuor lineas longum, operculo triangulari instructum. In altera extremitate in cartilaginem tripartitam desinit, cujus una pars, ut dixi, in membrana media tympani adhæret, aliæ duæ in falce membranam hancce excipiunt." (Windischmann, De penitiori auris in Amphibiis structura. 1831.)

The "triangular ligament" of Cuvier is clearly the "*malleus*" of Prof. Peters; and the same part seems to be meant by the "aliæ duæ" of Windischmann.

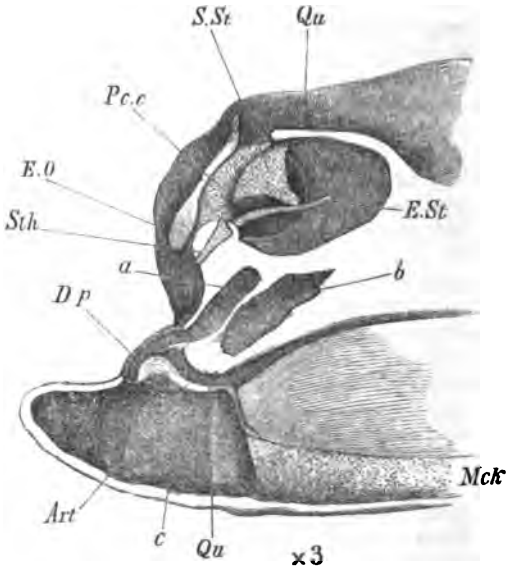
What Cuvier terms the "stem" of the stapes of the Crocodile is more or less completely ossified; but I find, in all cases, that it passes directly into the cartilaginous axehead-like plate, the convex edge of which is connected with the *membrana tympani*. There is no trace of the joint described by Prof. Peters in any of the specimens I have examined; neither have I been able to see anything of the "filiform tendon" which is said to "proceed from the posterior bonndary of the tympanic cavity."

Where the outer end of the stem of the stapes widens out into this process for the tympanic membrane, which I shall call the "*extrastapedial*" cartilage (fig. 1, *E.St*), it gives off, upwards and backwards, a slender cartilaginous prolongation, which expands and becomes the second "axehead-like" process, called "*malleus*" by Prof. Peters (*S.St*); but I have not been able to detect any trace of what Prof. Peters calls "a little short cylindrical intermediate cartilage" between this and the stem of the stapes. In all the specimens I have examined there is complete cartilaginous continuity between the two.

What Prof. Peters terms the "cartilaginous margin of the tympanum" is a backward prolongation of the cartilage of the periotic region of the skull, which corresponds in part, if not wholly, with the *tegmen tympani* of a mammal. It may be called the "parotic process" (fig. 1, *Pc.c*); and in the adult it is converted, in great measure, into a slender and curiously curved process of the pro-otic, and, in part, into a process of the so-called exoccipital bone. Muscular fibres, which represent the *stapedius* muscle (fig. 2, *Stp*), proceed from this cartilaginous margin, or the corresponding bones, to the margin and outer face of the cartilage called "*malleus*" by Prof. Peters, but which I shall term the "*suprastapedial*" carti-

lage (*S.St*). The inner surface of the posterior edge of the suprastapedial cartilage is thus closely connected with the posterior part of the parotic process of the skull, while its anterior end comes into contact with the quadrate bone, which is connected with the front part of the same process.

Fig. 1.



Side view of the right side of the hinder part of the skull of a young *Crocodilus biporcatus*. The squamosal, the postfrontal, and the tympanic membrane are removed, and the quadrate (*Qu*) is, in part, indicated only by an outline.

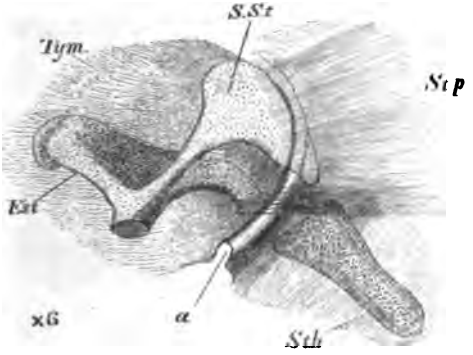
E.O. Exoccipital. *Pc.c.* Cartilaginous termination of the parotic process of the skull. *E.St.* Extrastapedial process of the stapes. *S.St.* Its suprastapedial process. *Sth.* The stylo-hyal cartilage supposed to be seen through the quadrate bone. *a, b.* Air-chambers of the quadrate. *D.p.* Pneumatic duct, leading from the posterior of these (*a*) to *c*, the air-chamber of the articulare (*Art*). *Mck.* Meckel's cartilage.

In the natural position of the parts, and when the head is horizontal (fig. 1), the plane of the extrastapedial cartilage is also nearly horizontal. The long axis of the suprastapedial cartilage is inclined at an angle of 45° to that of the extrastapedial cartilage; and the posterior ends of the two cartilages approach one another very closely. In close proximity to both lies the upper and broader end of a small and short rod of cartilage (*Sth*) which tapers below to a free rounded extremity. It lies upon the upper and posterior face of the quadrate bone; and its lower extremity terminates some distance above the upper end of the pneumatic duct (*D.p*), the fibrous wall of

which is continuous with the sheath of connective tissue which envelopes the cartilaginous rod in question. It is this relation of the parts which, I am disposed to imagine, has deceived Prof. Peters, who seems to have taken the pneumatic duct and this cartilage for one continuous cartilaginous rod. In front, this minute cartilaginous style is in relation, as I have said, with the quadrate bone; behind, the *portio-dura* nerve passes down close to and parallel with it, and the digastric muscle covers it; above, it abuts against the lower and posterior walls of the tympanic cavity. Can there be any doubt, therefore, that it answers to the styloid cartilage, or proximal end of the hyoidean arch, in a mammal?

A fold of the lining membrane of the tympanum (*a*, fig. 2) somewhat obscures the junction of the extrastapedial and suprastapedial cartilages with the styloid cartilage; but by detaching the parts and saturating them with glycerine and caustic soda, it is plainly demonstrable that the styloid cartilage is only connected by fibrous tissue, and, indirectly, by the *stapedius*, with the *stapes*.

Fig. 2.



Inner view of the tympanic membrane (*Tym*) of a young *Crocodilus biporcatus*, with the attached stapedial cartilages (*S.St*, *E.St*), the fold (*a*), the styloid cartilage (*Sth*), and the stapedius muscle (*Stp*). The stem of the stapes is cut through just where it begins to ossify.

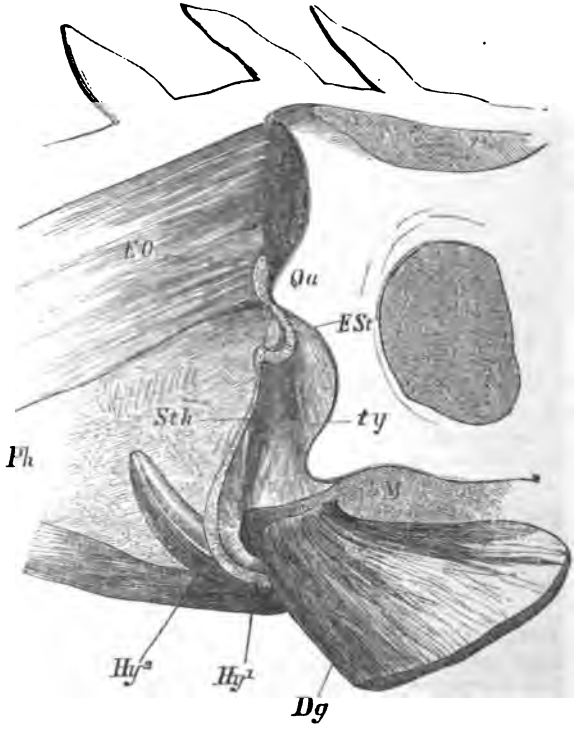
Thus, then, in the Crocodile, the connexion between the *articulare* and the *stapes*, supposed by Prof. Peters, does not exist; but there is a very close connexion between the *stapes* and a cartilage which distinctly represents the upper extremity of the hyoidean arch; and, so far from the Crocodile furnishing any ground for the supposition that the *stapes* and its appendages are modifications of the skeleton of the first visceral arch, as is suggested by Prof. Peters, the facts observed strongly suggest that these parts are modifications of the skeleton of the second visceral arch.

This suggestion is converted into a certainty when that remarkable Lizard *Sphenodon punctatum* (=*Hatteria*) is examined. Dr.

Günther's statement (Phil. Trans. 1867, p. 620), that, in this Lizard, the stapes is "attached by a fibro-cartilaginous ligament" to the anterior cornu of the hyoid, strongly attracted my attention when I read his valuable memoir on this reptile; and having had an opportunity, thanks to him, of examining into the question for myself, I can fully confirm his assertion.

Nothing can be more instructive than the arrangements represented in Fig. 3. *Sphenodon* has no externally visible tympanic membrane; but on removing the integument which lies over the aural region and the anterior portion of the digastric muscle, the fibres of a strong aponeurotic expansion, which takes its place, are seen to pass from the posterior edge of the quadrate bone and from the angle of the

Fig. 3.



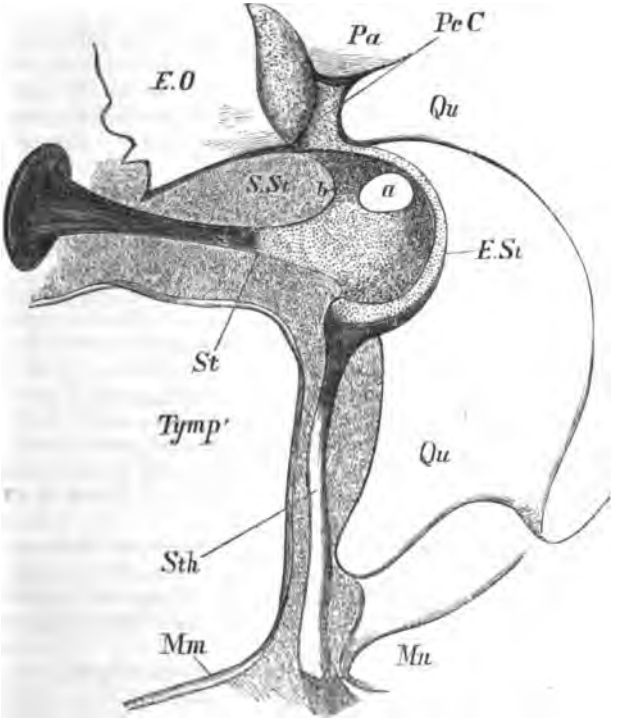
The right side of the posterior half of the skull of *Sphenodon punctatum*, twice the size of nature.

The integument is taken away and the digastric muscle (*Dg*) detached from its origin. *E O.* Exoccipital. *Qu.* Quadrate. *M.* Mandible. *Hy*¹, *Hy*². Anterior and posterior cornua of the hyoid. *Sth.* "Stylo-hyal" part of the anterior cornu. *E St.* Extrastapedial cartilage. *Ph.* The membranous wall of the pharynx, attached, in front, to the hyoidean cornua, and then continued into the aponeurotic outer wall of the tympanic cavity, *ty*.

mandible, to the anterior margin of the anterior cornu of the hyoid (*Hy*[1]), the upper part of which is entirely cartilaginous. The hyoidean cartilage ascends behind the quadrate bone, with a slight backward convexity, until it has nearly reached the skull, and then appears to be suddenly bent into the form of a little scroll with a backward concavity (fig. 3, *E St*). The upper end of the scroll becomes connected with the skull; the concavity is filled up by aponeurotic fibres.

The aponeurotic expansion which has been mentioned covers the

Fig. 4.



The tympanic cavity and the adjacent parts laid open from behind, and the aponeurotic expansion removed, in *Sphenodon punctatum*. Five times the size of nature.

The letters as in fig. 3, except:—*Pa*. Parietal. *Pc.C*. Parotic cartilage. *S.St*. suprastapedial cartilage. *b*. Origin of this cartilage from the stapes. *a*. Foramen included between it and the extrastapedial. *Mm*. The cut edge of the mucous membrane. *Tymp*. The pharyngeal recess which takes the place of the tympanic cavity. The exoccipital is supposed to be broken away to show the fenestral end of the stapes.

outer end of the tympanic cavity; when it is removed, the proximal end of the cornu of the hyoid is seen to expand, and becomes converted into a broad plate of cartilage, the curved margin of which gives rise to the "scroll." Internally the plate is continued into the stem of the stapes, and speedily becomes ossified (fig. 4). There can be no doubt, therefore, that it corresponds with the extrastapedial cartilage of the Crocodile.

What answers to the axehead-shaped suprastapedial cartilage of the Crocodile is the upper process of the cartilaginous part of the stapes (*S. St*), which, however, passes into the extrastapedial cartilage externally and above, so as to enclose the foramen, *a* (fig. 4). On the left side, the suprastapedial process was fibrous at the point *b* (fig. 4). Superiorly, the suprastapedial cartilage (*S. St*) is directly continued into the cartilaginous termination of the parotic process of the skull (*Pc.C*), in which granular osseous matter is deposited.

Thus the suprastapedial cartilage turns out to be nothing more than the proximal end of the hyoidean arch, while the stapes and its appendages are exclusively related to this arch, and have nothing whatever to do with the mandibular arch.

With respect to the stapes (or *columella auris*) in Birds, I may remark that Prof. Peters makes no reference to the careful investigations of Platner ('Das Quadratbein der Vögel'), who takes the same view of the homology of that structure as himself.

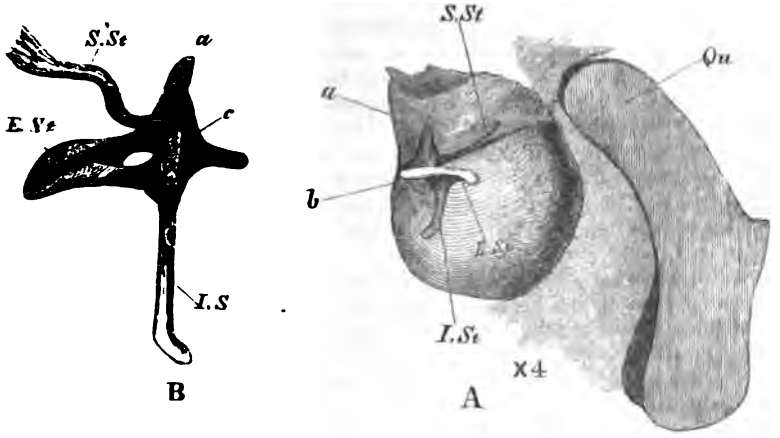
Platner observes (*l. c.* p. 16):—"The functions of the parts which lie within the tympanic cavity of birds almost all bear upon the tightening or relaxation of the tympanic membrane. If we consider the apparatus directed to this end in the tympanic cavity of Birds, we find:—(1) the stapes with the attached cartilage, which represents the other auditory ossicles in an aborted condition; (2) the tendon of the tensor tympani, which arises from the lower part of the occiput and is attached partly to the stapes and partly to the tympanic membrane; (3) an elastic ligament, which I have found in all the birds which I have examined, and which passes from the base of the cartilage which is attached to the stapes, on the side which is opposite to the insertion of the tensor tympani (*i. e.* from the front aspect), up to the tympanal articulation (Paukenhöhlengelenk) of the os quadratum, where it unites with the mucous membrane which covers the tympanic cavity internally."

The disposition of the parts described by Platner, in the Common Fowl, is shown in the accompanying figure (fig. 5).

As in the Crocodile, the stem of the stapes is ossified and ends in a triradiate cartilaginous expansion. When the skull is horizontal one ray of the expansion is represented by a horizontal triangular plate, the outer edge of which is fixed to the tympanic membrane. It represents the extrastapedial cartilage of the Crocodile, but differs therefrom in being perforated by a large hole. Where the stem of the stapes passes into this plate, it gives off a short vertical process upwards and a long slender curved process downwards. Both these lie free in the tympanic cavity. From the root of the upper process an elastic ligament arises and passes forwards to the

outer wall of the periotic capsule, just behind the articulation of the quadrate bone.

Fig. 5.



A. The auditory region, the tympanic membrane being taken away, in a Fowl. *Qu.* Quadratum. *S.St.* Platner's ligament. *E.St.* The extrastapedial cartilage, the edge of which is fixed to the tympanic membrane. *b.* The end of the extrastapedial which is fixed to the posterior boundary of the tympanum. *c.* The ascending process. *I.St.* The infrastapedial process.

B. The outer end of the stapes separated from the stem where the latter begins to be ossified. Turned round and magnified.

I see no room for any doubt that this ascending process and the elastic ligament represent the suprastapedial cartilage of the Crocodile.

As in the Crocodile, the posterior end of the extrastapedial cartilage is closely connected by fibrous tissue with the posterior boundary of the tympanum and the tympanic membrane; but I have been unable to discover even a rudiment of a styloid cartilage. The inferior, free, curved process of the stem of the stapes, which may be termed *infrastapedial* (*I.St*) seems at first to answer to that cartilage; but its relations are quite different.

Thus the Lizard, the Crocodile, and the Bird present a complete series of modifications of the parts described. In *Sphenodon* the hyoidean arch is histologically continuous throughout its entire length; and in its upper part is a rod of cartilage which, at one point, passes into the *stapes*.

In the Crocodile, the upper part of the hyoidean cornu has no direct connexion with the lower, and the rudimentary styloid part is not histologically continuous with the stapedial part.

In the Bird the styloid part has vanished, and the suprastapedial is represented only by fibrous tissue.

Such developmental evidence as exists is entirely in accordance with the view of which these anatomical facts appear to me to afford a sufficient demonstration.

Rathke distinctly states that in *Coluber natrix* the *stapes* results from a modification of the upper end of the hyoidean arch. Prof. Peters does not allude to this important circumstance; and, what is still more remarkable, in giving an account of his observations on the condition of the parts in a young Crocodilian embryo, he does not point out that Rathke's statements on the same topic are diametrically opposed to his own. The embryo examined by Prof. Peters (*l. c.* p. 595, figs. 1, 1*a*) was 70 millimetres, or nearly 3 inches long. He says that the quadrate bone was "angelegt," but contained "neither cartilage nor bone;" so that it is not obvious what the histological condition of the part referred to may have been.

But in an embryo of *Aligator lucius* of less size (2″ 2‴ long, the skull measuring 7‴) Rathke ('Untersuchungen über die Entwickelung und den Körperbau der Krokodile,' 1863, p. 34) found the quadratum quite cartilaginous.

"The quadrate bone resembled in form that of young and adult specimens of *Alligator lucius*, but was narrower and thinner, in proportion to its length, in its lower part, which is provided with a shallow articular excavation. It consisted of cartilage ensheathed in its middle third by a bone. By its broader and flatter upper half it was loosely attached to the outer surface of the cartilaginous auditory capsule, in front of and above the fenestra ovalis . . . . .

"With the quadrate bones articulated two long and, on the whole, slender Meckelian cartilages, which extended to the mandibular symphysis. For the greater part of their length they were cylindrical, and diminished in diameter very gradually from behind forwards; posteriorly, however, where they were connected with the quadrate bones, they were a good deal enlarged. An absolutely and relatively short, hook-like prolongation extended beyond the articulation. The thinner and longer cylindrical portion of each was loosely invested by five very thin, but completely ossified, plates, which enclosed it, as in a sheath, though they were separated by larger or smaller intervals. At a later period these plates grow and become closely united, thus giving rise, as in other Reptiles and in Birds, to the greater part of each ramus of the mandible. But of Meckel's cartilage only the enlarged part ossifies, and thus gives rise to the articular piece of the lower jaw."

How is this discrepancy to be accounted for? Unfortunately I have been able to procure no specimen of an embryonic Crocodile so small as either of those here described; but Prof. Peters's figures (Taf. i. figs. 1, 1*a*) leave very little doubt on my mind that the cartilage which he marks *m*, and imagines to be his "malleus" (the suprastapedial cartilage) is really the quadratum, the articulation of which with Meckel's cartilage takes place in the ordinary way, and that *i*, called the *columella* (or *stapes*), is neither more nor less than the pterygo-palatine cartilage. The most cursory glance

is sufficient to prove that the inner extremity of *i* must needs lie beneath and internal to the eye, and cannot by any possibility come near the *fenestra ovalis*. It therefore seems to be impossible that *i* can be the *stapes*.

Bearing clearly in mind the demonstration now given that the *stapedial apparatus* (if I may so term the *stapes* with its appendages) of the *Sauropsida* is connected entirely with the hyoidean arch, and that it consists of a stem terminating, at one end, in the plate which covers the *fenestra ovalis*, and, at the other, in sundry processes of cartilaginous or fibrous texture, one of which is connected with the tympanic membrane (when that structure exists), while another passes up to be united with the otic region of the skull, close to the articulation of the quadrate bone, we may pass to the consideration of the homologies of these parts in the ordinary *Mammalia*, of which Man may be taken as an example.

The Okenian view, adopted by Prof. Peters, assumes that the *ramus* of the mandible of the Mammal answers to the whole *ramus* of the mandible of a Sauropsidan, that the tympanic bone of the Mammal answers to the quadrate bone of the Sauropsidan, and that the *ossicula auditûs* of the Mammal, or the *malleus*, *incus*, and *stapes*, collectively, correspond with the stapedial apparatus of the Sauropsidan.

The Reichertian view, which I have hitherto supported, assumes that the *ramus* of the mandible of the Mammal answers only to part of the *ramus* of the Sauropsidan, inasmuch as the articular piece of the Sauropsidan mandible answers to the *malleus* of the Mammal—that the quadrate bone of the Sauropsidan is the homologue of the *incus* of the Mammal—and, consequently, that the stapedial apparatus of the Sauropsidan is entirely represented by the *stapes* of the mammal. In the place of the tympanic bone of the mammal there are only the ossifications which are found in the membranous frame of the tympanic membrane in some *Sauropsida* (*e. g.* many birds) and *Amphibia*.

The arguments by which this view has been supported are briefly these:—

In the Sauropsidan embryo a rod of cartilage occupies the first visceral arch on each side, and meets its fellow in the middle line. The rod becomes jointed, and the part on the distal side of the joint is converted into Meckel's cartilage, while that on the proximal side of the joint is modelled into the rudiment of the quadrate bone, which is invariably, in its earliest state, cartilaginous. Soon, however, the quadrate cartilage ossifies, and a centre of ossification appears in that part of Meckel's cartilage which articulates with the quadratum. This gives rise to the articular element of the mandible. All the other constituents of the lower jaw are developed in the fibrous tissue which surrounds the rest of Meckel's cartilage, which structure either persists throughout life, or disappears.

In a mammalian embryo the first visceral arch also contains a rod of cartilage, which, there can be no doubt, is the homologue of that in the Sauropsidan. The ramus of the mandible is developed in the fibrous tissue which surrounds the distal portion of the rod, which

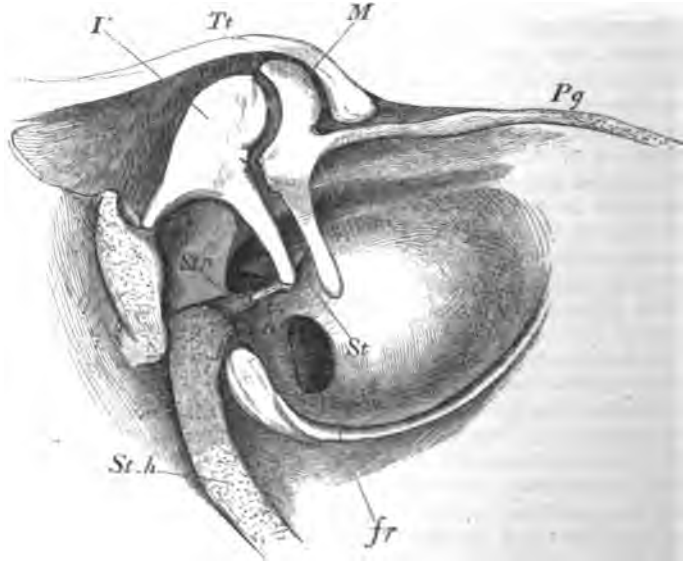
remains for a time, as Meckel's cartilage, but soon disappears. The ramus of the mandible of a Mammal, therefore, cannot contain any representative of the *os articulare* of the Sauropsidan, which takes its origin in the proximal end of Meckel's cartilage.

The tympanic bone of the Mammal is developed, quite independently of the cartilaginous axis of the first visceral arch, in the fibrous rim of the tympanic membrane. Therefore it cannot represent the Sauropsidan quadrate, which is preformed in cartilage, and is, in fact, the proximal end of the cartilaginous axis of the first visceral arch.

These arguments, to my mind, retain their full force, and have not been affected by the observations of Prof. Peters.

In the next place, it is not disputed that the *malleus* of the Mammal arises by the direct ossification of a part of the cartilage of the first visceral arch. But I have shown, in the present paper, that the suprastapedial of the Sauropsidan is the proximal end of the hyoidean, or second, arch. It is therefore impossible that the suprastapedial should be, as Prof. Peters supposes, the homologue of the *malleus*.

Fig. 6.



The ear-bones and the adjacent parts (the tympanic membrane, the tympanic bone of the squamosal, and the ramus of the mandible being removed) of a human fœtus at about the 5th month. Magnified four diameters.

Tt. The *tegmen tympani*, part of the periotic mass. *M.* The malleus, with its Folian process (*Pg*) passing into Meckel's cartilage. *I.* The incus. *St.* The stapes, with the cartilaginous process *a*, which extends from the region of the orbicular bone into the *stapedius* muscle, *Stp.* *St.h.* The stylo-hyal or styloid process, still quite cartilaginous. *fr.* The foramen rotundum.

Thus I find myself compelled to dissent from every one of Prof. Peters's conclusions; but, in working over the ground again, I have also been led to depart from the Reichertian view (which I have hitherto adopted) in one point, and that a very important one.

In a young mammalian fœtus, Meckel's cartilage passes, above, directly into the *malleus*; and at no time is any articulation developed between the *malleus* and the rest of the cartilage. Further, the *incus* articulates by a broad surface with the *malleus*, and its dimensions are such that its long axis appears to continue that of the malleus and Meckel's cartilage. In fact it appears exactly as if the *incus* were the proximal end of the cartilage of the first visceral arch. If so, the articular surface between the *incus* and the *malleus* must needs answer to that between the *quadratum* and the *articulare* of the Sauropsidan; and as the *incus* and the *malleus* ossify, nothing can seem closer than the resemblance which they bear to the *quadratum* and the *articulare* respectively. Hence Reichert conceived that the *quadratum* was the homologue of the *incus*, and the *malleus* that of the *articulare*, and I have followed him. But the study of *Sphenodon* and of the Crocodile has led me to believe that we have fallen into an error.

It is admitted, on all hands, and indeed cannot be disputed, that the stem and fenestral plate of the stapedial apparatus of the Sauropsidan answer to the crura and fenestral plate of the *stapes* of an ordinary mammal. But the *incus* of a mammal is related to the *stapes* on the one hand, and to the walls of the tympanic cavity on the other, nearly as the suprastapedial of a Crocodile is to the same parts; if the *incus* remained cartilaginous the resembance would be complete. On the other hand, in the human fœtus, the *stapes* has a cartilaginous prolongation which is embraced by the *stapedius* muscle, and contributes to reduce the interval between the *stapes* and the upper extremity of the cartilaginous styloid process (or upper end of the hyoidean arch) to a very small space.

Thus, in the Mammal, the proximal end of the hyoidean arch is in nearly the same condition as in the Crocodile, except that—

(1) There is a distinct articulation between the suprastapedial part and the stem of the *stapes*.

(2) The extrastapedial portion of the *stapes* is no longer distinguishable, and the *stapes* has lost its direct connexion with the tympanic membrane.

(3) The suprastapedial is ossified and converted into an *incus*. The *incus*, therefore, cannot be the homologue of the quadratum.

If this view be correct, it follows that as the *malleus* is the ossified proximal end of the cartilage of the first visceral arch, the *malleus* must represent the *quadratum*.

And thus the difference between the Sauropsidan and the Mammal will be, that in the latter the cartilage of the first visceral arch does not become jointed, and does not develope any representative of the *articulare*; while it gives off an extrastapedial process, which becomes connected with the middle of the tympanic membrane.

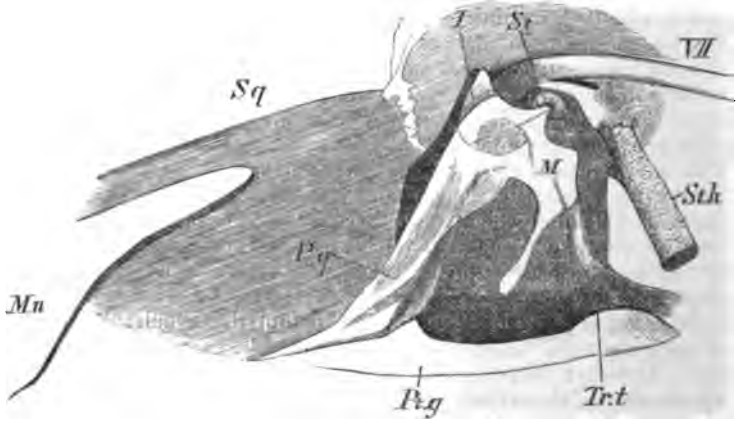
Thus, in principle the Reichertian doctrine still holds good; but

in one matter of special homology it must be altered, and for *quadratum=incus* we must read *quadratum=malleus*.

The modification of Reichert's view which I now propose completely removes a difficulty which has often presented itself to my own mind, and which is urged with much force by Prof. Peters, in his first two papers. If the *incus* be the homologue of the *quadratum*, why does it become so small and insignificant in the Marsupials and Monotremes, which, in so many respects, approach the *Sauropsida*? This question I have always felt could only be met by another. Why, if the *ossicula auditûs* of the mammal do not represent bones of much more importance in the *Sauropsida*, does the *malleus* attain such a vast size in the *Monotremata*?

If the *malleus* is, as I have endeavoured to prove it to be, the homologue of the quadratum, the last question receives an obvious answer; and no less readily is it intelligible why the *incus* should be reduced, seeing that the suprastapedial is always insignificant in size, and may even become a mere fibrous band, in the *Sauropsida*.

Fig. 7.



The left tympanic cavity and the adjacent parts in *Echidna setosa*. Some portions of the squamosal and of the periotic bones, with the tympanic membrane, have been removed.

Mn. Mandible. *Sq.* Squamosal. *Pt.g.* The pterygoid. *St.h.* The stylo-hyal. *VII.* The portio dura. *St.* The stapes. *I.* The incus, the greater part of the contour of which is supposed to be seen through the malleus (*M*). *P.g.* Folian process of the malleus. *Tr.t.* The tensor tympani.

I may mention, incidentally, that *Echidna* presents other anomalies than those which have been described by Prof. Peters and others. The muscle which plays the part of the *tensor tympani* is very large and arises from the base of the skull, where it forms the roof of that posterior and inner region of the tympanic cavity which is bounded below by the pterygoid. The strong tendon of this muscle

passes outwards, and is inserted into the upper aspect of that knee-like process of the *malleus* which is fixed to the tympanic membrane.

The cartilaginous "styloid" end of the hyoidean arch is fixed into the wall of the outer and posterior end of the tympanic cavity, very near the *incus* and *stapes*; but I can find neither a *stapedius* muscle, nor any ligament representing it.

It will be observed that the proximal end of the skeleton of the first visceral arch (whether it be osseous, cartilaginous, or fibrous), like that of the second, remains attached to one and the same part of the skull, viz. the outer and upper wall of the periotic mass, external to the vestibular sac, throughout the *Mammalia* and the *Sauropsida*. In Mammals the proximal skeletal elements of the arches (*malleus* and *incus*) are very generally equal, or the *incus* may be the smaller.

In the *Sauropsida*, the suprastapedial (=*incus*) is always smaller than the *quadratum* (=*malleus*).

In Teleostean and Ganoid fishes, and in the Sharks, the general relations of the two arches remain unchanged, but their proportions are reversed.

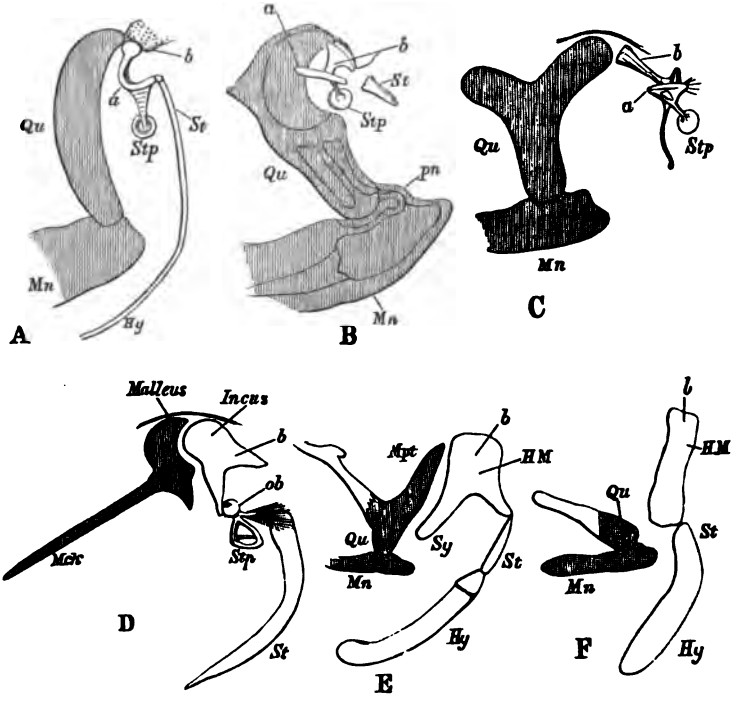
The only vertebrated animals in which a portion of the first visceral cleft remains open throughout life are some *Ganoidei* and most *Elasmobranchii*, in which, according to Wyman's observations, the spiracle is the remains of that cleft. It follows that any skeletal part which bounds the spiracle posteriorly cannot belong to the first, or mandibular, visceral arch, but must appertain to the second, or hyoidean arch. Now the suspensorial cartilage of the Elasmobranchs occupies this position. Its proximal end is attached to the outer wall of the auditory capsule; its distal end bears the proper hyoidean arch. Thus it answers exactly to the upper end of the second cartilaginous visceral arch, and therefore must contain the homologue of the *incus*. But the suspensorial cartilage of the Elasmobranchs is undoubtedly the homologue of the hyomandibular bone and symplectic of the osseous *Ganoidei* and of the *Teleostei*—which, therefore, must, in part or wholly, answer to the *incus*. Where, then, is the homologue of the proximal end of the skeleton of the first visceral arch of the fish, if the hyomandibular belongs altogether to the second? I find it in that prolongation of the quadrate cartilage of the Teleostean which ascends in front of the hyomandibular, and is at first quite free from it, but afterwards becomes surrounded and replaced by the metapterygoid, which eventually helps to bind it to the hyomandibular.

Thus the puzzling division between the mandibular and the hyoidean parts of the suspensorial apparatus in a fish becomes intelligible as the result of their primarily separate development.

In the osseous fishes the proximal end of the mandibular arch is arrested in its development and loses its direct connexion with the skull; but in the Sharks the ascending portion of the quadrate atrophies altogether, or is represented merely by pre-spiracular cartilages; and the quadrate itself forms only the posterior termination of the palato-quadrate arch, or so-called upper jaw.

In the *Chimæræ*, *Dipnoi*, and all *Amphibia*, the proximal ends of the cartilaginous first and second visceral arches become united together, at an early period, into a common plate, in which the malleal and incudal elements are not separately distinguishable. In the *Chimæræ*, *Dipnoi*, and the lower *Amphibia* they remain in this condition throughout life; but in the higher *Amphibia* changes of a most remarkable kind take place, of which I do not now propose to speak, as my friend Mr. Parker is engaged in working out that part of the subject.

Fig. 8.



I have endeavoured to give visual expression to my interpretation of the modifications of the proximal ends of the mandibular and hyoidean arches in the series of diagrams A, B, C, D, E, F, displayed in fig. 8. In all these the mandibular arch is shaded with vertical lines, while the hyoidean arch is left unshaded or nearly so. The letters have the same signification throughout. In the mandibular arch:—*Qu*. Quadrate. *Mn*. Mandible or Meckel's cartilage. In the hyoidean arch:—*a*. Extrastapedial. *b*. Suprastapedial. *Stp*. Stapes. *St*. Stylo-hyal. *Hy*. The ventral moiety of the hyoidean cornu. A. *Sphenodon*. B. Crocodile. C. Bird. D. Mammal. E. Teleostean fish. F. Shark.

In D, *ob* stands for the *orbiculare*; in E, *Mpt* is the metapterygoid, and *Sy* the symplectic.

I subjoin a tabular view of the homologies of the parts under discussion in the *Mammalia*, *Sauropsida*, and Teleostean Fishes.

Mandibular arch:—

I. MAMMAL .....*Malleus* .....*Meckel's cartilage.*
II. SAUROPSIDAN ...*Quadratum* .....*Articulare*...*Meckel's cartilage.*
III. TELEOSTEAN... { *Metapterygoid* & *Quadratum* } ...*Articulare* ...*Meckel's cartilage.*

Hyoidean arch:—

I. MAMMAL .....*Incus* .....*Stapes*.....*Stapedius, Styloid, Hyoid cornu.*
II. SAUROPSIDAN. *Suprastapedial. Columella auris*...*Hyoid cornu* (Sphenodon).
III. TELEOSTEAN...*Hyomandibular* .....*Stylo-hyal, Hyoid.*

June 10, 1869.

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

The Secretary called the attention of the Meeting to the following noticeable additions to the Society's Menagerie during the month of May:—

1. Five Greenland Seals (*Phoca grœnlandica*), which had been brought from the north by one of the sealing-vessels into Peterhead, and purchased for the Menagerie on the 6th and 11th of May. This species of Seal had not been previously exhibited in the Society's Menagerie, and presented several interesting points of difference when compared with its allies. In particular it was noticeable for the use of its fore limbs in locomotion, instead of progressing by the action of the muscles of the belly as is the case with *Phoca vitulina* and *Phoca fœtida*.

On the 18th of May two additional specimens of the same species had been brought home in one of the Hudson's Bay Company's ships, and presented to the Society by Sir C. M. Lampson, Bart., F.Z.S.

2. A Golden-headed Marmoset (*Hapale chrysomelas*), from Brazil, purchased May 14th, and believed to be the first example of this scarce species ever exhibited in the Society's collection.

3. Two additional specimens of the Aard-wolf of South Africa (*Proteles lalandii*), brought home by Captain Dixon on the 20th of May, and purchased for the Menagerie. These animals had been placed in the collection in company with the former specimen, purchased October 26th, 1868 (see P. Z. S. 1868, p. 530). All three of them appeared likely to thrive in captivity.

4. A fine example of the Vulturine Eagle (*Aquila vulturina*), brought home by Captain Dixon, on behalf of Mr. E. L. Layard, F.Z.S., by whom it had been presented to the Society's Menagerie.

The only example of this Eagle previously exhibited was believed to be the one acquired at the sale of Lord Derby's Knowsley collection in 1851.

5. An example of the Panda (*Ailurus fulgens*), presented by Dr. H. Simpson, May 22nd, being one of three specimens obtained in the neighbourhood of Darjeeling, as mentioned by the Secretary in a former communication to the Society (*anteà*, p. 278). Two of the animals of this species, with which Dr. Simpson had started from Calcutta, had unfortunately died upon the voyage; the third

Ailurus fulgens.

had reached the Gardens in a very exhausted state, but was gradually recovering under the care of the Superintendent. Its food appeared to be mainly of a vegetable nature.

6. A specimen of the West-Indian Brown Pelican (*Pelecanus fuscus*) in immature plumage, presented by Captain Dow, F.Z.S., of the Royal Pacific Steamship Company's ship 'Costa Rica,' and received May 30th. This bird had been captured by Captain Dow on Pedro Gonzalez Island, one of the group of Pearl Islands in the Bay of Panama, on the 4th of May.

The following papers were read :—

1. Notice of the Discovery at Sarawak in Borneo of the Fossilized Teeth of Rhinoceros and of a Cervine Ruminant. By GEORGE BUSK, F.R.S.

As the existence of the Rhinoceros in the Island of Borneo is at present a matter of considerable doubt amongst zoologists, the discovery of remains belonging to that genus in the country of Sarawak is one of considerable interest in a zoological point of view. Palæontologically, also, the fact that these remains are in a fossilized or subfossilized condition and associated with the tooth of a probably extinct ruminant renders the discovery one of great interest, if only as affording encouragement to the attempt that it is to be hoped will shortly be made, under the auspices of Mr. Brooke, the present Rajah of Sarawak, to investigate the mammalian palæontology of that tropical region—an investigation which, if successfully carried out, cannot fail to afford results of the highest interest.

As regards the existence of a Rhinoceros in Borneo at the present time, the question must be regarded as quite an open one. In the opinion of some (amongst whom, I believe, I may cite Mr. Wallace), and certainly in that of Mr. Brooke, the existence of a Bornean Rhinoceros is by no means improbable, although perhaps limited to the northern parts of the island. It is certainly not now found in the Sarawak country; but the present specimens are amply sufficient to show that it existed there at some former period.

It should, moreover, be stated that some direct evidence, were it fully to be relied upon, has recently been afforded of the presence of *Rhinoceros sondaicus* in Borneo, in the shape of a very perfect and beautiful skull now in the British Museum, which was purchased as coming from that island; but as this testimony rests, so far as I am aware, solely upon the statement of a dealer, it may not be regarded as of much weight.

The evidence I have now to adduce of the former residence of a Rhinoceros in Sarawak is that afforded by two molar teeth, for an opportunity of exhibiting and describing which I am indebted to the kindness of Sir Charles Lyell, to whom they were sent by Mr. Brooke. In a letter to Sir Charles the Rajah states that, "although he has forgotten the exact locality in which the teeth were found, he is able to say positively that they were picked up in the Sarawak country, but whether in a cave or not does not appear." As additional evidence of their *provenance* I may state that within the last few days Sir Charles Lyell has been informed by Signor Beccari that when he was at Sarawak he was shown some fossils, consisting of the neck-bone and tooth of a pachyderm, and, if he is not mistaken, two teeth of a ruminant, which were not found in a cavern, but in transported strata, formed by the decomposition of basalt, in the east of Sarawak, where the Chinese are working gold. It is highly probable, however, that Signor Beccari's memory may have

failed him, and that the two teeth are those of the Rhinoceros, and the single one that of the Ruminant in question.

The Rhinoceros-teeth are the right and left second upper molars (*m.* 2), evidently belonging to the same individual. They consist only of the crown portions, which appear to be not fully developed at the base, and are wholly in the "germ" state, having no fangs and never having been protruded from the alveolus; they amply suffice, however, to afford distinctive characters. As regards the condition in which they are, the enamel and dentine, so far as the latter can be seen here and there, are extremely brittle and obviously contain but little animal matter. The surface is of a deep brown colour, and the subjacent substance has also a strong ferruginous tinge; it is also, as shown by experiment, strongly impregnated with iron. There is no dendritic appearance in any part When wetted they exhale a remarkably strong peaty or earthy odour. These circumstances prove that they have lain for a long time in soil containing much iron and vegetable matter, and probably of a peaty nature. The hollows of the teeth, moreover, were partially filled with mould having the above characters. It may consequently be concluded from this, and from the entire absence of anything like the usual cave-earth, that the teeth had in all probability been lodged in a dried-up bog or peaty marsh, and not in a cavern—a conclusion which is in accordance with the statement of Signor Beccari above cited. They must be regarded as fossilized in the same sense as the usual remains found in quaternary deposits of a similar kind, though it is impossible, in the absence of other data, to express any opinion as to the probable period they had been so imbedded.

Before proceeding to describe the morphological characters of the teeth, it will be as well to premise a few words in explanation of the terms employed.

The upper molars of Rhinocerós are of a more or less quadrilateral form, and are almost always rather wider in the transverse than in the longitudinal or antero-posterior direction. They present, therefore, four sides—an *external* or *dorsal* (the *dorsum*), an *internal*, an *anterior*, and a *posterior*. They may also be described as consisting of an external wide *lamina*, which forms the entire outer side of the tooth, and from which project obliquely, inwards and backwards, two transverse plates which, on the inner aspect, end in two conical or pyramidal columns or pillars. These columns and plates are separated from each other by a wide and deep valley, the median *sinus*; and in front of the anterior column, towards the inner part, there is in most cases a shallow valley, the *anterior sinus*, and behind the posterior column a much deeper one, the *posterior sinus*.

On the *dorsum* may be observed, besides the anterior and posterior margins, which are very usually more or less elevated, three vertical *elevations* or *costæ*, of which the anterior is always by far the most prominent.

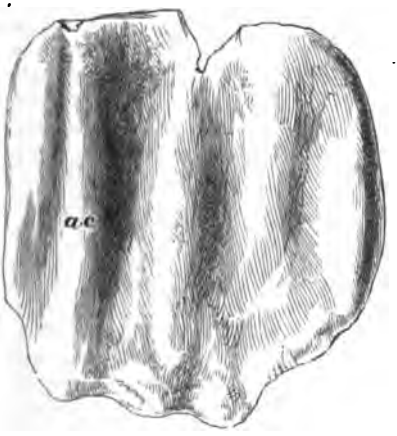
On the anterior face the anterior sinus is crossed at the bottom by a prominent ridge, the *anterior vallum*; whilst the posterior sinus, on the opposite side of the tooth, is closed in behind by the

posterior vallum, which extends across from the posterior and external angle of the tooth to the side of the posterior column. This *vallum* is in some species deeply emarginate in the middle, and in others presents in the middle a *denticle* or small pointed cusp. On the *inner* face are seen the two pyramidal columns separated by the entrance of the median valley or *sinus*; and at the bottom of this entrance there is frequently a small tubercle, the *median tubercle*. Within the median sinus is seen projecting into it from the posterior column a process of enamel, which is usually termed the "*crochet*," and by some the "posterior combing-plate;" and in addition to this, in many cases, there are one or more small projections of the same kind, usually springing from the *outer lamina* into the *sinus*, which have been termed the "anterior combing-plate or plates." They might be conveniently designated as the *crista* or *cristæ*.

To describe the Sarawak teeth in the same order:—

1. On the *dorsum* the *anterior costa* (*a c*, fig. 1) is very prominent and prolonged to the base of the crown in its present immature condition. It is of considerable thickness. The second or median costa is very distinct and rounded; the third or posterior almost obsolete,

Fig. 1.



Dorsum of *m.* 2, Sarawak tooth.

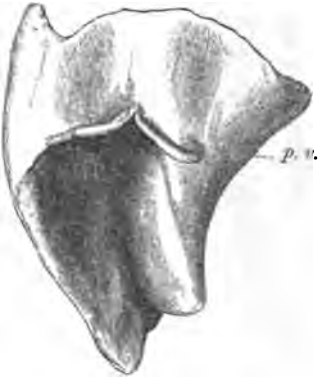
being visible only towards the base and quite at the apex. The hinder border of the *dorsum* is much raised, so that between it and the anterior *costa* the surface of the tooth is deeply hollowed or concave. 2. The *anterior vallum* (*a. v.* fig. 2, p. 412) is strongly developed, and the anterior *sinus* deep, especially at the base. 3. The *posterior vallum* (*p. v.* fig. 3, p. 412) is deeply emarginate and presents no trace of a *denticle*, and its upper edge is even and not tuberculated. 4. On the inner face the entrance of the median sinus is contracted at the bottom and wide upwards, so that the columns, and especially

the posterior, are somewhat slender, and the latter is curved forwards towards the summit. There is a very minute *tubercle* at the bottom of the fissure. The crochet (*c*, fig. 4, p. 413) projects directly forwards, and rises from the hinder column at a very open angle. There is no trace of a *crista*.

Fig. 2.

Anterior surface.

Fig. 3.



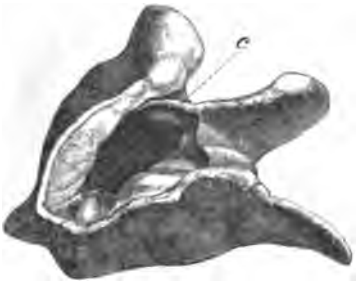
Posterior surface.

The question now is to determine the species, recent or extinct, to which these teeth belong. Although the evidence afforded by a single tooth, and that in a not fully developed condition, cannot be regarded as very ample or sufficient in many cases, still I think in the present it may be safely relied upon.

Without entering into other details, I may say that the dimensions of the tooth alone exclude from consideration, among existing species, *R. indicus*, *R. bicornis*, and *R. simus*, leaving of known species only *R. sondaicus* and *R. sumatranus*, and, amongst quater-

nary fossil or extinct forms, all except *R. etruscus*. All the other characters, moreover, would equally exclude these species; I shall, therefore, at present advert only to the latter three above named.

Fig. 4.



Crown surface.

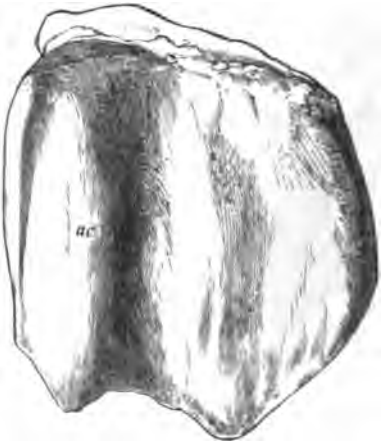
1. If we regard the entire dentition of *Rhinoceros sondaicus**, it is of course at once distinguished from *R. sumatranus* by the size of the outer incisor, and by the conformation in many respects of nearly all the teeth, and especially of the premolars; but as we are now concerned only with the second upper molar, I will limit what I have to say to that tooth alone.

As regards the *dorsum* (fig. 5, p. 414), the resemblance between this surface in *R. sondaicus* and in the Sarawak tooth is obvious at first sight; the only difference, so far as I can perceive, is in the circumstance that the anterior costa (*a c*) is not prolonged quite to the base of the crown; but this, I think, may be explained by the immature condition of the Sarawak specimens. But by this surface alone it would not be easy, I conceive, or even possible, in some cases, to distinguish between *R. sondaicus* and *R. sumatranus*, as shown in figure 6 (p. 414), which represents the dorsal surface of the same tooth in *R. sumatranus*. The chief points upon which I should rely, as showing the identity of the Sarawak teeth with those of *R. sondaicus*, are:—1, the wide angle at which the crochet (*c*) is given off (fig. 7, p. 415); 2, the emargination and absence of a denticle on the *posterior vallum*; 3, the comparatively greater transverse as compared with the longitudinal diameter of the crown,—since in *R. sumatranus* the crochet springs at a right angle or even less from the hinder column (fig. 8, p. 415), and the posterior vallum, which has a more or less crenate edge, presents a very distinct and constant

* Under this name I include *R. nasalis*, *R. stenorhynchus*, and *R. floweri* of Dr. Gray, not because I would venture at present to decide as to the true relations of these forms to each other, but because the dental characters at any rate, so far as I can perceive, afford no sufficient distinctions between them; and one thing appears abundantly clear, that, as contrasted with other well-marked species, they all constitute a group apart which I should myself regard as specific.

denticle, whilst the longitudinal exceeds the transverse diameter of the crown.

Fig. 5.



Dorsum of *m*. 2, *R. sondaicus*.

Fig. 6.

Dorsum of *m*. 2, *R. sumatranus*.

2. As regards *R. etruscus*, which, in the *crochet* and *posterior callum*, exhibits the same characters as *R. sondaicus*, the distinction from the Sarawak fossils, and from the latter species, is to be sought (1) in the dorsal surface, in which the anterior costa is very little prominent, and much narrower or thinner than in *R. sondaicus*, and the hinder border is not at all raised, so that, instead of a concavity, the surface behind the anterior costa presents a convexity. The second or median costa also is much wider and more convex, and the third

or posterior is continuous throughout the entire height of the crown (see fig. 9, p. 416).

Fig. 7.

Crown surface, *R. sondaicus*.

Fig. 8.

Crown surface, *R. sumatranus*.

I consider, therefore, as regards the Sarawak teeth, that they belong to a species not distinguishable by its dental characters from *R. sondaicus*, and that that species formerly inhabited the country about Sarawak.

Before concluding, I would mention that Mr. Wallace has been good enough to place in my hands two upper molars, and, strangely enough, the two upper second molars of the same individual, and in the most beautiful and perfect condition, which he procured in Sumatra, but which present indubitably all the characters of the

tooth in question in *R. sondaicus*. That species, therefore, would seem to exist in Sumatra as well as in Java; but I am not aware that zoologists are acquainted with this fact.

Fig. 9.

Dorsum of *m.* 2, *R. etruscus*.

The Cervine Tooth.

I shall say but very few words on the subject of the other fossil tooth sent by Mr. Brooke to Sir Charles Lyell, as it is scarcely in a state to justify any extended observations. It is probably the second upper molar of a species of *Cervus*; but it is considerably larger than the corresponding tooth of *Cervus hippelaphus*, and it is remarkable among all the ruminants' teeth with which I have had an opportunity of comparing it by the depth and wideness of the median sulcus in the outer surface.

It appears to me to belong to an extinct species; but at present I shall refrain from expressing any decided opinion on it. The fragment is much worn, and imbedded in a hard dark-coloured matrix which looks as if it had been much rolled; in fact the specimen bears a very close resemblance to many of those procured from the Crag.

2. Descriptions of six new Species of American Birds of the Families Tanagridæ, Dendrocolaptidæ, Formicariidæ, Tyrannidæ, and Scolopacidæ. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.

(Plate XXVIII.)

1. Calliste florida, sp. nov. (Plate XXVIII.)

Læte viridis; pileo et uropygio aurulento lavatis; interscapulio nigro variegato; alis nigris, secundariis et tectricibus omnibus

viridi marginatis: cauda nigra, rectricibus intermediis extus cærulescenti-viridi late marginatis: regione parotica nigra: ventre medio cum crisso et tectricibus subalaribus flavicantibus: rostro et pedibus nigris: long. tota 5·0, *alæ* 2·5, *caudæ* 1·7 *poll. Angl.*

Hab. Costa Rica.

Obs. Species *Callistæ schranki* maxime affinis, sed fronte nigra et pectore flavo omnino caret, et rostrum magis tenue habet.

A collection of Costa-Rican birds recently received from Mr. Julian Carmiol contains a single skin of this new *Calliste*. It is marked "*female*;" but the male is probably hardly different, though it may be a little brighter in colouring.

The only described species at all resembling it is *Calliste schranki*, which is of the same general appearance, but may readily be distinguished by the characters given above.

In his last catalogue of Costa-Rican Birds*, Mr. Lawrence included five Tanagers of this group—namely, *Callistæ icterocephala, guttata, gyroloides, francescæ*, and *dowii*. Salvin has received examples of all these from the same district. The present bird is therefore the sixth Costa-Rican species of *Calliste*.

2. SYNALLAXIS AREQUIPÆ.

Synallaxis orbignii, Scl. et Salv. P. Z. S. 1867, p. 986, nec auctt.

Supra fusca, pileo parum obscuriore, uropygio rufo: alis extus fusco-nigris, tectricibus et secundariis fusco indistincte marginatis: cauda nigra, rectrice una utrinque extima fere omnino et duabus utrinque proximis in pogonio exteriore rufis: subtus lacteo-alba, macula gulari, tectricibus subalaribus, hypochondriis et crisso rufis: rostro obscure corneo, pedibus nigris: long. tota 6·8, *alæ* 2·7, *caudæ* 3·0, *tarsi* 1·0.

Hab. in vicin. urbis Arequipæ, Peruv. occidentalis.

We now find that we have been wrong in identifying this bird with *S. orbignii* (*S. humicola*, d'Orb.)—that species being easily distinguishable on comparison by its rufous wings, and the more rufescent tinge of the upper plumage, particularly on the head and forehead. In *S. orbignii* the rufous colour of the secondaries extends through both webs, and makes a conspicuous large square basal patch of this colour. This patch is quite absent in the present bird.

For an opportunity of examining the true *S. orbignii*, and thus correcting our error, we are indebted to Mr. T. Moore, Curator of the Derby Museum, Liverpool, who has kindly submitted to our inspection two skins of it belonging to that collection. They were obtained by Mr. Bridges, in Bolivia, and purchased by the late Lord Derby through Mr. Cuming in 1846.

3. GYMNOCICHLA CHIROLEUCA, sp. n.

Gymnocichla nudiceps, Moore, P. Z. S. 1859, p. 55; Scl. et Salv. Ibis, 1859, p. 119; Lawr. Ann. L. N. Y. ix. p. 109.

* Ann. Lyc. N. Y. ix. p. 98.

Nigerrima: campterio toto et tectricum alarium marginibus, necnon remigis primi limbo angusto, albis: rostro et pedibus nigricanti-plumbeis, illo versus apicem albicante: long. tota 6·0, *alæ* 3·2, *caudæ* 2·8, *tarsi* 1·3, *rostri a rictu* 1·0.

Hab. in Costa Rica et in rep. Honduratensi.

Obs. Similis *G. nudicipiti*, sed campterio toto albo et rostro validiore insignis, et plaga dorsi ad basin plumarum alba valde minore.

Upon comparing Arcé's specimens of *Gymnocichla* collected at Tucurriqui with Panama skins of *G. nudiceps*, we find that they belong to different species, of which we have pointed out the characters above. We have therefore selected the name *chiroleuca* for the present bird, as expressing one of its most noticeable characters, the pure whiteness of the bend of the wing.

We have also, through Mr. Moore's kindness, had an opportunity of reexamining the bird collected by Leyland at Omoa, in Honduras, and named by him *G. nudiceps*, in his list of Leyland's collection (Proc. Zool. Soc. 1859, p. 55), and find it also belongs to the present species. Mr. Moore notes that the bareness of the head in his specimen is only partial; and this is likewise the case in the Costa-Rican example. The denudation only extends, over the top of the head, rather further than a line joining the eyes, but embraces the whole space immediately round the eyes. In the adult *G. nudiceps* (as is shown in Cassin's figure, Pr. Acad. Sc. Phil. v. p. 106, t. 6) the whole summit of the head is bare.

4. GRALLARIA PRINCEPS, sp. nov.

Grallaria guatemalensis, Salvin, P. Z. S. 1867, p. 146.

Supra oleaginea, plumis nigro marginatis; pileo et collo postico valde obscurioribus et cineraceo tinctis; loris et oculorum ambitu rufescentibus: alis obscure fuscis, extus et intus castaneo limbatis: cauda omnino fuscescenti-castanea: subtus saturate ferruginea, pectore paulo obscuriore, gutturis medii plumis nigro variegatis: rostro obscure corneo, mandibulæ basi albicante; pedibus corylinis: long. tota 6·5, *alæ* 4·3, *caudæ* 1·7, *tarsi* 1·9, *rostri a rictu* 1·3.

Hab. in Veragua (*Arcé*).

Obs. Similis *G. guatemalensi*, sed rostro robustiore, altiore, colore corporis superi obscuriore, ventris autem rubiginoso saturatiore distinguenda.

The receipt of a second and more adult specimen of this *Grallaria* from Veragua has enabled us to distinguish it from its northern ally, to which Salvin had previously referred it with some hesitation. It is still more different from *G. regulus* of Western Ecuador, which is smaller and much less deeply ferruginous below.

The present species makes the sixth of the group allied to *G. rex*, which are thus distributed:—

1. *G. imperator*, ex Brasilia.
2. *G. rex*, ex Guiana.
3. *G. regulus*, ex Æquator. occidentali.

4. *G. princeps*, ex Veragua.
5. *G. guatemalensis*, ex Guatemala.
6. *G. mexicana*, ex Mexic. merid.

5. CONTOPUS OCHRACEUS, sp. nov.

Supra olivaceus, pileo obscuriore: alis caudaque nigricantibus; secundariis et tectricibus alarum ochraceo late marginatis: subtus ochraceus, in ventre medio clarior, mentum versus obscurior; rostro superiore nigro, inferiore flavo; pedibus nigris: long. tota 6·5, *alæ* 3·3, *caudæ* 2·9, *tarsi* 0·6, *rostri a rictu* 0·9.

Hab. in Costa Rica.

A single skin of this apparently undescribed Tyrant has lately been transmitted to us by Mr. Julian Carmiol. It is a typical species of *Contopus*, rather larger than *Contopus virens*, and with the bill considerably larger, but readily distinguishable from this and every other member of the genus known to us by its yellowish ochre-coloured belly.

Mr. Lawrence's *Contopus lugubris* (Ann. Lyc. N. Y. ix. p. 134) is not known to us, but is stated to be a "very sombre-coloured species;" so it can hardly be intended for the present bird.

6. GALLINAGO IMPERIALIS, sp. n.

Supra saturate rufa, nigro variegata et transfasciata, facie paulo dilutiore, remigibus primariis nigricantibus, secundariis extus dorso concoloribus: subtus gutture toto ad medium pectus nigro et rufo variegato; abdomine albo nigroque regulariter transfasciato: cauda brevi, a tectricibus superioribus cooperta, nigricante unicolore: tectricibus subalaribus nigricantibus, fasciis paucis obscuris albis: tarsis brevibus, robustis, tibiis fere omnino plumis obtectis: long. tota 11·0, *alæ* 6·0, *caudæ* 1·5, *tarsi* 1·2, *digiti medii cum ungue* 1·7, *rostri a rictu* 3·3.

Hab. in Nova Granada interiore.

Mus. S. & G.

Of this very singular bird Salvin purchased an example some time since from a London dealer along with a number of other skins received direct from Bogota. It should be mentioned that the specimen was not prepared after the usual well-known fashion of "Bogota" skins, having been roughly mounted. But the dealer stated that his correspondent in New Granada had called his attention to the bird as being something rare, and that there could be no doubt as to its origin.

At first sight we were nevertheless inclined to think that the bird might be *Scolopax saturata*, of Java, which it somewhat resembles in general coloration, and that an error had been made about the locality. This point was soon settled in the negative, by reference to the original type specimen of Horsfield. *Scolopax saturata* possesses the characteristic white terminations of the rectrices and the cross patches on the back of the head which distinguish the veritable Woodcocks.

There can be no question, however, that our bird shows consider-

able *rapprochement* towards true *Scolopax*, though we think it best to keep it within the limits of *Gallinago*, its nearest structural allies being *G. stricklandi* and *G. jamesoni*, both of which have short robust tarsi and the tibiæ feathered, as in the present species, nearly down to the tarsal joint. The wings of our single specimen of this bird are not in very perfect condition; but, as far as we can tell, the third and fourth primaries would be rather longer than the first and second, and longest. The secondaries, as in all Snipes, are very long, and in the present bird quite reach to the points of the primaries when the wing is closed. The tail-feathers are likewise deficient, only three of them remaining *in situ*. These show no traces of transverse markings whatever, in which respect this bird is more like true *Scolopax* than *Gallinago*. But there are likewise no traces of the white terminations of the tail-feathers, which are so conspicuous in the Woodcocks.

3. Note on *Gyropus dicotylis*, a new Species of Parasite.

By ALEXANDER MACALISTER, Demonstrator of Anatomy, Royal College of Surgeons, Ireland*.

The specimens of this insect which have been submitted to me were obtained from the skin of a Collared Peccary (*Dicotyles torquatus*) which died in the Dublin Zoological Gardens several years ago; and for the opportunity of examining and describing them I am indebted to Dr. Carte, Director of the Royal Dublin Society's Museum, and to Mr. Kirby, Assistant Curator, who kindly forwarded them to me. As far as I am aware, the species is a new one; and accordingly I have followed the practice usually adopted in the nomenclature of Anoplura and have named the parasite after its host. The specimens submitted to me were ten in number, of both sexes, and had been lying in spirits for some months. They accorded in all respects with the generic character of *Gyropus* given by Nitzsch (Thierinsekten, p. 44) and Denny, namely:—head depressed, scale-like, horizontal; frontal and temporal margins sinuated; mouth anterior; mandibles without teeth; maxillæ obscure; labium and labrum produced, trapezoidal, entire; maxillary palpi long, rigid, conical, four-jointed; labial palps none; antennæ four-jointed, capitate; eye inconspicuous or none; thorax of two segments; abdomen of ten segments; tarsi two-jointed, ungues simple; two posterior limbs of each side long, curved to base of femur; stomach symmetrical.

The specimens vary from ·15 to ·175 of an inch in length, the males being rather longer but narrower than the females. The head is broader than long. The clypeus is not marked with the deep frontal sinuosities which are visible in *G. ovalis* or *gracilis*. The temporal lobes are produced and acute, with their anterior margin slightly

* Communicated by Dr. J. Murie.

concave, and the posterior convex, the apex of the lobe being directed forwards and outwards. This appearance is similar to the arrangement of these lobes in *G. ovalis* of the Guinea-pig. Frontal margin convex, obtuse, fringed by a few hairs; eye very small, inconspicuous, situated in front of the temporal sinus on the upper surface of a

Gyropus dicotylis (magnified).

small eminence, and guarded by a few hairs. Occipital margin convex on either side, slightly concave in the centre, but not nearly so much as in *G. ovalis*. The antennæ have their basal joints cylindrical, large, the second short and rounded, the third club-shaped, the fourth and last is large and dilated, bent upwards and backwards; these joints are well defined, and each one begins extremely narrow. In *G. ovalis* the last joint is securiform; in the present species it is more club-shaped. The maxillary palpi are four-jointed, each joint being more slender than its precessor, the terminal segment being the smallest, and the third the longest.

The neck is one-third the breadth of the head (one-half in *G. ovalis*). Prothorax hexagonal, flattened, wider transversely than antero-posteriorly, smaller than the head; this segment is longer than the head in *G. longicollis* of the Agouti, but it is equal to it in *G. hispidus* (the parasite of the Three-toed Sloth). There is no trace of the transverse depressed line on the prothorax, which is characteristic of *G. ovalis*. Sternum slightly prominent. The union between the prothorax and the combined meso- and metathorax is of the same size as the neck. This compound segment is quadrilateral, wider behind than in front, and bearing the two posterior pair of legs, between which opens, on each side, a spiracle. It is once and a half the length of the prothorax, and very slightly wider. The first pair of limbs are ·05″ long, with a single incurved unguis. The tibia is armed at the junction of its middle and lower third with a prominent tooth, which

forms with the unguis about two-thirds of a circle. This tooth is capable of being opposed to the claw like a finger and thumb, by which means the parasite can "pick his steps" along a hair, although uniunguiculate. In one young specimen this tooth appears as a knob and not as an incurved spine; and it is usually a little sharper in the female than in the male. These processes are frequently noticed among such Anoplura as are parasitic upon bristly animals; thus *Hæmatopinus eurysternus* of the Ox and *H. suis* of the Pig both possess a similar spur. In these, however, the tooth is at the lower end of the tibia, and not removed from it by one-third as in *G. dicotylis*. The lower end of the femur, the upper end of the tibia, the lower end of the latter, and the base of the tarsus are each furnished with a small, brown, oval, transversely striated scale on the extensor aspect. The tarsus is two-jointed, the unguis faintly transversely striated and incurved, ending in a single sharp point. The second pair of legs is twice the length of the first pair, the coxa being short, nearly cylindrical, the trochanter bent almost to a right angle with the femur and contracted at its coxal articulation. The femur is half as long as the entire first limb, slightly curved at its lower end. The tibia is also equally elongated and sharply incurved, destitute of a tooth at its extremity, this appendage being confined solely to the first pair; in this respect it differs strikingly from *Hæmatopinus suis*, in which a tooth exists on the tibia of each of the three pairs of legs. The tibia is garnished with a few scattered hairs, not nearly so numerous as in *G. hispidus* or *G. gracilis*. Unguis curved, triquetrous, transversely striated, twice as large as that of the first pair of legs; its extremity split into two teeth, of which the outer is the longer. The third pair of limbs resemble the second in every respect; and both exhibit the small brown scales, similar to those described on the first pair.

The abdomen is large, flattened and membranous, composed of ten segments, as is usually the case in the genus. Walckenaer, however, only found eight in *G. gracilis*. The first segment is closely united to the metathorax, the last is small and nearly hidden. The central segments are distinctly separate, margins rather acutely toothed, each tooth having a few hairs in its vicinity, not being nearly so pubescent as *G. gracilis* or *G. hispidus*. The male abdomen is oblong and narrow posteriorly; the female abdomen is broadly ovate, more sharply toothed along its margin, with its segments more distinctly separate; trachea distinct and looped.

The species of this genus hitherto described have been found infesting Rodents and Edentates, among which may be mentioned the Agouti, Guinea-pig, and Aï. None, as far as I know, have been found on Pachyderms, with the exception of the present species. The characters which I would suggest as diagnostic of this species are the following:—Frontal outline convex, non-sinuated; last joint of antennæ bent and dilated; no transverse depressed line on prothorax, which is smaller than head; brown scales at bases of tibia, femur, and tarsus; tibia of fore leg with a prominent spur at its lower third, colour ferruginous brown: size $\frac{1}{4}$ of an inch.

The species of the Pig-family, as far as at present known, are infested by comparatively few parasites, which, when we bear in mind their uncleanly habits and mode of life, is rather singular. Our common Pig has but one parasite, the *Hæmatopinus urius* of Nitzsch, or *H. suis* of Burmeister and Denny.

It is an interesting fact that this genus *Gyropus* seems peculiarly American in distribution: the *G. hispidus* of the Aï, *G. gracilis* and *G. ovalis* of *Cavia cobaya*, and *G. longicollis* of *Dasyprocta* agree with *G. dicotylis* in being from the western hemisphere. All the other species are of minute size, the *Gyropus ovalis* being $\frac{1}{48}''$, *G. gracilis* $\frac{1}{56}''$, *G. longicollis* $\frac{1}{3}$ of a French line, *G. hispidus* about the same size. This species, being one-seventh of an inch in length, may fairly be reckoned as a giant in the genus.

4. Descriptions of some Species of Fishes from the Peruvian Amazons. By Dr. ALBERT GÜNTHER, F.R.S., F.Z.S., &c.

Some collections of fishes sent by Mr. E. Bartlett from the Upper Amazons were noticed in Ann. & Mag. Nat. Hist. 1866, xviii. p. 30, and in Proc. Zool. Soc. 1868, p. 229. In this paper I intend to describe those species which were brought home by this traveller on his return to England, and which prove to be new. Unfortunately the specimens are not in so good a condition as those previously sent. The proportion of new forms is much less than we might have expected from those almost unexplored parts of the river Amazons, Mr. Bartlett's collections having added only twenty-three species to this fauna. I may mention that the last collection contained also *Sorubim lima* (Bl. Schn.), *Rhytiodus microlepis* (Kner), and *Myletes asterias* (Müll.).

MEGALOBRYCON, g. n.

This genus is closely allied to *Bryconops*, from which it is technically distinguished by the presence of a maxillary series of teeth.

Dorsal fin placed in the middle of the length of the body, immediately behind the ventrals. Anal long. Abdomen rounded in front of, and somewhat compressed behind the ventrals. Cleft of the mouth of moderate width. Teeth notched, in a triple series in the intermaxillary, and in a single in the maxillary and mandible; no other teeth behind the mandibulary teeth or on the palate. Nostrils close together. Gill-openings wide. Scales of moderate size, with the free portion striated.

MEGALOBRYCON CEPHALUS. (Fig. 1, p. 424.)

D. 11. A. 24–26. L. lat. ca. 70.

The height of the body is one-third of the total length (without caudal), the length of the head one-fourth. Intermaxillary in a triple series, those of the outer series being smallest, about twice as large as those of the maxillary; the front mandibulary teeth largest.

The upper jaw projects beyond the lower, the teeth not being covered by the lips. Snout scarcely longer than the eye. Head very broad, the interorbital space very convex, its width being equal to the length

Fig. 1.

Megalobrycon cephalus.

of the postorbital portion of the head. The coloration appears to have been uniform.

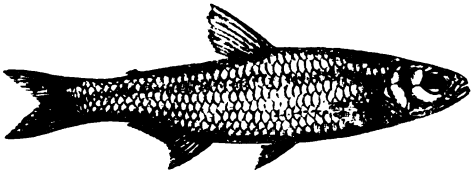
The specimens are 13 inches long, and in a bad state of preservation.

CHIRODON ALBURNUS. (Fig. 2.)

D. 10. A. 20. L. lat. 37. L. transv. 11.

The height of the body is a little more than the length of the head, and one-fourth of the total (without caudal). Upper profile of the head not concave. The pectoral does not extend to the ventral. Teeth scarcely compressed, pointed, with a minute (microscopical)

Fig. 2.



Chirodon alburnus.

lobe on each side; there are about twelve in the upper and eighteen in the lower jaw. Sides with an ill-defined silvery longitudinal band; the middle caudal rays blackish.

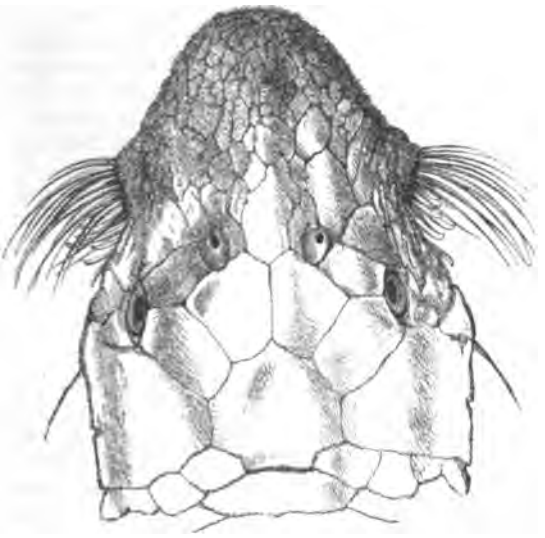
Two and a half inches long.

CHÆTOSTOMUS HETERACANTHUS. (Figs. 3 & 4.)

D. 1/7. A. 5. L. lat. 22.

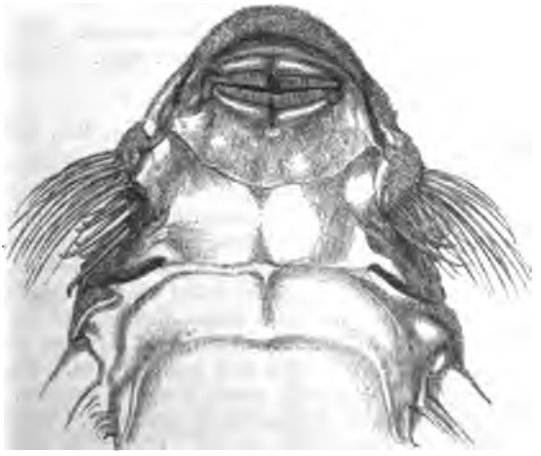
Head much depressed, longer than broad, its length being more

Fig. 3.



Chætostomus heteracanthus.

Fig. 4.



Chætostomus heteracanthus.

than one-third of the total (without caudal). Head without any ridges above; interorbital space exceedingly broad, its width being five times the horizontal diameter of the small eye. Snout covered with small scutes, which are rough with small spines along the margin. *Interoperculum with two kinds of spines, there being a group of about twelve slender but stiff and slightly hooked spines surrounded by a ring of long setiform spines*; the longest of the stiff spines is about twice the length of the orbit, and the longest setiform spine about thrice that length. Thorax and abdomen nearly naked, with non-confluent minute granulations. Teeth exceedingly fine. Dorsal fin higher than long, but the spine is much shorter than the head. There are seven scutes between the two dorsal fins. The pectoral spine extends beyond the middle of the ventral, the ventral beyond the anal. Eleven scutes between the anal and caudal. Scutes without keels, rough, but without prominent spines. Uniform greyish; each dorsal scute lighter in the centre.

One specimen, $7\frac{1}{2}$ inches long.

Chætostomus latifrons.

D. 1/8. A. 5. L. lat. 25.

Head much depressed, a little longer than broad, its length being rather more than one-third of the total (without caudal). Head without any ridges above; interorbital space broad, the diameter of the eye being somewhat less than one-third of its width. Snout naked, without tentacles. Interoperculum with about sixteen spines, hooked at the apex, the longest being nearly twice the length of the eye. Thorax and abdomen naked. Scutes without ridge, but spiny, the marginal spines being rather strong and prominent. Teeth exceedingly fine. Dorsal fin rather higher than long, the first ray rather feeble, shorter than the head. There are six scutes between the two dorsal fins. The pectoral spine does not extend to the middle of the ventral; the ventral reaches beyond the anal. Eleven scutes between the anal and caudal. Pectoral spine rough. Uniform black.

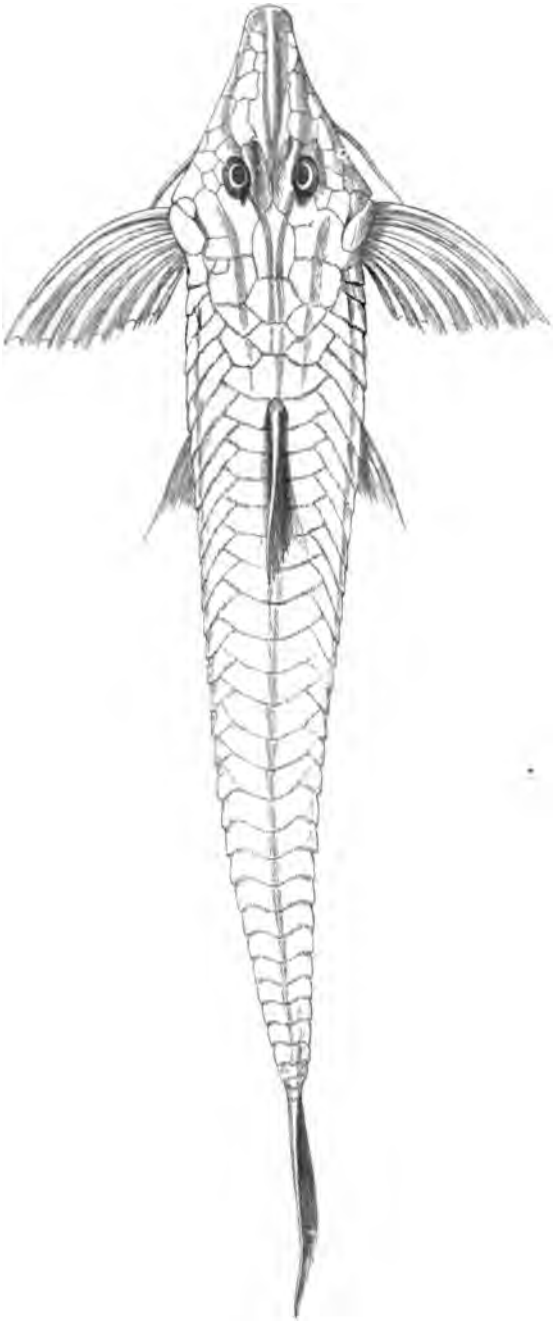
One specimen, 7 inches long.

Loricaria macromystax. (Figs. 5 & 6, pp. 427, 428.)

Snout somewhat produced and rather narrow, slightly concave on the side; mouth of moderate width, the upper lip terminating laterally in a long barbel, extending beyond the axil of the pectoral fin; lower lip broad, with numerous barbels and smaller fringes. Small teeth in both jaws. Orbit with a very shallow notch behind, its horizontal diameter being not quite equal to the width of the interorbital space. Scutes smooth, the lateral ridges distinct and confluent on the eighteenth scute. L. lat. 31. A series of eight or nine scutes between the roots of the ventral and pectoral fins. Thorax and abdomen covered with numerous, small, irregular scutella. Of the fin-rays only the upper of the caudal is produced. Origin of the dorsal opposite to the root of the ventral. Coloration uniform.

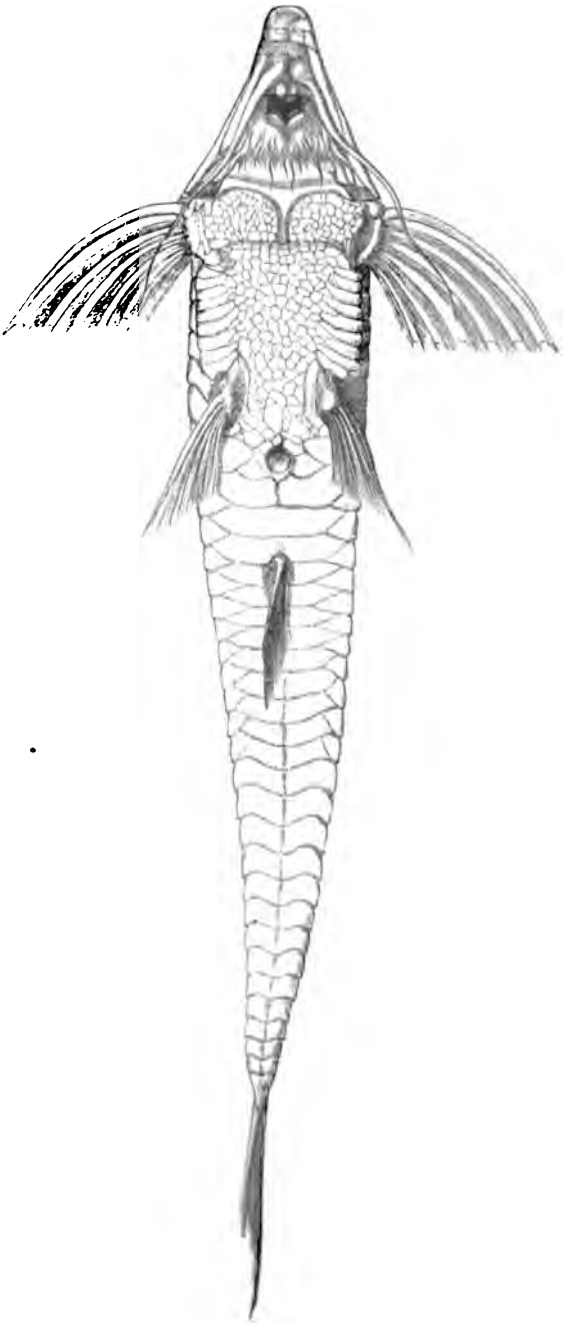
One specimen, 7 inches long.

Fig. 5.



Loricaria macromystax.

Fig. 6.



Loricaria macrolepis

STEGOPHILUS NEMURUS.

D. 8. A. 6.

Caudal fin deeply forked, the upper lobe produced into a filament. The distance of the origin of the dorsal fin from the root of the caudal is contained once and two-thirds in its distance from the end of the snout. Dorsal fin midway between the root of the ventral and origin of the anal. Anterior part of the back spotted with brown. Tail with obscure, broad, dark cross bands.

One specimen, 3 inches long.

5. Contribution to the Ichthyology of Tasmania. By Dr. A. GÜNTHER.

The British Museum has lately received some large collections of Fishes from Tasmania. Most of the examples belong to species known, but afford much additional information of great interest with regard to geographical distribution, variation of colour, and size, so that I intend to describe them in detail in a memoir destined for the 'Transactions' of the Society. For the present, I give the diagnoses of two undescribed species.

ANTHIAS RICHARDSONII.

D. $\frac{10}{20}$. A. $\frac{3}{9}$. L. lat. ca. 60.

This species has been received with, and is most closely allied to, *A. rasor*; but whilst *A. rasor* has a subvertical ovate blackish spot below the lateral line, vertically below the commencement of the soft dorsal fin, and covered by the extremity of the pectoral fin, this spot is placed more backwards in *A. richardsonii*; it is placed vertically below the fifth to ninth dorsal rays, below the lateral line, and of a horizontally ovate shape; the pectoral just reaches it.

NEPTOMENUS DOBULA.

D. $7\left|\frac{1}{40}\right.$. A. $2\left|\frac{1}{23}\right.$. Vert. 24.

The length of the head is contained thrice and a half in the total length (without caudal), the height of the body four times and one-third. Scales small and deciduous. Pectoral fin not quite so long as the head.

The type of this genus, *N. brama*, is described from a single stuffed example; the species characterized here belongs evidently to the same genus; and I find that it has 24 vertebræ, and therefore belongs to the *Carangidæ*. There are two very small spines in front of, and at a short distance from, the anal fin.

Mr. F. P. Pascoe exhibited specimens of a Beetle (*Taphroderes distortus*, Westw.) from Natal, belonging to the family Brenthidæ,

in which the left mandible was greatly enlarged and deformed, the right being normal. This peculiarity was stated to be confined to the male.

Mr. W. H. Flower read a memoir on the skeleton of the Chinese White Dolphin (*Delphinus sinensis*, Osbeck), founded on a specimen of this rare species captured near Amoy by Mr. R. Swinhoe, and presented to the Museum of the Royal College of Surgeons.

This paper will be published in the Society's 'Transactions.'

A paper was read by Dr. O. Finsch, on the collection of Birds from North-eastern Abyssinia and the Bogos country formed by Mr. William Jesse, Zoologist to the Abyssinian Expedition, accompanied by field-notes by the collector. The collection was stated to be of great interest, and to contain 735 specimens, referable to 221 species, whereof two appeared to be new to science. These were proposed to be called *Alœmon jessii* and *Lanius fallax*.

This paper will be published in the Society's 'Transactions.'

Mr. C. Horne read a paper entitled "Notes on the habits of some Hymenopterous Insects of the North-western Provinces of India." This communication was illustrated by an extensive series of drawings of these insects, their nests, and their parasites.

This paper will be published in the Society's 'Transactions.'

June 24, 1869.

Dr. P. H. Pye-Smith, F.Z.S., in the Chair.

The Secretary spoke of several additions to the Society's Menagerie since the last Meeting, amongst which were particularly noticed:—

1. Two Double-striped Thick-knees (*Œdicnemus bistriatus*) from Central America, presented by George Dawson Rowley, Esq., F.Z.S., June 3rd, being the first examples of this interesting species of Plover ever exhibited in the Society's Gardens.

2. A Red-bellied Monkey (*Cercopithecus erythrogaster*), acquired by purchase on the 8th of June, and believed to be the second known individual of this rare species, which had been originally described by Dr. Gray from a specimen living in the Society's Menagerie*. The animal was received from a vessel coming from

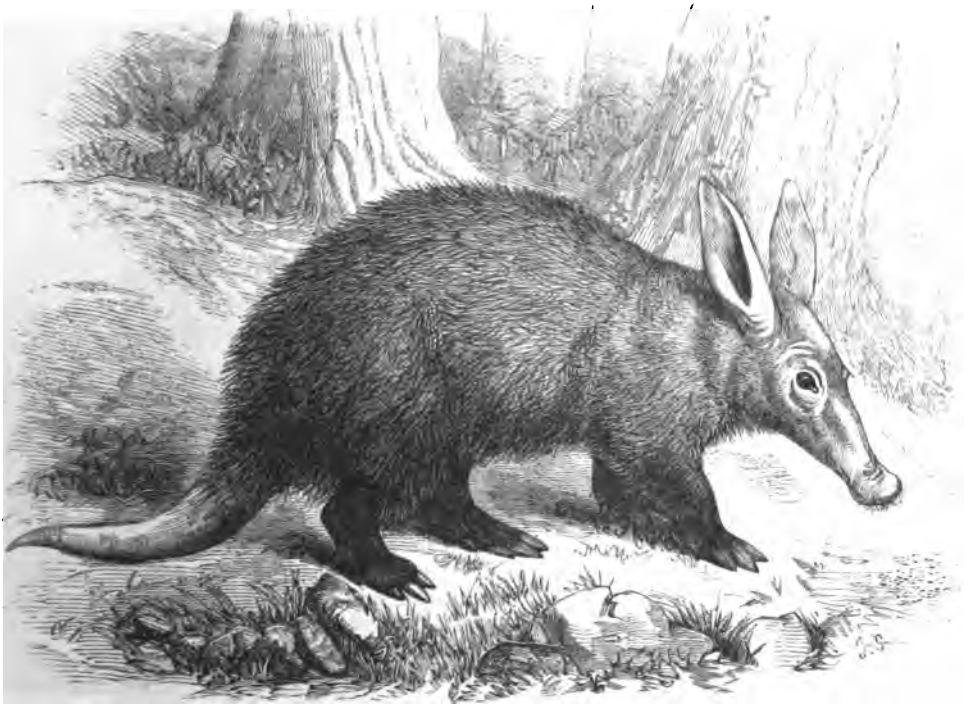
* See P. Z. S. 1866, p. 169, pl. xvi. Since this was written I have seen a third example of this Monkey in the Hamburgh Museum, and have been informed by Dr. Hilgendorf that this and another specimen were recently living in the Zoological Gardens of that city.—P. L. S.

some part of the West-African coast; but the exact locality was unknown.

3. A New Caledonian Rail (*Ocydromus lafresnayanus**), presented to the Society by Dr. George Bennett, F.Z.S., of Sydney, and received, by the 'Paramatta,' on the 10th inst.

This very interesting bird, which had been sent to Dr. Bennett from New Caledonia, was little known in European collections, and had never previously been received alive. It was allied to the Weka Rail (*Ocydromus novæ-zeelandiæ*), but quite distinct specifically, if not generically. A more extended notice of this remarkable bird would be given whenever it died and so afforded the means of making a thorough examination of it. This it was impossible to effect while the bird was living.

4. A Cape Ant-bear (*Orycteropus capensis*), purchased on the 18th of June for £150, and believed to be the first specimen of



Orycteropus capensis.

this singular Edentate ever brought to Europe alive. This animal had been purchased at Port Elizabeth, Algoa Bay, and brought to

* *Gallirallus lafresnayanus*. Verr. et Des Murs, Rev. Zool. 1860, p. 437.

this country by the captain of one of the Union Steamship Company's vessels. It fed well, principally on raw meat pounded small, in the same manner as the American Ant-eaters (*Myrmecophaga jubata*), two specimens of which, obtained in October and November 1867, were still living in good health in the Society's Menagerie.

Mr. P. L. Sclater exhibited some very fine specimens of Snakes, forwarded to the Society by Mr. George Wilks, of Buenos Ayres, C.M.Z.S. These had been determined by Dr. A. Günther as *Heterodon d'orbignyi* (Günther's Cat. of Colubrine Snakes, p. 83) and *Euophrys modestus* (*ib.* p. 139).

Mr. W. T. Blanford, C.M.Z.S., exhibited specimens of the head of a Rhinoceros (*Rhinoceros keitloa*?) and of an Ælian's Wart-hog (*Phacochœrus æliani*), obtained by him during the late Abyssinian expedition, and called attention to the fact that the incisors were permanent in both jaws of the latter, a fully adult individual.

Mr. Blanford also exhibited, and made remarks upon, some skins of *Hyraces* obtained by him in various parts of Abyssinia.

Mr. Blanford exhibited specimens of three very rare Indian birds, viz. *Trocalopteron fairbanki* from the Anamullay Hills, *Prinia adamsi* (with the nest) from near Ahmednuggur, and *Alcippe brucei* from Mahableshwar.

Mr. Howard Saunders, F.Z S., exhibited some eggs of the Flamingo (*Phœnicopterus antiquorum*), and the skull and skin of the Spanish Lynx (*Felis cervaria*), obtained by him in the neighbourhood of Seville during a recent visit to Spain.

The Secretary exhibited, on behalf of Mr. King, and made remarks upon, some drawings by Mr. Tuffen West, illustrating the development of *Hippocampus annulosus* and *H. brevirostris*.

An extract was read from a letter addressed to the Secretary by Mr. William H. Hudson, dated Buenos Ayres, April 30, 1869. Alluding to the paper by Messrs. Sclater and Salvin on birds collected by him near Buenos Ayres (P. Z. S. 1868, p. 137) Mr. Hudson observed, "I regret to find that I have made so great a mistake as to mark as females two of the three black-plumaged Silverbills (*Lichenops perspicillatus*, *l. c.* p. 141). This was pure carelessness, as all the black-plumaged birds I have ever opened were males, and the red females. I have watched them pairing and building their nests, and am therefore quite positive they are male and female, though the country-people here regard them as of different species."

Mr. Sclater remarked that the much vexed question whether *L. erythropterus* were really the female of *L. perspicillatus* might thus be considered to be finally set at rest.

Dr. Habel, of New York, exhibited and made remarks on a selection from a collection of birds formed in the Galapagos Islands, to which he had recently paid a five months' visit. Dr. Habel stated that his whole collection embraced upwards of 300 specimens, referable to about 70 species, some of which he believed to be new to science. Dr. Habel had likewise made extensive collections in other branches of natural history, and was preparing to publish a complete account of the fauna of the Galapagos based upon these investigations.

The following papers were read :—

1. On *Anarhynchus*.

By Dr. G. HARTLAUB, F.M.Z.S.

It is now thirty-six years since a good French work, the zoological part of the 'Voyage de l'Astrolabe,' by Quoy et Gaimard (Zoologie, Paris, 1833), brought to our knowledge the full and rather detailed generic and specific description of a very curious grallatorial bird from the east coast of the Northern Island of New Zealand. This bird was introduced into the system under the name of *Anarhynchus*, its beak being "recourbé en haut comme les Avocettes et dévié à droite." Though the hunters of this expedition had killed a certain number of individuals, only one, a younger bird, "dont le sexe n'était pas encore caractérisé," was deposited in the galleries of the Jardin des Plantes. Besides this one specimen, the beaks of several others had been collected and preserved, to show that the most anomalous, nay almost incredible, lateral bend of the apical half of the beak was not an accidental but a constant formation. What has become of these beaks? Whether they have really been deposited in the Paris Museum, and whether they are still to be found there or not, nobody has ever ascertained. The unique and very indifferent-looking specimen in the Paris collection having been overlooked by most ornithologists, the whole *Anarhynchus*-matter became rather apocryphal, and the more so when the Nestor of English ornithologists, Mr. G. R. Gray, declared that this bird was represented in the 'Voyage de l'Astrolabe' with a deformed beak, that organ being perfectly straight in most specimens. Now it is really difficult to understand how such an apodictical opinion could have been given by one who certainly had never seen an *Anarhynchus*; for so much is certain, that up to this year no other specimen of the rare New-Zealand bird had reached any of the greater collections of Europe. In Dieffenbach's work, as well as in the 'Zoology of H.M.SS. Erebus and Terror,' it is simply enumerated; and Bonaparte, who most erroneously places *Anarhynchus* between *Terekia*

very doubtful supposition), it would be called *Pohoera* by the natives, and would never be seen inland.

From what exact locality of New Zealand the two specimens sent by Dr. J. Haast came we cannot say; but the circumstance of this gentleman living at Christchurch makes it probable that they were killed on the Southern Island.

P.S. *Scolopax sumatrana*, Raffl. (Linn. Trans. xiii.), "a small species with the long bill curved upwards, grey above, white beneath, quill-feathers blackish," a bird which Mr. G. R. Gray seems inclined to consider not different from *Anarhynchus*, has nothing to do with our New Zealand bird, but is certainly *Terekia cinerea*.

2. Oiseaux nouveaux de l'Afrique occidentale.

Par J. V. Barboza du Bocage.

(Plate XXIX.)

1. Cossypha subrufescens.

Supra olivaceo-cinerea, uropygio et supracaudalibus ferrugineis; subtus flavo-ferruginea, abdomine medio pallidiore; capite genisque nigris; superciliis protractis, albis; tectricibus alæ cinerascente indutis, olivaceo limbatis; remigibus fuscis, pogonio externo cinerascente; subalaribus ferrugineis; rectricibus duabus mediis nigricantibus, reliquis ferrugineis, extimæ pogonio externo versus basim nigricante; pedibus fuscis; iride brunnea.

Jun. *Tectricibus alæ macula apicali rufescente notatis.*

Long. 0·210 metr., rostri a rictu 0·024, alæ 0·102, caudæ 0·094, tarsi 0·032.

Deux individus de Caconda, un mâle adulte et un jeune. Ils se rapprochent de *Bessonornis semirufa*, Rüpp. (Syst. Uebers. Vög. Nord-Ost-Afr. p. 44, pl. 21), mais leur taille est plus forte, et la teinte du dos et des ailes assez distincte.

2. Crateropus affinis.

C. plebejo, *Rüpp., similis, sed major. Supra brunneo-cinerascens. subtus et in uropygio pallidior; plumis capitis, colli, gutturi pectorisque medio obscurioribus et macula apicali alba notatis; remigibus primariis totis brunneis: rectricibus cinereo-brunneis fusco transversim fasciolatis; rostro nigro; pedibus fuscis; iride rubra.*

Long. 0·235 metr., rostri a rictu 0·024, alæ 0·105, caudæ 0·107, tarsi 0·030.

An *Crat. plebejus*, Hartl. (Syst. der Orn. W.-Afr. p. 79)?

Un seul individu mâle de Leullengues, dans l'intérieur de Mossamedes.

3. Buccanodon anchietæ. (Plate XXIX.)

Brunneo-rufescens, collo pectoreque nitide nigris; pileo, mento

gulaque sulphureis; superciliis et capitis lateribus albis; nuchæ collique plumis maculis parvis apicalibus albis notatis; gutture et pectore longitudinaliter sulphureo striatis; tectricibus alæ dorso obscurioribus nitore nonnullo viridescente; remigibus primariis fuscis, secundariis fulvescenti-albo limbatis; cauda supra fusca cinereo induta, subtus cinerea; crisso et subcaudalibus fulvescenti-albidis; vibrissis mollibus, nigris; rostro pedibusque nigris; iride rufescenti-brunnea.

Long. 0·166 metr., rostri 0·024, alæ 0·094, caudæ 0·050, tarsi 0·018.

Quatre individus mâles de Caconda. C'est la deuxième espèce connue du genre *Buccanodon*. L'autre espèce, *B. duchaillui* (Cass.) = *Barbatula formosa*, Verr. (Rev. et Mag. Zool. 1855, p. 218, pl. 5), vient du Gabon.

Je dédie la nouvelle espèce à M. d'Anchieta, naturaliste-voyageur Portugais qui parcourt depuis deux ans l'intérieur de l'Afrique occidentale et a beaucoup contribué par ses découvertes à nous dévoiler la faune de ces régions presque ignorées.

M. d'Anchieta m'a envoyé des mêmes localités plusieurs autres oiseaux, dont je me bornerai pour le moment à citer les plus intéressants :—

Æsalon ardesiacus (Vieill.), ♂.
Turdus simensis, Rüpp.
Urolectes cissoides, Bp.
Telephonus trivirgatus (Smith).
Lamprotornis purpureus, Boc.
Euplectes xanthomelas, Rüpp.
Corythaix livingstonii (Gray).
Numida mitrata, Pall.
Gallinago æquinoctialis, Rüpp.
Pternistes sclateri, Boc.
Lobivanellus lateralis, Smith.

3. On two new Birds collected by Mr. E. Bartlett in Eastern Peru. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A.

(Plate XXX.)

Mr. E. Bartlett has placed in our hands for examination some birds collected during his recent expedition to Eastern Peru, subsequently to those of which we have given an account to this Society in former communications upon this subject*.

The greater part of these are, either from the condition of the specimens themselves, or from their being females or immature forms belonging to obscure groups, not very readily determinable. But there are two well-marked species amongst them which we are, with

* See P. Z. S. 1866, pp. 175 et 566, et 1867, p. 748.

some confidence, able to describe as new. These are, first, a new Tanager of the genus *Euphonia*, which we propose to call

EUPHONIA CHRYSOPASTA, sp. nov. (Plate XXX. figs. 1 & 2.)

Supra æneo-viridis, in fronte et uropygio paulo magis splendens, in pileo summo obscurior: alis caudaque nigricantibus æneo limbatis: subtus medialiter læte flava, lateraliter viridi aspersa; tectricibus subalaribus, remigum marginibus internis, et tibiis albis: rostro obscure plumbeo, pedibus fuscis: long. tota 4·3, *alæ* 2·3, *caudæ* 1·5.

♀. *Supra mari similis, subtus medialiter grisescenti-alba, crisso flavo.*

Hab. in Peruvia orient. in ripis fl. Ucayali (*Bartlett*); et in ripis fl. Napo, reipubl. Æquatorialis.

Mr. Bartlett obtained three male examples of this Tanager—two on the Upper Ucayali (in June 1865), and one on the lower part of the same river. Sclater's collection contains a pair of the same species, obtained from the Rio Napo through M. Verreaux some years since, but which have remained hitherto undetermined.

This *Euphonia* is a well marked form, and does not very closely resemble any other described species. The change of the under surface from yellow in the male to greyish white in the female is repeated in *E. chalybea* and *E. xanthogastra*.

The second bird is a small Piprine form, allied to the rufous species of *Heteropelma*, which Herr v. Pelzeln has lately described as *H. rufum**, but much more diminutive in size, being scarcely larger in bulk than a typical *Pipra*, although its tail is relatively much longer. In the shape of the bill, however, as in general structure, this bird comes nearer to *Heteropelma* than to *Pipra*. The wings reach to about the middle of the tail, the third remex being scarcely longer than the second and fourth, the first rather shorter than the fifth. The tail is nearly square at the end, the external rectrices being very little shorter than the medial. The feet are small and slender; the tarsus divided in front into five or six scutes, and covered behind with minute, almost obsolete, reticulations. The three anterior digits are closely united together, the cohesion between them extending up to, if not rather beyond, the commencement of the terminal digits. The general colour is rufous, with a cinereous cap ornamented by a half-concealed vertical stripe, as in *Heterocercus*†. In the male this stripe is of a lemon-yellow; in the female and young male red. We propose to call this bird

NEOPIPO RUBICUNDA, sp. et gen. nov. (Plate XXX. fig. 3.)

Rufa; subtus, præcipue in gula, dilutior: pileo cinerascente, striga

* Orn. Bras. p. 185. We believe this bird to be the same as *Schiffornis major*, Bp., described and figured by Des Murs in Castelnau's Voyage, Ois. p. 66, t. xviii. f. 2.

† Herr v. Pelzeln has separated his *Heterocercus flavivertex* from *H. linteatus*, as having the vertical spot yellow and no black on the head (Orn. Bras. p. 186). But Strickland's figure of *H. linteatus*, fem. (Contr. Orn. 1850, pl. 63), exactly agrees with one of Natterer's type specimens of *H. flavivertex*; and we are by no means satisfied that the two birds are distinct.

mediali capitis flava: alis intus nigricantibus, extus rufis: cauda unicolori rufa: rostro corneo, maxilla ad basin pallida: pedibus fuscis: long. tota 3·5, *alæ* 1·9, *caudæ* 1·4, *rostri a rictu* 0·4, *tarsi* 0·5.

♀. *Mari similis, sed striga pilei læte rufa.*

Hab. in Peruvia orientali, Chamicurros et Xeberos (*Bartlett*).

Mr. Bartlett obtained three specimens of this bird in Eastern Peru—a female at Xeberos in May 1866, and an adult and young male at Chamicurros in August 1867. The bird was met with in company with *Tyrannulus elata* and *Elainea pagana*, rather resembling these birds than the true *Pipræ* in its habits.

PS. Since this paper was read we have received separate copies of a paper by Mr. Lawrence, extracted from the 'Proceedings of the Academy of Nat. Sc. of Philadelphia' for December 1868, wherein is a description of a bird which seems to be our *Neopipo* under the name *Pipra cinnamomea*. The species will therefore probably stand as *Neopipo cinnamomea*.—Aug. 7th, 1869.

4. Descriptions of three new Species of Tanagers from Veragua. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A.

(Plates XXXI., XXXII.)

A collection of Veraguan birds recently received from Enrique Arcé contains examples of three species of Tanagers which we believe to have not yet been characterized. These we propose to describe as follows:—

1. Buthraupis arcæi, sp. nov. (Plate XXXI.)

Supra saturate cærulea, alis caudaque nigris cæruleo limbatis; subtus læte flava; loris et gutture toto nigris, hoc viridi paululum adumbrato; tectricibus subalaribus albis flavo tinctis: rostro et pedibus nigris: long. tota 5·5, *alæ* 3·5, *caudæ* 2, *tarsi* 0·9.

Hab. in Veragua.

This well-marked species of the Tanagrine genus *Buthraupis* we have the pleasure of dedicating to Enrique Arcé, its discoverer, as likewise that of many other fine species of Central-American birds. It is smaller in size than any other member of the genus, unless it be the *Buthraupis edwardsi*, recently described by Mr. Elliott (N. Ann. d. Mus. i. Bull. p. 77, t. 4. f. 2), from New Granada, the only species of the group we have not yet met with. In coloration our new bird rather resembles the large *B. cucullata* of Bogota; but, besides the great difference in size, the head, instead of being black, is of the same colour as the back, and the under surface is of a deeper yellow.

Arcé sends two specimens of this Tanager, both of which he ob-

tained in the cordillera of Chucu. They are marked male and female, but do not differ in coloration.

2. TACHYPHONUS CHRYSOMELAS, sp. nov. (Plate XXXII.)

Splendide aureus; oculorum ambitu angusto, interscapulio, alis et cauda nigerrimis; remigum marginibus internis et subalaribus, necnon rectricum externarum in pogonio interno limbis angustis flavicanti-albis: rostro et pedibus nigris: long. tota 4·5, *alæ* 2·5, *caudæ* 1·8, *tarsi* 0·65, *rostri a rictu* 0 5.

Fem. *Olivacea, alis caudaque fusco-nigricantibus olivaceo limbatis; subtus flavicans, lateraliter obscurior; subalaribus et remigum marginibus internis albis.*

Hab. in Veragua.

This very beautiful little species of *Tachyphonus* is at once distinguishable from all its relatives by its black and yellow colour, which reminds one of the most brilliant *Icteri*. It is of diminutive size, being less in bulk even than *T. luctuosus*, which has hitherto remained the smallest known species of the genus. Its bill is particularly slender and delicate, not much more so, however, proportionately, than that of *Tachyphonus surinamus*.

Arcé obtained several examples of both sexes of this bird in the cordillera of Chucu.

3. CHLOROSPINGUS PUNCTULATUS, sp. nov.

Supra olivaceus; alis caudaque fusco-nigris, olivaceo limbatis; pileo toto cum nucha et capitis lateribus nigris; macula postoculari alba: subtus flavicanti-olivaceus, pectore aurantiaco tincto; gutture nigro sparsim punctulato: ventre medio albicante: campterio alari et subalaribus limonaceo-flavis: rostro et pedibus nigris: long. tota 5·2, *alæ* 2·7, *caudæ* 2·2.

Hab. in Veragua.

This *Chlorospingus* belongs to the group distinguished by a white postocular spot, which embraces *C. ophthalmicus* and its allies. Its black head distinguishes it from all these, except *C. pileatus* (Salv. P. Z. S. 1864, p. 581). In the latter bird, however, the under surface is of a pale cinereous, with a yellowish pectoral band and flanks, and there are no traces of the throat-spots, which render the present species easily recognizable.

Arcé collected several specimens of this new *Chlorospingus* in the cordillera of Chucu.

5. On an apparently new Genus of Minute Parasitic Cirripeds, between *Lepas* and *Dichelaspis*. By JOHN DENIS MACDONALD, M.D., F.R.S., Staff-Surgeon R.N.

(Plates XXXIII., XXXIV.)

On examining the gills and respiratory appendages of *Neptunus pelagicus*, one of the swimming crabs, occurring in great plenty at

Moreton Bay*, I found them beset with beautiful little pink-tinted barnacles, having a vitreous-looking capitulum, about one-eighth of an inch in length, with shelly depositions bearing an important relation to the rudimentary valves of *Dichelaspis* and *Conchoderma*. In general form, however, and even in many details of their anatomy, these little parasites are perfect miniatures of *Lepas anatifera*, their most striking character being that the valves, which are semitransparent in the greater part of their extent, are distinctly in articulation with each other, or closely approximate (see Plate XXXIII. fig. 3).

The peduncle is of considerable length, and cylindrical, though tapering a little towards the capitulum (Plate XXXIII. figs. 1 and 2). It is, moreover, so transparent as to exhibit, under a low power, its outer circular and inner longitudinal layer of muscular fibres, with the contained tubular structure and pink-coloured ova. When more matured these latter reach the back part of the cavity enclosed by the valves, where they become arranged in a single leaf-like layer, which, adapting itself to the curvature of the posterior and lateral valves, receives the body of the animal in its concavity. In this single expansion the union of two ovigerous lamellæ is indicated by a central notch in its inferior border (fig. 2, *b* & *c*). To an ordinary observer the oral organs would present a great similarity to those of *Lepas*, but they appear to be somewhat more prolonged, so as to form a kind of proboscis.

In the capitulum the valves are five, approximate, corneous, and strengthened by the deposit of shelly matter, as above mentioned; besides which they are marked with distinct lines or increments of growth, and dotted with minute points, indicating at least a pseudocell-structure (Plate XXXIII. fig. 3). These lines of growth are obtusely angular in the scuta (*b*), but rather semicircular in the terga (*c*) and carina (*d*). The centre of development is posterior and basal in the carina, anterior and basal in the scuta, and posterior and subapical in the terga.

The shelly supporting piece of the scuta consists of a long and fusiform occludent segment, connected with a rudimentary basal one, and an intervening oblique ray directed towards the middle of the carina. The shelly part of the terga is subapical and narrowly crescentic, with the convexity near the dorsal border. Finally, the shelly framework of the carina consists of a narrow mid-rib extending only to the base of the terga posteriorly, but bifurcated at the proximal end, where each limb skirts the base of its own moiety. In the occludent margin of the capitulum the lines of growth (Plate XXXIV. *b*) increase in length and thickness from before backwards.

The parts of the mouth more particularly considered afford the following characters:—

The labrum (Plate XXXIV. *c*) is protuberant or bullate, its angular edge supporting a row of fine conical tubercles.

* This species is also abundant at Sydney, and amongst the islands of the South-western Pacific.

The palps (*d*) consist of a base and a simple oral terminal segment, with a brush of hairs at its extremity.

The mandibles (*e*) present six prominent teeth, diminishing in size from before backwards—the sixth or apical tooth being notched, so as to give the indication of a seventh.

The maxillæ (*f*) support four or five principal conical points, or teeth, upon a slightly oblique but straight edge.

The external maxillæ (*g*) are quite membranous, of rhomboidal shape with rounded angles, setaceous on their inner surface, and capable of meeting together below the maxillæ, so as to answer the purpose of a labium.

The branches of the first pair of cirri (*h*) are richly bristled, and nearly of equal length and thickness.

Assuming this little cirriped to form the type of a new genus, it may be named *Parodolepas* neptuni*, with the following generic characters, subject, of course, to such revision as may be ultimately found necessary:—

Valves five, approximate, transparent in their general extent, but strengthened by the deposit of shelly matter, after the manner of the rudimentary valves of *Dichelaspis*, without, however, overlapping each other, as they are circumscribed by their respective plates. Carinæ not extending beyond the base of the terga, and meeting the scuta in a straight longitudinal line. Mandibles with six teeth, gradually decreasing in size from before backwards; the sixth or apical tooth notched, giving an indication of a seventh. Maxillæ supporting about five principal conical points, or teeth, upon an oblique but straight border. Anterior and posterior ramus of the first cirri nearly equal in length and breadth, and well clothed with hairs.

In a subsequent cruise to Nandi Bay, Vanua Levu, Feejee, I met with a second little pedunculated cirriped, parasitic upon another swimming crab; but I regret to say that, although I made rough drawings of the oral organs and one or two of the cirri (see the woodcut, p. 443), I did not think it worth while to compare the capitulum with that of the species above described; but, as far as I can remember, it presented very similar characters.

The palps (*a*) presented an oval extremity crested with hairs; and the mandibles (*b*) were four- or five-toothed, the two or three terminal ones being subdivided irregularly.

The maxillæ (*c*) were comparatively short, and furnished with numerous points upon a slightly convex border, the two or three outer ones being separated from the rest by a shallow notch. The external maxillæ (*d*) were small, and closely beset with long hairs upon their inner surface.

The anterior branch of the first pair of cirri (*e*) was very short as compared with the posterior, the segments of both being armed with transverse rows of hairs in front, but quite nude posteriorly. If this inequality in the size of the two branches of the first cirrus be not of generic importance, it is probable that the species may be referable to the genus *Dichelaspis*. Some future inquirer may be able

* Πάροδος, transition; the specific name *neptuni* expresses the habitat.

to settle this point. It would appear, however, as though at least distinct species of Cirripeds infested distinct species of Pinnipeds.

Oral organs of a Feejeean Pedunculated Cirriped.

a, palp; *b*, mandible; *c*, maxilla; *d*, external ditto; *e*, anterior branch of first pair of cirri. (See p. 442.)

Of all the pedunculated cirripeds, *Dichelaspis lowei* appears to make the nearest approach to *Parodolepas neptuni*, both in size and the disposition of the shelly parts of the capitulum. It is, however, somewhat larger*, and there is no evidence that the approximation of its valves has been overlooked; added to which its mandibles are only furnished with four teeth, while the maxillæ are thickly beset with spines, the three upper being divided from the rest by a notch; in which latter particulars it would agree better with the Feejeean species.

Parodolepas is of great interest, as showing that the unequivocal presence of "five valves approximate," as in *Lepas* and *Pœcilasma*, coexists with the still more obvious development of what might be denominated the centres of shell-growth of the last-mentioned genera, and which, as it were, constitute the only representatives of true

* Length of capitulum $\frac{3}{10}$ of an inch as compared with $\frac{3}{16}$ of an inch.

valves in *Dichelaspis* and *Conchoderma*. In all this we perceive the manifestation of, at least, a unity of design, if it be not simply an evidence of that latitude for diversity, or the susceptibility of divergent modification, impressed upon original types by the Great Author of Nature. Yet, though we may trace back divergent subtypes to one primary source, it would be unphilosophical to expect the mutual transmutation of any two such resultants into each other as contingent upon what the Darwinian theory is too often incorrectly assumed to involve. For, even if a tendency to revert to the original type, such as we see in unstable variety, were to manifest itself in any case, the effect of such a tendency would be the production of something very different from the collateral forms, instead of running into them, which a superficial thinker might suppose to be most natural; for the collateral forms themselves must have originated in special and protracted change developing great, though gradual, modification.

EXPLANATION OF PLATES XXXIII. & XXXIV.

PLATE XXXIII.

Fig. 1. *Parodolepas*, attached in a group to one of the gills of *Neptunus pelagicus*. Natural size.

2. *a*. Group of three of the same little Cirripeds attached to one of the gill-flappers. Considerably enlarged.
   b. Lateral view of the single ovigerous lamella.
   c. Front view of the same, showing the emargination of its anterior border; also considerably enlarged.

3. Magnified view of *Parodolepas neptuni*, showing the course of the lines of growth, the shelly thickenings, and the minutely dotted surface of the valves.
   a. Pedicle.
   b. Scutum.
   c. Tergum.
   d. Carina.

PLATE XXXIV.

Highly magnified view of the oral apparatus of *Parodolepas neptuni*.
   a. Shelly support of the scutum (occludent segment).
   b. Occludent margin of the capitulum, showing lines or increments of growth decreasing both in thickness and length from before backwards.
   c. Labrum with minute dental points on its angular edge.
   d. Palp.
   e. Mandibles.
   f. Maxilla.
   g. External maxillæ.
   h. Anterior pair of cirri.

6. Descriptions of new Land and Freshwater Molluscan Species collected by Dr. John Anderson in Upper Burma and Yunan. By W. T. BLANFORD, F.G.S., C.M.Z.S., &c.

The following are the principal novelties in the large and very interesting collection made by Dr. John Anderson when accompany-

ing the recent expedition to Yunan. They will be figured, and the previously described species enumerated, in Dr. Anderson's full account of his journey, together with his other numerous novelties.

1. PALUDINA BENGALENSIS, Lam., var. DIGONA (vel P. DIGONA).

Testa P. bengalensi *persimilis, sed decussatim striatula, anfractibus superioribus juxta suturam angulatis; ultimo biangulato, et supra et infra peripheriam, angulis singulis fasciis fuscis spiralibus congruentibus, zona tertia intermedia, aliis basalibus, lineis angustioribus spiralibus interdum interjectis.*

Long. 23½–32 mm., diam. 17½–23; apert. 13–17½ longa, 10½–14½ lata.

Hab. in valle fluminis Iravadi circa Ava, Bhamo, &c.

Merely a variety of *P. bengalensis*, and passing insensibly into the type in Assam, and into the var. *balteata*, Bs. (*P. doliaris*? Gould), in Sylhet. If, however, *P. microgramma*, v. Martens, *P. sumatrensis*, Dkr., and similar allied varieties be distinguished by a particular name, this form should also be so, and may in that case be called *P. digona*. It is perfectly intermediate between *P. bengalensis*, Lam., and *P. oxytropis*, Bs.

2. PALUDINA DISSIMILIS, Müll., var. DECUSSATULA (vel P. DECUSSATULA).

Testa imperforata, conoideo-ovata, tenuiuscula, olivacea, fascia pallida subperipheriali in anfractu ultimo plerumque signata, subglabra, striis incrementi et lineis subconfertis flexuosis spiralibus decussata. Apex acutus; sutura mediocriter impressa. Anfr. 6–7, *convexi, ultimus tumidior. Apertura subovata, intus lactea. Peristoma tenue, nigrum. Operculum corneum, crassum.*

Long. 25, diam. 17½ mill.; apertura 13 longa, 10½ lata.

Hab. Ava.

Nearer to the variety *præmorsa* of Benson than to any other Indian form. It is distinguished by its fine decussating striation.

The *Paludinæ* of British India, like most of the freshwater shells, are in endless confusion—a state which has certainly not been removed by the work of Von Frauenfeld and Reeve. I fully concur with the remarks of Von Martens (Malakozoologische Blätter, xiii. p. 98) as to the forms figured in Reeve, which are undistinguishable as species from *P. dissimilis* of Müller; indeed I am inclined to go much further, and to class such forms as *P. crassa*, Hutton, and *P. præmorsa*, Bens., as varieties also, though they are sufficiently distinct to deserve varietal names. The form now described is equally deserving of distinction.

3. MELANIA IRAVADICA, sp. nov.

Testa elongato-turrita, tenuis, fusco-olivacea, decollata. Anfr. circa 7, *primi erosi,* 3–4 *superstites convexi, superi seriebus duabus spiralibus nodorum confertorum circumdati, ultimus spiraliter liratus, nodis fere vel omnino obsoletis. Apertura rhomboideo-*

ovata, antice subeffusa; peristoma tenue, margine externo subrecto, basali antice porrecto, columellari sinuato. Operc.?

Long. exempli majoris decollati 25 mm., diam. 15; apert. oblique 13 longa, 8 lata. Exempli mediocris (etiam decollati), long. 13, anfr. ultimi 11, diam. maj. 14, min. 12½; apertura oblique cum peristomate 13 longa, 8½ lata.

Hab. in flumine Iravadi superiore ad Malé et Bhamo.

Distinguished from the numerous varieties of *M. variabilis*, Bens., by the external margin of the peristome not being sharply curved outwards close to the base, but nearly straight, with a very gentle concave curve throughout. Unfortunately, the opercula have disappeared from all the specimens, as well as from some collected by myself in 1861.

4. BITHYNIA IRAVADICA, sp. nov.

Testa subrimata, ovato-conica, solidula, sub lente minutissime (fere obsolete) decussato-striata, pallide olivacea vel fulva. Spira elevato-conica, apice obtusiusculo sæpe eroso, sutura parum impressa. Anfr. 6, *convexiusculi, ultimus ad peripheriam obtuse angulatus. Apertura subverticalis, ovata, postice angulata, antice subangulata et subeffusa; peristoma tenue, rectum, marginibus callo junctis, columellari verticali cum basali angulum fere rectum faciente. Operc. normale.*

Long. 11, diam. 6½ mm.; apert. 6 mm. longa, 4 lata.

Hab. in paludibus et rivulis prope Mandélé urbem principalem hodiernam regni Avæ.

Intermediate between *B. ceranospatana*, v. Frauenfeld (*B. cerameopoma*, Bs. MS.*), of India, and *B. goniomphalus*, Mor., of Siam.

5. FAIRBANKIA? (an BITHYNIA?) TURRITA, sp. nov.

Testa subperforata, turrita, solidula, fulva, glabra, nitidula. Spira elongato-conica, sutura impressa. Anfr. 7, *convexi, ultimus antice subascendens, subtus rotundatus. Apertura ovata, postice vix angulata, varice externo mediocri instructa; peristoma undique expansiusculum, marginibus callo junctis, externo leviter arcuato, columellari obliquo, antice cum basali subangulatim juncto. Operc.?*

Long. 6¼, diam. 3 mm.; aperturæ long. 2½, lat. 1¾ mm.

Hab. ad Kyoukpong (in flumine Iravadi?).

This looks like an estuary shell. In the absence of the operculum its position is doubtful; but if not allied to *Fairbankia bombayana*, W. Blanf., it may perhaps be a *Bithynia*, near *B. nassa*, Theobald.

6. CYCLOPHORUS SUBLÆVIGATUS, sp. nov.

Testa aperte umbilicata, depresso-turbinata, solida, sublævigata, oblique striatula, in anfractibus superioribus et nonnunquam sed rare in ultimo lineis impressis confertis spiralibus decussata,

* I believe this common Indian shell is undescribed by Benson; at least I can find no description of it. It has been referred to by name in Benson's papers; and I regret Von Frauenfeld's selecting such a name as *ceranospatana* by which to describe it.

castanea, supra peripheriam et circa umbilicum spiraliter albido fasciata, periomphalo lato albo. Spira depresso-conica, lateribus concavis, apice papillari, magis exserto, sutura profunda. Anfr. 5, *convexi, ultimus magnus, ad peripheriam angulatus, angulo antice evanescente, subtus convexus, juxta aperturam leniter descendens. Apertura fere rotunda, obliqua, lutescenti-albida, aliquantulum latior quam alta. Peristoma rectum, incrassato-expansum, subcontinuum. Umbilicus pervius. Operculum normale.*

Diam. maj. 46, min. 38, axis 25 mm.; apert. cum perist. 23 mm. lata, 21½ alta.

Hab. haud procul a Bhamo, ad ripas fluminis Iravadi.

Somewhat allied to *C. pearsoni*, Benson, and *C. excellens*, Pfr., but more depressed than either. It is distinguished from *C. theobaldianus*, Bens., by its much smaller mouth and smoother surface.

7. SPIRACULUM ANDERSONI, sp. nov.

Testa late umbilicata, depressa, discoidea, oblique striata, lineis elevatis minutis spiralibus superne et præsertim juxta peripheriam, sed non circa umbilicum, confertissime decussata, albida, strigis castaneis fulguratis radiantibus picta. Spira plana, apice vel plano vel vix exsertiusculo, sutura profunda. Anfr. 4½, *teretes, ultimus versus aperturam longe descendens,* 5–6 *mill. pone peristoma tubulo suturali reverso parvo, arcuatim recurvato vel subrecto et libero,* 2–3 *mm. longo munitus. Apertura diagonalis, rotunda; peristoma continuum, duplex, internum expansiusculum undique appressum, postice juxta anfractum penultimum profunde angulatim sinuatum, externum expansum, supra sinum dilatatum, juxta anfractum penultimum instar cuculli plani porrectum. Operc. persimile ei* Sp. hispidi, *corneum, intus concavum, extus convexum, marginibus anfractuum, præsertim externorum, lamellatim liberis, apice planiusculo.*

Diam. maj. 15½–17, min. 12–13½, axis 5–6, apert. diam. intus 5 mm.

Hab. ad Bhamo cum præcedente.

Distinguished from *Sp. avanum*, W. Blanf., by its more oblique mouth, differently shaped and more expanded peristome, by the horizontal cowl-shaped projection running forwards along the last whorl instead of being vertical, the greater distance of the sutural tube from the mouth, and the much more convex operculum.

8. HELIX (TRACHIA) CATOSTOMA, sp. nov.

Testa late umbilicata, depressa, subdiscoidea, cornea, tenuis, striata. Spira depresso-convexa, sutura leviter impressa. Anfr. 7, convexi, arcte convoluti, ultimus rotundatus, circa umbilicum subcompressus, antice abrupte deflexus, valde descendens, pone aperturam subconstrictus. Apertura fere horizontalis, truncato-ovata; peristoma album, reflexum, antice et postice prope anfractum penultimum arcuatum, marginibus subdistanter convergentibus, callo tenui junctis; umbilicus latissimus, pervius.

Maj. diam. 16, min. 14½, alt. 6½ mm.

Hab. Ponsee in Yunan.

A peculiar form, resembling *H. oldhami*, Bens., but with the mouth somewhat as in *H. nilagarica*, Pfr.

9. HELIX (PLECTOPYLIS) ANDERSONI, sp. nov.

Testa dextrorsa, latissime umbilicata, discoidea, solidula, albida, epidermide crassula fusca, interdum ad peripheriam laciniatim fimbriata, induta, sub epidermide decussato-striata, lineis spiralibus supra distinctis, infra subobsoletis. Spira plana, apice vix prominente, sutura subimpressa. Anfr. 7½–8, *angusti, arcte convoluti, supra planulati, infra in umbilico convexiusculi, ultimus superne ad peripheriam angulatus, subtus tumidus et circa umbilicum pervium, omnes anfractus monstrantem, obtuse compressus, pone aperturam leviter descendens, juxta peristoma constrictus. Apertura perobliqua, rotundato-lunaris; peristoma album, undique expansum, superne ad extremam peripheriam leviter angulatim porrectum, marginibus lamella curvata, ad ambas extremitates incisa junctis, lamina intranti nulla. Janua interna remota, ad ⅓ anfractuum ab apertura sita, e plica unica verticali parietali, 4 palatalibus horizontalibus, harum tribus inferioribus versus extremitates altioribus, medio humilibus, postice subbifidis, una basali etiam horizontali simplici constans.*

Diam. maj. 26, min. 23, alt. 8½ mill.

Hab. Bhamo in regno Avæ et Hoetone in Yunan.

Distinguished from the numerous allied Burmese forms by the absence of a reentering lamina running from the aperture, by the very simple internal plication, &c. It approaches *H. laomontana*, Pfr.

10. HELIX (SIVELLA) PERCOMPRESSA, sp. nov.

Testa aperte et pervie umbilicata, perdepressa, lenticularis, tenuis, cornea, acutissime carinata, nitida, striis incrementi oblique curvatis notata. Spira fere plana, apice vix exserto, sutura impressa marginata. Anfr. 5, *convexi, ultimus carina mediana acuta utrinque compressa instructus, circa umbilicum tumidior, non descendens. Apertura parum obliqua, securiformis; peristoma tenue, rectum.*

Diam. maj. 12, min. 10½, axis 3 mm.

Hab. Bhamo in regno Avæ.

Near *H. sanis*, Bens., and *H. castra*, Bs., but more depressed than either.

11. NANINA (ROTULA) ARATA, sp. nov.

Testa imperforata, lenticularis, tenuis, cornea, supra oblique plicato-striata, infra lævior nitidula, radiatim striatula. Spira depresso-conoidea, apice acutiusculo, sutura parum impressa, submarginata. Anfr. 7, *lente accrescentes, convexiusculi, ultimus acute carinatus, subtus convexus, non descendens. Apertura angulato-lunaris, obliqua; peristoma rectum, obtusum, marginibus distantibus, basali subincrassato, columellari declivi vix reflexiusculo.*

Diam. maj. 23½, min. 21½, axis 11 mm.; apertura 12½ mm. lata, 8 alta.

Hab. haud procul a Bhamo in regno Avæ.

Var. *Minor, anfractibus arctius convolutis.*

Diam. maj. 17½, min. 15, axis 7½ mm.

Hab. ad Ponsee in Yunan.

This shell is an ally of *N. climacterica*, Bs., but distinguished by a higher spire and sharper keel.

12. ACHATINA (GLESSULA) OBTUSA, sp. nov.

Testa elongato-turrita, albido-cornea, cerea, solidiuscula, confertim flexuose plicato-striata, infra suturam plicata. Spira elongata, ad apicem subcylindracea, apice perobtuso papillari, sutura vix impressa subcorrugata. Anfr. 12–14, *fere planulati, ultimus ad peripheriam subangulatus. Apertura obliqua, subovata; peristoma simplex, rectum.*

Long. 48–52, diam. 10–11, ap. long. 10–11, lat. 5–5½ mill.; apex 3 mill. latus.

Hab. ad Bhamo in regno Avæ.

Very close to *A. cassiaca*, Bens., but distinguished by finer sculpture, narrower and less numerous whorls, and much more obtuse apex. The two form a well-marked section of the genus.

13. ACHATINA (GLESSULA) SUBFUSIFORMIS, sp. nov.

Testa turrita, subfusiformis, tenuiuscula, pallide olivaceo-cornea, nitida, striatula, ad suturam subplicata. Spira elongato-pyramidalis, apice brevissime conico mucronato, sutura impressa submarginata. Anfr. 8, *convexi, ultimus subelongatus, antice attenuatus. Apertura subovata, columella parum arcuata, antice oblique truncata; peristoma obtusum, leviter undulatum.*

Long 17⅔, diam. 5⅔ mill.; apert. 6 longa, 3 lata.

Hab. Ponsee in Yunan.

This form may be recognized by its long lower whorl subattenuate below.

14. SUCCINEA ACUMINATA, sp. nov.

Testa conico-ovata, tenuissima, striata, pellucida, luteo-cornea, spira brevi acuminata subconica, lateribus subrectis. Anfr. 2½, *penultimus parum convexus, ultimus ⅔ longitudinis superans (in testa juniore ¾ subæquans), supra planulatus, infra tumidior. Apertura obliqua, ovata, subtus parum latior, basi recedens; peristoma acutum, margine externo (dextro) recto cum anfractu penultimo angulum fere rectum faciente, columella subrecta, anguste marginata.*

Long. 18½, diam. maj. 8½, min. vix 6, ap. long. 14, lat. infra medium 7½ mill. Exempli minoris long. 13, diam. 6½, ap. long. 10, diam. 5½ mill.

Hab. ad Momein in Yunan.

A peculiarly acuminate form, perhaps allied to *S. indica*, Pfr. A scarcely distinguishable race occurs in Kashmir, whence Dr. Stoliczka has brought specimens.

15. UNIO BURMANUS, sp. nov.

Testa subovata, solida, subcompressa, valde inæquilateralis, picea vel

fusco-olivacea, concentrice plicato-striata, disco medio et postico rugis obliquis irregulariter angulatis, interdum granosis, hic illic præsertim versus marginem ventralem obsoletis corrugato; umbonibus non prominentibus, subplanulatis, angulatim corrugatis, haud procul ab extremitate anteriore positis; lunella parva, concava; latere antico brevissimo subacuminato-rotundato; area convexa; margine dorsali postice regulariter convexo-curvato, terminaliter rotundato, ventrali convexo; dentibus cardinalibus crassis, radiatim corrugatis, in valva dextra binis, anteriore minimo, in sinistra ternis vel subternis; lateralibus elongatis subcurvatis, in valva dextra subduplicibus, in sinistra duplicibus; margarita colore salmonis tincta. Testa junior rotundato-ovalis, omnino præter ad extremitatem anticam subradiatim granoso-plicifera.

	1.	2.	3 (Testa junior).
Long.	52	45	34
Lat.	35	32	26½
Crass.	22	20	17
Ligamenti long.	23	20½	16

Hab. in flumine Iravadi ad Bhamo in regno Avæ.

I know of no *Unio* with which I can compare this. *U. pellis lacerti*, Mor., from Siam, is a little like it, but is much narrower and less inequivalve.

Several other species of *Unio* occurring with *U. burmanus* appear to me to be rather varieties of named species than forms deserving a distinct name. In one or two cases I feel doubtful, however. All would unquestionably be described as new by many naturalists. It is worthy of note that some of them are more closely allied to forms occurring in the Brahmapooter river, in Assam, than to those inhabiting the lower Irawady valley, in Pegu. The land shells of Bhamo and its neighbourhood are mostly either identical with forms occurring in Cachar and Khasia, or closely allied to them; and it is a remarkable and interesting fact connected with freshwater shells to find that they coincide in their distribution with the land animals, and do not follow the lines of the rivers in which they live, thus adding another proof of the existence of a means of migration amongst them independent of the course of rivers.

7. Notes on the Myology of *Menobranchus lateralis*. By St. George Mivart, F.R.S., Lecturer on Comparative Anatomy at St. Mary's Hospital.

The specimen which has served me for examination is one of those mentioned in my paper on *Menopoma* as having been confided to me from the stores of the Royal College of Surgeons.

This well-known species with permanent external gills has a more slender form than *Menopoma*; it has also a narrower head and

muzzle, and is destitute of the lateral folds of skin; but the tail has a cutaneous fin both above and below, extending further forwards, inferiorly, than in the last-named genus.

The skin is smooth and devoid of transverse wrinkles. A deep fold passes across the underside of the throat, as in the larvæ of other Batrachians.

The rounded cloacal aperture is placed very much behind the origins of the pelvic limbs.

The forearm and leg are respectively but little shorter than the arm and thigh, and the pectoral and pelvic limbs are widely separated.

The posterior digits are not broadened by cutaneous folds.

The gape of the mouth only extends backward to about the eye, though it appears from the fold of the lips to recede further.

The head is flat, the eyes destitute of eyelids, and a longitudinal groove runs along the middle of the back.

Dimensions.

	inches.
Extreme length from muzzle to tail-end	11·00
Length from mandibular symphysis to middle point between the arm-pits	2·16
Length from the said middle point to anterior end of cloaca	5·34
Length from cloaca to end of tail	3·25
Length of head about	1·30
Breadth of head	1·19
Vertical thickness of head	·53
Vertical thickness of mid-body about	·96
Greatest breadth of body	1·07
Transverse diameter of tail at about its mid-length	·33
Vertical extent of tail at the same place	1·00
Distance between the eyes	·57
Extreme length of pectoral limb	1·27
Extreme length of pelvic limb	1·47
Distance from mid-point between the eyes to the end of the muzzle	·40
Distance between the origins of the pectoral and pelvic limbs of one side	4·51
Distance of the origin of the pectoral limb from the mandibular symphysis	2·12
Distance of the origin of the pectoral limb from the end of the tail	4·07

Proportions.

Length of head compared with its breadth at 100	109·2
Height of head compared with its breadth at 100	44·5
Length of body (from pectoral girdle to cloaca) compared with its breadth at 100	499·0

	inches.
Breadth of mid-tail to its height at 100	33·0
Height of body to length from pelvic girdle to cloaca at 100	17·9
Length of tail to the same	60·8
Length of pectoral limb to the same	23·7
Length of pelvic to the same	27·5

Myology.

As in *Menopoma*, so in *Menobranchus*, the general muscular investment of the body may be divided into four longitudinal portions separated by four more or less marked antero-posteriorly directed lines of demarcation.

Each of the longitudinal muscular masses is more or less clearly divided and cut up by transverse tendinous intersections, which are most marked in the hinder part of the body and the anterior part of the tail.

Of the four lines of demarcation, only the dorsal one is much marked in the trunk. This extends from the mid-cranial region to the end of the tail; and above the caudal portion of it is a mass of fatty bodies which fill up the dorsal caudal fin. A similar mass fills up the ventral caudal fin and the caudal part of the ventral line of demarcation, almost as far forwards as the cloacal aperture. Immediately in front of that aperture, and extending thence forwards to the hinder margin of the pelvis, a very large thick glandular cushion is interposed, separating the longitudinal muscular masses more widely than they are separated in any other part of the body. In front of the pelvis the ventral line of demarcation is formed by the but-little-marked *linea alba*.

The lateral lines of demarcation extend from the throat to the end of the tail; and the anterior end of the furrow widens into the gap, out of which the branchial arches protrude. In the trunk this linear division is situated rather above the middle (vertically) of the side of the body. In the tail it passes along the middle, each dorso-lateral caudal muscular mass being about equal in extent to each ventro-lateral caudal muscular mass.

Each dorso-lateral muscular mass extends from the upper surface of the skull to the distal end of the dorsum of the tail, investing the transverse processes, neural arches, and spines of the vertebræ and ribs, but having no direct connexion with the pectoral and pelvic arches. It is a continuous thick fleshy mass, not differentiated into distinct muscles. Its fibres are all antero-posteriorly directed.

Each ventral portion of the lateral muscular mass (*i. e.* the part between the lateral linear groove and the *linea alba* and the caudal continuation of that part) extends from the urohyal to the end of the ventral portion of the tail, interrupted, however, by the pelvis and by the interposed large glandular cushion behind it.

As in *Menopoma*, the trunk portion of the ventral lateral mass,

but not its caudal portion, consists of distinct muscular layers superimposed.

Muscles of the Trunk.

The *external oblique* (figs. 3, 4, 8, 9 & 10, *Ex. O*). The fibres of this muscle extend obliquely backwards and downwards; and the muscle itself forms a sheet of such fibres, which extends from the lateral furrow nearly to the ventral middle line of the body, and from the shoulder to the pelvis. Towards the tail it seems to unite indistinguishably with the internal oblique.

The *internal oblique*. This (as in *Menopoma*) is the largest muscle of the body, extending, as one may say, from the urohyal to the tail's end. The fasciculi of fibres are rather large and coarse, and extend from one tendinous intersection to another. The direction of the fibres is forwards and downwards. The muscle is partly inserted into the ilium and its rib; but some fibres pass beneath these hard parts, and the muscle is so continued on into the tail. Towards its anterior insertion this muscle appears to fuse with the rectus (which is superficial to it), and to constitute a sterno-hyoid (figs. 4 & 5, *S. H*).

The *transversalis* is a delicate muscular layer, extending from the region of the heart backwards to a little behind the pelvis.

Rectus (fig. 4, *R*). This muscle is very delicate and thin in the abdominal region; towards the pectoral arch and in front of it it is thicker, and covers externally the internal oblique, with which it appears to fuse, when they pass forwards as the sterno-hyoid (figs. 4 & 5, *S. H*) to its insertion into the urohyal. This muscle may be regarded as continued on even to the mandibular symphysis by means of the genio-hyoid (fig. 4, *G. H*).

Retrahentes costarum. The muscular fibres I thus name run backwards on each side of the spine, being applied to the under surfaces of the bodies and transverse processes of the vertebræ. They extend from beneath the head to the pelvic region, but do not go on into the tail.

Muscles of the Head.

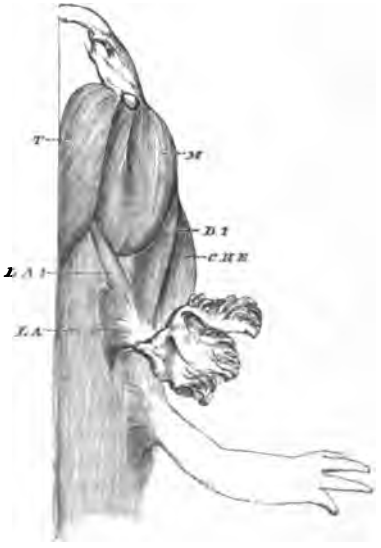
Temporalis (figs. 1, 2, & 3, *T*). This muscle arises from the middle of the upper surface of the skull, and (by fascia) from the first neural spine, also from the dorsum of the pterygoid and of the small bone extending outwards* in front of the suspensorium and above the pterygoid. From this extensive origin (reaching forwards a little in front of the eyeballs) the fibres converge, and are inserted, by a strong tendon, into the summit of the mandible, just in front of its articulation with the quadratum. Its insertion is posterior and somewhat internal to the insertion of the tendon of the masseter.

Pterygoid. I do not find this muscle distinct from the temporal.

* See 'Ontleed en dierkundige Bijdragen tot de Kennis van *Menobranchus*,' by J. Van der Hoeven (Leyden, 1867), pl. ii. fig. 4, *i*.

The two appear to form but one, which arises in part (as has been said) from the dorsum of the pterygoid.

Fig. 1.



Superficial muscles of right side of head and of anterior part of trunk.

C. H. E. Cerato-hyoideus externus. *D.* 1. First part of digastric. *L. A.* Levatores arcuum. *L. A.* 1. Most anterior part of the same. *M.* Masseter. *T.* Temporalis.

The *masseter** (figs. 1, 2, & 3, *M*) is an exceedingly thick muscle, which is more or less divisible into a larger outer portion and a smaller inner part, the fibres being inserted into the tendon (which appears towards the lower part of the muscle) in a somewhat penniform manner. The muscle arises (between the temporal and digastric) from the antero-superior surface of the suspensorium, and is implanted, by its tendon, into the outer side of the mandible towards its upper border and in front of the insertion of the tendon of the temporalis.

The *digastric*† (figs. 1, 2, & 3, *D.* 1 & *D.* 2) is also a considerable muscular mass, and springs from different origins; it is inserted by a strong tendon into the posterior extremity of the mandibular ramus. This strong tendon also connects the dorsal end of the hyoidean cornu with the posterior extremity of the mandible.

The muscle appears to me to consist of two parts. One of these springs from the outer surface of the suspensorium, the origin ex-

* Fischer, 'Anatomische Abhandlungen über die Perennibranchiaten und Cecotremen' (Hamburgh, 1864), p. 59, tab. iii. B. *m*.

† Fischer, *l. c.* p. 50, tab. iii. B. *dg''*.

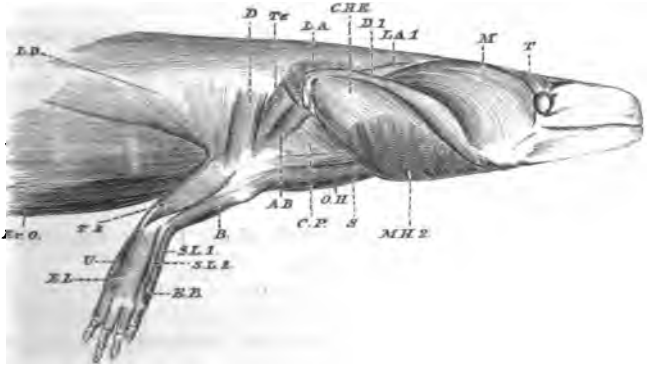
tending from the extreme end of the opisthotic forwards and downwards to the distal end of the quadratum (fig. 2, *D.* 2). This portion is entirely hidden until either the masseter is drawn forwards or the digastric backwards.

Fig. 2.

Deeper muscles of right side of head, the *masseter* being drawn forwards and inwards, the first part of the *digastric* outwards.

C. H. E. Cerato-hyoideus externus. *D.* 1. First part of digastric. *D.* 2. Second part of digastric. *L. A.* Levatores arcuum. *L. A.* 1. Most anterior part of the same. *L. A. P.* Levator arcus primi. *M.* Masseter. *T.* Temporalis.

Fig. 3.



Superficial muscles of right side and of extensor surface of right pectoral limb.

A. B. Adductor branchiarum. *B.* Biceps. *C. P.* Constrictor pharyngis. *C. H. E.* Cerato-hyoideus externus. *D.* Deltoid. *D.* 1. First part of digastric. *E. B.* Extensor brevis. *E. L.* Extensor longus. *Er. O.* External oblique. *L. A.* Levatores arcuum. *L. A.* 1. First part of the same. *L. D.* Latissimus dorsi. *M.* Masseter. *M. H.* 2. Mylo-hyoideus posterior. *O. H.* Omo-hyoid. *S.* Subclavius. *S. L.* 1 & *S. L.* 2. Supinator longus. *T.* Temporalis. *Tr.* Trapezius. *T.* 2. Triceps. *U.* Ulnaris.

The other part of the digastric (figs. 1, 2, & 3, *D.* 1) is larger, and springs from the dorsal end of the first branchial arch (above the attachment of the levator arcus primi), and is inserted behind the first part into the tendon before mentioned.

*Levatores arcuum** (figs. 1, 2, & 3, *L. A*, & *L. A.* 1, also fig. 2, *L. A. P*). These are much developed, and the one going to the first branchial arch is remarkably distinct from the rest. This, the *levator arcus primi* (fig. 2, *L. A. P*), is quite hidden until the digastric is pulled outwards and the anterior part of the dorso-lateral muscular mass inwards towards the middle line. When this is done the *levator arcus primi* is to be seen passing outwards and backwards from the exoccipital and opisthotic to the anterior margin of the first branchial arch, very near its superior extremity.

The *levatores** of the second and third branchial arches arise mainly from the dorsal fascia; but the most anterior part (figs. 1 & 2, *L. A.* 1) seems to be differentiated off from the anterior end of the dorso-lateral muscular mass, and covers, and is similar in direction to, the hidden levator arcus primi. In the figure, between the most anterior part (fig. 1, *L. A.* 1) and the first part of the digastric (fig. 1, *D.* 1) a portion of the anterior end of the dorso-lateral muscular mass is seen to be interposed.

Mylo-hyoideus anterior† (figs. 4 & 5, *M. H.* 1). This muscle is relatively smaller than is its homologue in *Menopoma*. It arises from the inside and lower border of the ramus of the mandible, and unites with its fellow of the opposite side without forming any distinct longitudinal tendinous interval.

The *mylo-hyoideus posterior*‡ (figs. 3, 4, & 5, *M. H.* 2) is a considerable muscle, the postero-inferior part of which is enclosed on both sides by the skin forming a free fold or opercular flap beneath the throat. The muscle arises from the dorsal segments of the hyoidean cornu and first branchial arch, also from the fascia investing externally the voluminous cerato-hyoideus externus. Passing downwards it unites with its fellow of the opposite side, a sort of linea alba marking their junction. At its anterior part this muscle is placed above the mylo-hyoideus anterior, the latter being superficial to it.

I could find no trace of the muscle which I have described in *Menopoma* as the constrictor faucium.

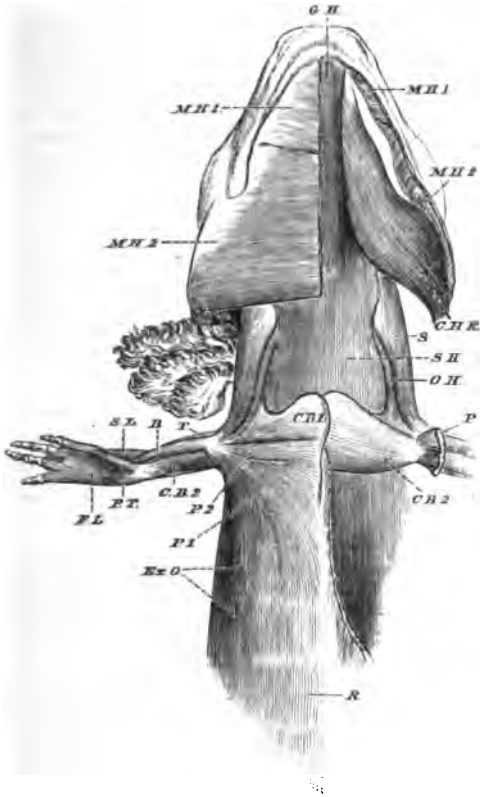
Constrictor pharyngis§. This consists of two parts: one (the *dorso-trachealis*) arises from the fascia external to the dorso-lateral muscular mass behind and beneath the levatores arcuum; the other (the *hyo-trachealis*) springs from the postero-ventral surface of the third branchial arch. The fibres converge and join the fellow muscle of the opposite side beneath the trachea.

The *genio-hyoideus*‖ (fig. 4, *G. H*) is a rather long narrow muscle

* Fischer, *l. c.* p. 81, tab. iii. B. *la*.
† Fischer, *l. c.* p. 41.
‡ Fischer, *l. c.* p. 42.
§ Fischer, *l. c.* p. 89.
‖ Fischer, *l. c.* p. 55.

which runs beside its fellow of the opposite side from its origin, the urohyal, forwards to the mandibular symphysis.

Fig. 4.



Muscles of ventral surface: on the right side superficial muscles; on the left side deeper muscles, the *mylo-hyoidei*, *pectoralis*, and *external oblique* being removed. Also superficial flexor muscles of right pectoral limb.

B. Biceps. *C. B.* 1 & *C. B.* 2. Coraco-brachialis. *C. H. E.* Cerato-hyoideus externus. *Ex. O.* External oblique. *F. L.* Flexor longus. *G. H.* Genio-hyoid. *M. H.* 1 & *M. H.* 2. Mylo-hyoideus. *O. H.* Omo-hyoid. *P.*, *P.* 1, & *P.* 2. Pectoralis. *S.* Subclavius. *S. H.* Sterno-hyoid. *S. L.* Supinator longus. *T.* Triceps.

*Cerato-hyoideus externus** (figs. 1, 2, 3, 4, & 5, *C. H. E.*). A very voluminous muscle, springing from the whole under surface and anterior part of the inner surface of the hyoidean cornu. Passing

* Fischer, *l. c.* p. 68.

backwards, it is inserted into the outside of the dorsal part of the first branchial arch, immediately beneath the insertion of the second part of the digastric.

Fig. 5.

Deepest muscles of left side of ventral surface of head, the *cerato-hyoideus externus* being drawn strongly forwards.

C. A. 1, *C. A.* 2, & *C. A.* 3. Constrictores arcuum. *C. H. E.* Cerato-hyoideus externus. *C. H. I.* Cerato-hyoideus internus. *M. H.* 1 & *M. H.* 2. Mylo-hyoideus. *S. H.* Sterno-hyoid.

Cerato-hyoideus internus * (fig. 5, *C. H. I*). A very much smaller muscle than the last, and, as Fischer says, "spindle-shaped and tendinous at each end." It arises from the inner end of the posterior surface of the hyoidean cornu, and is inserted into the lower end of the dorsal segment of the first branchial arch.

Constrictores arcuum † (fig. 5, *C. A.* 1, *C. A.* 2, and *C. A.* 3). There are three of these small muscles. The first connects the ventral end of the second branchial arch with the dorsal end of the ventral segment of the first branchial arch. The second and largest of the three connects together the ventral ends of the dorsal segments of the first and third branchial arches. The third muscle connects together the ventral ends of the dorsal segments of the second and third branchial arches.

A muscle‡ (figs. 4 & 5, *S. H*), which corresponds to the ***sterno-hyoideus*** of ***Menopoma***, though here there is no sternum, and is in fact the anterior continuation of the rectus, passes forwards and is inserted into the dorsal surface of the urohyal and into the ventral surface of the ventral segment of each first branchial arch, near its junction with the basihyal.

* Fischer, *l. c.* p. 72, tab. i. fig. 4, *pa*.
† Fischer, *l. c.* p. 74, tab. i. fig. 3, *ca* and *ca'*.
‡ Fischer, *l. c.* p. 104.

Omo-hyoideus (figs. 3, 4, & 5, *O. H*). This elongated muscle arises from the inner and upper side of the precoracoid cartilage, and passes thence forwards to between the urohyal and first branchial arch.

*Genio-glossus**. This small muscle arises, on each side, from the posterior surface of the mandibular symphysis, and thence passes outwards and backwards to be inserted into the skin of the mouth.

The *levatores branchiarum*† are small muscles which pass downwards from the dorsum of each branchial arch respectively to the dorsum of each gill-tuft.

The *depressores branchiarum*‡ go from the ventral surface of each branchial arch to the ventral surface of each gill-tuft respectively.

Of the *adductores branchiarum*§, the first goes from the dorsal end of the second branchial arch to the first gill-tuft; the second similarly from the third branchial arch to the second gill-tuft; the third, long and delicate (fig. 3, *A. B*), extends from the angle between the precoracoid and scapular cartilages forwards to the root of the third gill-tuft and dorsal part of the last branchial arch.

Appendicular Muscles.

Pectoral Limb.

Trapezius (fig. 3, *Tz*). This is an exceedingly small muscle, which is placed immediately behind the third adductor branchiarum and levatores arcuum. It arises from the fascia investing the dorsal muscle, and is inserted into the lower half of the anterior margin of the scapula down to its junction with the precoracoidal cartilage.

The *latissimus dorsi* (fig. 3, *L. D*) is more than twice the size of the trapezius. It arises from the fascia, and ends by coalescing with the upper part of the triceps.

The *pectoralis* (fig. 4, *P.* 1 & *P.* 2) is a considerable muscle which arises partly from one of the tendinous intersections of the rectus, partly from a raphe separating it from its fellow of the opposite side, and partly from the under surface of the posterior part of the coracoidal cartilage towards and at its inner margin. It is inserted into the lowest part of the crest of the humerus, immediately above the origin of the biceps. The part arising from the coracoid (*P.* 2) is slightly separated from the larger and more posteriorly arising portion (*P.* 1).

Serratus magnus. This is a thin small muscle springing from the side of the lateral muscular mass beneath the latissimus dorsi. It is inserted into the inner side of the upper part of the scapula.

The *levator anguli scapulæ* is a very long and slender muscle.

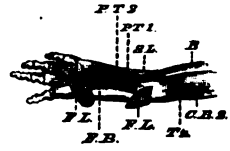
* Fischer, *l. c.* p. 67.
† Fischer, *l. c.* p. 38, and tab. iii. *b*, *lb'*, *lb''*, *lb'''*.
‡ *L. c.* p. 39, and tab. i. fig. 1, *db'*, *db''*, *db'''*.
§ *L. c.* p. 39.

It arises from the occiput, and is inserted into the inner side of the dorsum of the scapula, being conterminous with the insertion of the serratus magnus.

The *omo-hyoid* has been already described amongst the muscles of the head.

Subclavius (fig. 3, *S*). This is an elongated muscle, like the precoracoidal cartilage to which it is attached. It arises from the ventral surface of the last-named cartilage, and is inserted into the upper part of the crest of the humerus, immediately opposite the summit of the biceps and between the insertions of the pectoralis, deltoid, and trapezius.

Fig. 6.



Deeper flexor muscles of right forearm, the *flexor longus* being cut and reflected

B. Biceps. *C.B.*2. Coraco-brachialis. *F.B.* Flexor brevis. *F.L.* Flexor longus. *P.T.*1 & *P.T.*2. Pronator teres. *S.L.* Supinator longus. *Tr.* Triceps.

Coraco-brachialis (figs. 4 & 6, *C.B*). This muscle consists of two parts.

1. The first part arises from the whole ventral surface of the coracoid, partly covered externally by the pectoralis, and partly appearing superficially between the second part of the pectoralis and omo-hyoid. It also arises from the postero-external margin of the coracoid. It is inserted into the humerus, between the implantation of the pectoralis and the origin of the biceps on the one hand, and the upper portion of the second part of the coraco-brachialis on the other.

2. The second portion of the muscle is thick and long. It arises from the posterior margin of the coracoid close behind the glenoid cavity; passing down, it is inserted into the shaft of the humerus to and at the internal condyle.

The *deltoid* (fig. 3, *D*) is a larger muscle than the trapezius. It arises from the outside of the scapula, and is inserted into the crest of the humerus immediately outside and behind the insertion of the subclavius.

Subscapularis. A very few and short muscular fibres, passing from just inside the postero-inferior margin of the scapula (close to the glenoid surface) to the adjacent part of the humerus, appear to represent this muscle. These are, however, difficult to distinguish from the adjacent coracoidal part of the triceps.

Biceps (figs. 3, 4, & 6, *B*). This muscle, which is quite single, springs from the tuberosity of the humerus just below the in-

sertion of the subclavius, and is inserted into the upper part of the radius.

Triceps (figs. 3 & 6, *T*). A large muscle arising from the postero-external angle of the coracoid from the outer and inner sides of the shaft of the humerus, and, by direct continuation, from the latissimus dorsi. It is inserted into the proximal part of the ulna.

Fig. 7.

Deeper muscles of extensor surface of right forearm, the *extensor longus* being cut and reflected.

E. B. Extensor brevis. *E. L.* Extensor longus. *P. Q.* Pronator quadratus. *S. L.* 1 & *S. L.* 2. Supinator longus. *U.* Ulnaris.

The *supinator longus* (figs. 3, 4, 6, & 7, *S. L*) appears to be double (*S. L.* 1, and *S. L.* 2, figs. 3 & 7), unless the more internal part (*S. L.* 2) represents an *extensor radialis*. It arises from about the lower third of the humerus, and is inserted into the lower part of the outer (or radial) side of the radius.

Ulnaris (figs. 3 & 7, *U*). This is a rather bulky muscle passing from the distal part of the ulnar side of the humerus downwards to the corresponding side of the carpus.

The *pronator teres* (figs. 4 & 6, *P. T*) also appears to be double (*P. T.* 1 and *P. T.* 2, fig. 6). Both parts extend from the lower end of the inner (or ulnar) border of the humerus, and extend downwards and outwards to the lower part of the radius.

Extensor longus (figs. 3 & 7, *E. L*). This muscle extends from the outer (or radial) border of the lower part of the humerus, and, expanding as it passes downwards, is inserted into the digits.

Extensor brevis (figs. 3 & 7, *E. B*). This is a very small muscle which arises from the radial side of the distal end of the ulna, and, passing obliquely downwards and outwards, goes mainly, if not exclusively, to the most radial digit.

Pronator quadratus (?) (fig. 7, *P. Q*). A small muscle passing from the ulna to the radius, obliquely downwards, and situated between the ulnaris, the inner part of the supinator longus, and the extensor brevis.

Flexor longus (figs. 4 & 6, *F. L*). This muscle arises from the ulnar side of the lower end of the humerus, and, expanding as it passes downwards, is implanted into the digits.

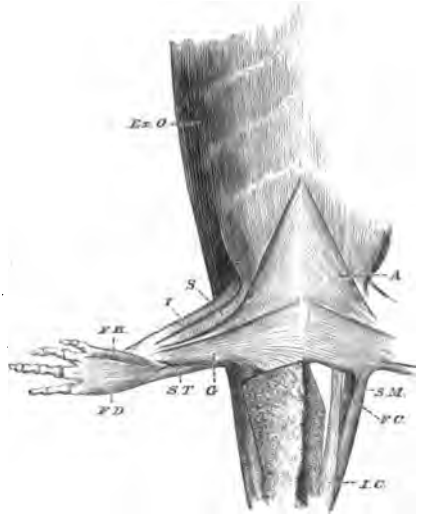
Flexor brevis (fig. 6, *F. B*). A small subtriangular muscle which

also goes to the digits, but which takes origin from the distal half of the ulna.

Pelvic Limb.

Semimembranosus (figs. 8, 9, 10, & 11, *S. M*). This slender muscle springs from the hypapophyses of the caudal vertebræ (the first two that are elongated), and passing forwards, enclosed in a sheath consisting of the subcaudal muscular mass, joins the posterior margin of the gracilis and origin of the semitendinosus. It passes along external to the large precloacal glandular mass, and side by side with similarly directed and similar-sized femoro-caudal and ischio-caudal.

Fig. 8.



Superficial muscles of ventral surface of right side.

A. Adductor. *Ex. O.* External oblique. *F. C.* Femoro-caudal. *F. D.* Flexor digitorum. *F. H.* Flexor hallucis. *G.* Gracilis. *I.* Iliacus. *I. C.* Ischio-caudal. *S.* Sartorius. *S. M.* Semimembranosus. *S. T.* Semitendinosus.

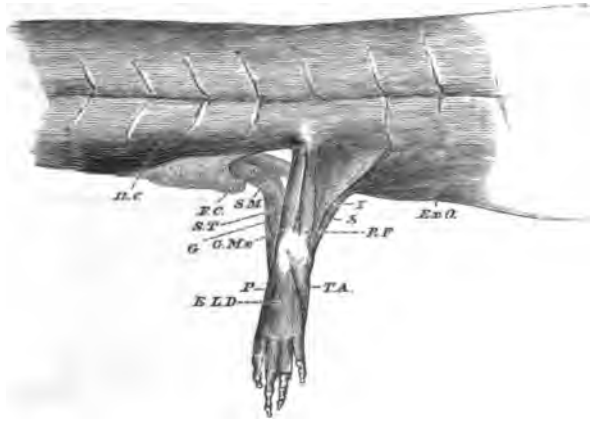
The *ischio-caudal* (figs. 8 & 11, *I. C*) is the most internal of the caudal appendicular muscles. It arises from the subcaudal muscular mass at the same distance backwards as does the semimembranosus; passing forwards, it is inserted into the postero-external angle of the ischium.

Femoro-caudal (figs. 8, 9, 10, & 11, *F. C*). This muscle is about the same size as that last described, and also springs from the anterior caudal hypapophyses. It comes out of the sheath formed for it and the muscles running parallel with it by the subcaudal

muscular mass, and, passing forwards, is inserted into the flexor surface of the femur just below the great trochanter, in close contiguity both to the insertion of the adductor and to the origin of the biceps.

The *ilio-caudal* (figs. 9 & 10, *Il. C*) is exceedingly large relatively, and thick, forming the bulk of the lateral caudal muscular mass below the lateral furrow. It is inserted into the whole length of the ilium and its annexed rib.

Fig. 9.



Superficial muscles of dorsal (extensor) surface of right pelvic limb, and of outer side of posterior part of trunk and anterior part of tail.

E. L. D. Extensor longus digitorum. *Ex. O.* External oblique. *F. C.* Femoro-caudal. *G.* Gracilis. *G. Mx.* Gluteus maximus. *I.* Iliacus. *Il. C.* Ilio-caudal. *P.* Peroneus. *R. F.* Rector femoris. *S.* Sartorius. *S. M.* Semimembranosus. *S. T.* Semitendinosus. *T. A.* Tibialis anticus.

Gracilis (figs. 8, 9, 10, 11, & 12, *G*). This muscle arises from the middle (antero-posterior) line of the ventral surface of the pelvic shield. It does not, however, extend forwards for nearly the whole length of this elongated shield, but only as far forwards as a line would be situated which should join the acetabula. It is inserted into the postero-peroneal surface of the upper half of the tibia.

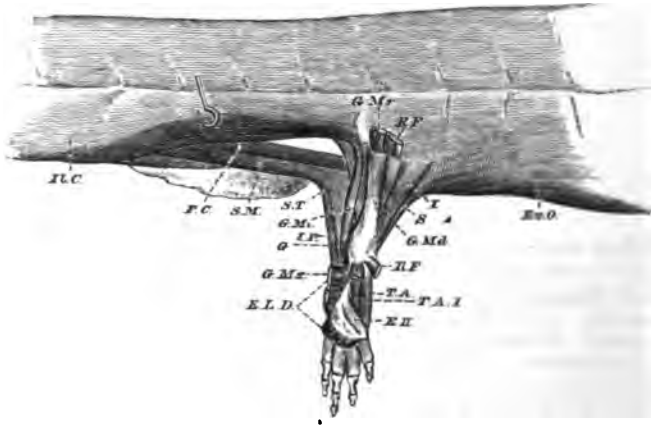
The *adductor* (figs. 8 & 11, *A*) is very much larger than in *Menopoma*, as it springs from the middle of the pelvic shield for its whole length, so that rather more appears superficially in front of the gracilis than is concealed beneath the latter. It is inserted into about the upper half of the flexor surface of the femur between the insertions of the iliacus and femoro-caudal.

Semitendinosus (figs. 8, 9, 10, & 11, *S.T*). This small muscle takes origin from the junction of the semimembranosus with the gracilis, and not from bone or cartilage. Its insertion is the outside of the flexor digitorum, near the pes.

Iliacus (figs. 8, 9, & 10, *I*). Of considerable size, this muscle arises from the internal surface of the antero-exterior margin of the pubic cartilage. It is inserted into the shaft of the femur from the proximal part of its anterior (extensor) surface down to the tibial condyle.

Sartorius (figs. 8, 9, 10, & 11, *S*). A long slender muscle, which I did not distinguish in *Menopoma*, and which I propose thus to name, arises from the fascia attached to the antero-outer margin of the pelvis, into which fascia fibres of the external oblique are inserted, so that this muscle appears like a continuation downwards of that, *i. e.* of the external oblique. Passing downwards along the inner or tibial margin of the iliacus, it is inserted into the inner side of the upper part of the tibia just above and on the inner (or tibial) side of the insertion of the gracilis.

Fig. 10.



Deeper muscles of outer side of hinder part of trunk and anterior part of tail, and of the dorsal (extensor) side of right pelvic limb—the *gluteus maximus*, *rectus femoris*, and *extensor longus digitorum* being cut and reflected.

E. H. Extensor hallucis. *E. L. D.* Extensor longus digitorum. *Ex. O.* External oblique. *F. C.* Femoro-caudal. *G.* Gracilis. *G. Md.* Gluteus medius. *G. Mi.* Gluteus minimus. *G. Mx.* Gluteus maximus. *I.* Iliacus. *I. C.* Ilio-caudal. *I. P.* Ilio-peroneal. *R. F.* Rectus femoris. *S.* Sartorius. *S. M.* Semimembranosus. *S. T.* Semitendinosus. *T. A.* & *T. A.* 1. Tibialis anticus.

Gluteus maximus (figs. 9 & 10, *G. Mx*). This muscle is very like the one so named by me in *Menopoma*, but it is rather more slender. It springs from the outside of the ilium, and, passing downwards, ends in an aponeurosis, which invests the knee anteriorly and passes to the upper part of the front of the tibia.

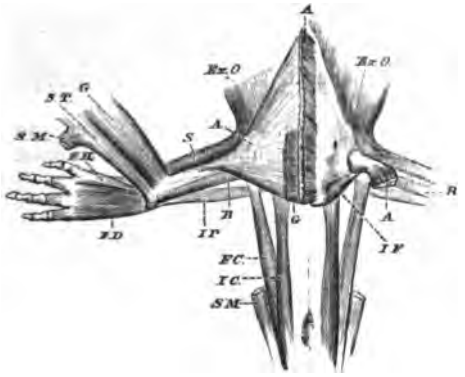
The *rectus femoris* (figs. 9 & 10, *R. F*), very similar in shape

and size to the gluteus maximus. Arising from the outer side of the ilium, it passes down beside the last-named muscle, and is inserted by aponeurosis into the inner side of the upper part of the tibia.

Gluteus medius (?) (fig. 10, *G. Md*). Arising from the front of the ilium, this small muscle passes down beside the iliacus, and is inserted into the upper part of the outer side of the femur.

Gluteus minimus (?) (fig. 10, *G. Mi*). This little muscular bundle passes from the posterior side of the ilium to the upper half of the posterior side of the shaft of the femur.

Fig. 11.



Deeper muscles of ventral or flexor surface of pelvic limbs, the *gracilis*, *semitendinosus*, and *semimembranosus* being cut and reflected on the right side, and the *adductor* also on the left side.

A. Adductor. *B.* Biceps. *Ex. O.* External oblique. *F. C.* Femoro-caudal. *F. D.* Flexor digitorum. *F. H.* Flexor hallucis. *G.* Gracilis. *I. C.* Ischio-caudal. *I. F.* Ischio-femoral. *I. P.* Ilio-peroneal. *S.* Sartorius. *S. M.* Semimembranosus. *S. T.* Semitendinosus.

Ischio-femoral (fig. 11, *I. F*). A very small muscle (which may perhaps answer to the quadratus femoris of higher animals) passes from the postero-external angle of the ischium to the head of the femur very near the acetabulum.

Ilio-peroneal (figs. 10 & 11, *I. P*). A very long and slender muscle arises from the ilium, immediately beneath and closely connected with the gluteus maximus. It is inserted into the peroneal side of the fibula above its middle.

The *biceps* (?) (fig. 11, *B*) is also a very slender muscle. It extends from the shaft of the femur, just below the insertion of the femoro-caudal, downwards to the lower part of the fibula.

Tibialis anticus (figs. 9 & 10', *T. A* and *T. A* 1). This muscle seems to be double in *Menobranchus*. It arises from the front of the distal end of the femur, and from the proximal parts of the tibia

and fibula. It is inserted into the tarsus and lower part of the tibia on the inner side of the leg. The inner portion (*T. A.* 1) is much like the extensor hallucis of *Menopoma* as to its origin, but it does not appear to descend below the shaft of the tibia.

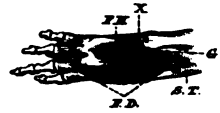
Peroneus (fig. 9, *P*). There is a muscle descending down the outer side of the leg, from the head of the fibula to the tarsus, as in *Menopoma*.

The *extensor longus digitorum* (figs. 9 & 10, *E. L. D*) is a large sheet of muscle covering the front of the leg. It arises by a strong aponeurosis from the front of the distal end of the femur. Passing downwards, it goes to the digits.

Extensor hallucis (?) (fig. 10, *E. H*). A small muscle which I thus name, with doubt and hesitation, takes origin from the lower part of the fibula, and, crossing the limb obliquely, passes to the dorsum of the hallux. Except that this muscle appears only to go to the innermost digit, it has very much the appearance of an extensor brevis digitorum.

Extensor brevis digitorum. This muscle seems to be entirely wanting, unless what I have doubtfully named extensor hallucis be really the extensor brevis.

Fig. 12.



Deepest muscles of ventral or flexor surface of right pelvic limb, the *flexor digitorum* being cut and reflected.

F. D. Flexor digitorum. *F. H.* Flexor hallucis. *G.* Gracilis. *S. T.* Semitendinosus. *X.* Tibialis posticus?

Flexor digitorum (figs. 8, 11, & 12, *F. D*). Subtriangular in shape, this muscle takes origin from the posterior surface of the peroneal condyle of the femur; thence expanding as it descends, it goes to the digits.

Flexor hallucis (figs. 8 & 12, *F. H*). Beneath the muscle last described is a muscle which arises from the posterior surface of the fibula and goes mainly, if not entirely, to the most tibial digit.

On the peroneal border of this muscle, between it and the flexor digitorum, a delicate bundle of muscular fibres passes downwards (fig. 12, *X*) to the carpus. It is entirely hidden by the flexor digitorum, so as to be only visible on the removal or reflection of the latter. Is this delicate muscle the representative of the tibialis posticus?

November 11th, 1869.

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

The Secretary read the list of additions to the Menagerie during the past four months, amongst which were particularly noticed:—

1. A Guacharo, or Oil-bird (*Steatornis caripensis*), taken from one of the caves inhabited by these birds in Trinidad, and presented to the Society by the Hon. Arthur Gordon, C.M.Z.S., Governor of the Island (received June 29th). Mr. Gordon had started from Trinidad with six of these singular birds alive; but five of them had died upon the passage, and the present specimen had only survived a few days after reaching the Society's Gardens. Enough had been done, however, to show that it was quite possible, with care and precaution, to bring the Guacharo alive to this country.

2. An example of a species of Macaque Monkey from the Anda-

Macacus andamanensis.

man Islands, obtained at Port Blair, in 1864, by Capt. R. A. Brown, R.N., of H.M.S. 'Vigilant,' and presented to the Society July 8th. This Macaque appeared to resemble most nearly the Pig-tailed Macaque (*Macacus nemestrinus*), and had a somewhat similar tail, but appeared distinguishable by the different arrangement of the hairs on the head. In a notice of the habits of this Monkey in 'Land and Water' for July 24th, 1869, Mr. Bartlett had proposed to call it *M. andamanensis*, which name would stand, if the validity of the species were confirmed by future investigations.

3. A specimen of the Kusimanse, or Mangue (*Crossarchus obscurus*), purchased July 8th, a rare West-African Carnivore, which had not been exhibited in the Society's Menagerie since the year 1834*.

4. Six Amherst's Pheasants (*Thaumalea amherstiæ*), deposited by Mr. J. J. Stone, F.Z.S., July 16th.

After many unavailing efforts, Mr. Stone had succeeded in adding this magnificent Pheasant to the list of introduced species. Unfortunately, only one female survived to reach this country,—the rest being males, adult or in change of plumage. The female of the Amherst's Pheasant was previously unknown, but turned out, as might have been anticipated, to resemble nearly the corresponding sex in the Gold Pheasant (*Thaumalea picta*). Mr. Stone had received these birds from his correspondent in Hankow; but Mr. Sclater had been informed by Mr. Swinhoe that they had been originally obtained for him by a French missionary priest resident at Ta-kien-lieou, at the foot of the Yung-ling mountains, in the further part of the province of Setchuen. The range of this bird was thus proved to extend from the Burmese frontier of Yunan (where it was obtained by Dr. Anderson†) into the province of Setchuen.

5. An Owen's Apteryx (*Apteryx owenni*), presented by the Acclimatization Society of Otago, New Zealand, and received July 28th, being the first example of this species received alive in Europe.

6. A White-bellied Stork (*Ciconia abdimii*), obtained by purchase July 29th, being the first example of this rare species exhibited alive in the Society's Menagerie.

7. A young pair of the recently discovered Long-tailed Deer of Northern China (*Elaphurus davidianus*), presented to the Society by H.E. Sir Rutherford Alcock, K.C.B., H.B.M. Ambassador at the Court of Pekin.

The expected arrival of a pair of this remarkable animal had already been announced (P. Z. S. 1868, pp. 210, 530). A coloured figure of them and complete account would be given in a paper on the Deer living in the Society's Gardens, which was now being prepared for publication in the Society's 'Transactions.'

8. A Pleurodele Newt (*Pleurodeles waltl*), obtained in the vicinity of Seville in Spain, and presented to the Society by Lord Lilford, F.Z.S., August 13th.

* See Mr. Martin's notice of the dissection of a specimen of this animal, P. Z. S. 1834. p. 113.

† See Dr. Anderson's letters, *antè*, pp. 111 et 278.

9. A specimen of the Potto (*Perodicticus potto*), purchased September 4th.

Perodicticus potto.

This rare Lemurine form had only been once before exhibited in the Society's Gardens, in 1848*.

10. A fine young male of the Spanish Ibex (*Capra hispanica*), from the Sierra Hermosura, in Southern Spain, presented to the Society by Major Howard Irby, of the 74th Highlanders, September 4th. Unfortunately, the female of this species from the same locality, presented by the same generous donor in August 1868†, had died; but several correspondents of the Society were on the look out for examples of this animal, so that there were fair prospects of its becoming ultimately a permanent denizen of the Society's Gardens.

11. Three Island-Hen Gallinules, from Tristan d'Acunha (*Gallinula nesiotis*, Sclater, P. Z. S. 1861, p. 260, pl. xxx.), presented by E. L. Layard, Esq., F.Z.S., September 3rd.

12. A superb Crested Eagle (*Spizaëtus ornatus*), from Costa Rica, presented by Capt. J. M. Dow, F.Z.S., and received September 27th, being the second example of this fine bird of prey exhibited in the Society's Gardens.

* See Report of the Council for 1849, p. 15. *Cf.* also Mr. Skues's notes, *antè*, p. 1.

† See P. Z. S. 1868, p. 526.

The following extracts were read from a letter addressed to Mr. Grote, F.Z.S., by Dr. J. Anderson, C.M.Z.S., dated Indian Museum, Calcutta, June 11th, 1869:—

"I dare say you will remember that I made various futile attempts while you were in Calcutta to procure living specimens of the Pigmy Hog of the Terai (*Porcula salvania*). On these occasions I trusted to the kind promises of some of my friends in the neighbourhood of Darjeeling; but as they all failed in their uneducated endeavours, I sent my own collectors last March to the Terai to try what they could do. I am glad to say they have been successful, and I have now a fine specimen of this remarkable little Hog before me while I write. It is a young male, but the natives assert that it is nearly full-grown. It measures 19 inches along the side, from the tip of the snout to the vent, and the tail is 21 lines in length. Jerdon is in error when he says that it has no mane; for my specimen has a marked list of long black hairs down the back, intermixed with yellowish-brown hairs, and with others banded with the latter colour and black. The hairs over the rump are longer than in any other part of the body. The sides are sparsely covered with bright yellow-brown hairs, and with others banded like those on the dorsum. The mesial line of the ventral surface, from between the fore legs to the vent, is almost nude, with only a few short yellow hairs. The legs are very graceful, and suggest that this elegant little creature must test the running-qualities of the dogs. The ears are full and round. The snout is moderately long, but not so tapering as in the common Boar. Mr. Southby, of the Selim Tea-Estate, under whose care my collectors were, informs me that *Porcula salvania* is common in the Terai below Punkahlarri, and is found in herds of 500 in the low jungle. The natives inform him that its food consists of bulbs and roots; and that the female carries her brood, which usually numbers three or four, for five or six months. It is very shy, and the Meehies trap it with nets and hunt it with dogs. A village will catch as many as four or five in a season, which they reckon from January to April; and when caught young it becomes easily domesticated, and is found tame about the villages. These wild people consider its flesh a great delicacy.

"I have also been trying hard to get skins, skeletons, and living specimens of the Yākin (*Budorcas taxicolor*). I have within the last month received two very fine skins of half-grown males, with small straight horns directed backwards. The Mishnees brought one of the specimens alive nearly as far as Debrooghur. This was in answer to the reward I had offered of one hundred rupees for a living specimen. I am afraid I shall not succeed in getting the beast alive to the plains, as it lives among the snow, being seldom seen below it. Major Stewart informs me that the Yākin is found in all the high ranges to the north-east of Debrooghur, and is far from uncommon. The Mishnees, with their very inferior appliances to shoot and catch them, are nevertheless frequently dressed in their skins, or have a part of a skin with the hair on as an ornament, which would seem to indicate that they are numerous. The Mish-

nees between the Brahmapootra and the Dihong say that the full-grown ones are so fierce that it would be impossible to bring them alive to Debrooghur. They are seen in pairs, and sometimes in herds of twenty or more. They are swift of foot and good climbers. Why Jerdon should have excluded this interesting animal from the Indian fauna is a puzzle to me; for it is quite as Himalayan as the Brown Bear and the Musk-deer, both of which are included in his book."

The following extracts were read from a letter addressed to the Secretary by Dr. George Bennett, F.Z.S., dated Sydney, June 15th, 1869:—

"The Government steamer 'Thetis' having been sent to Lord Howe's Island to investigate a case of homicide, among other gentlemen interested in natural history, Mr. R. D. Fitzgerald, of the Surveyor-General's department, obtained leave to visit the island. To this gentleman I am indebted for the following information, more especially for the interesting account of the habits of the 'Wood-hen,' a species of Rail now becoming rapidly extinct, peculiar to Lord Howe's Island. The 'Thetis' left Sydney on the 26th of May, arrived on the 29th, and returned to Sydney on the 7th of June, 1869. The island is situated in lat. 31° 30′ S., and long. 159° E. It is sixteen miles in circumference, 6½ miles in length, and averages about half a mile in width. The inhabitants are about thirty-five, including children. The produce of the island is maize, onions, potatoes, and bananas; the soil is rich, and the vegetation very luxuriant, among which palms, tree ferns, and the banyan fig are most conspicuous. Pigs and Goats run wild on the island, the former feeding principally upon the fruit of the palms.

"Among the birds collected by Mr. Fitzgerald, I recognized specimens of *Merula vinitincta*, *Zosterops strenuus*, *Chalcophaps chrysochlora*, and *Pachycephala gutturalis*. The most interesting bird procured, and of which only one was obtained, was the 'Wood-hen.' I recollect that in the year 1836 or 1837 the late Alexander Macleay, then Colonial Secretary of New South Wales, had several of these birds alive, which had been brought to him from Lord Howe's Island; and he at that time expressed an intention of sending them to the Linnean and Zoological Societies, but I am not aware whether they ever reached their destination. The White Gallinule, figured in Phillips's 'Voyage to Botany Bay,' and found only in Norfolk and Lord Howe's Islands, is now extinct, as it is not seen at either of those islands. Mr. Fitzgerald, in the account he gave me, says, 'The land birds are not numerous, probably not more than of twelve or thirteen distinct species. I observed:—a little Green Pigeon; a Blackbird, having leaf-tossing habits and call-notes of that class of birds; a *Zosterops*, or Silver-eye (of larger size than the species common about Sydney); a *Pachycephala*, or Thick-head, having the colonial appellation of "Doctor;" a *Rhipidura*, or Fly-catcher (similar to our Sydney species); a little *Acanthiza*; and a *Pachycephala* with black and yellow plumage, seemingly identical with *P. gutturalis*; a species of Kingfisher; a Crow-Shrike (*Strepera*

graculina?), and the "Wood-hen." The last-named bird reminded me of a "Corn-crake." It is said that there was formerly a large Pigeon on the island, now extinct. A Red-tailed Tropic Bird (*Phaëton phœnicurus*) was procured; but the oceanic birds, as far as noticed, were the same as those usually inhabiting the Australian seas. The "Wood-hen" is very peculiar in its habits, and the observations I made are as follows:—When ascending the mountain the guide stopped suddenly, as a note like two rasps of a saw was heard at some distance among the loose stones and ferns, and exclaimed "That is a Wood-hen." He then imitated the note of the bird, and the Wood-hen replied. He again tried the imitation, but the bird was silent. Another guide accompanying us then struck the back of the tomahawk against a tree; again the bird answered; further strokes of the tomahawk were useless, no reply could be obtained. Then a dog was made to bark, and with effect; the call of the bird was again heard, and again and again as often as the sounds were made and varied. At each time it was apparent that the bird was approaching nearer and nearer to our position, until the bird ran out, apparently quite confused and bewildered, close to our feet. The dog that accompanied us, and which had been kept back, was then set at liberty; he seized the bird and immediately killed it; otherwise it might have been captured alive. It was mentioned that had the dog been kept back and stones thrown at the bird, it would, on being merely grazed by one, retreat but show itself again immediately. It appears that the noise made to attract the bird must be constantly varied, one continuous sound having no effect; chorus or scraps of songs, crowing of a cock, or any other noise with which the "Wood-hen" is unacquainted will attract its attention and draw the bird towards you; and the guide stated that even if a gun was fired all the "Wood-hens" within hearing would show themselves. This being so, no wonder they are becoming scarce, and will, no doubt, be soon extinct.' "

In reference to this letter, Mr. P. L. Sclater exhibited a stuffed specimen of the so-called "Wood-hen," which had been mounted from an example in spirits transmitted by Dr. Bennett to the Royal College of Surgeons. Mr. Sclater stated that, as suggested in the letter, the bird was evidently a Rail of the genus *Ocydromus*, but apparently of a new species, for which he proposed the name

OCYDROMUS SYLVESTRIS, sp. nov. (Plate XXXV.)

Oleagineo-fuscus fere unicolor, subtus vix dilutior, capitis lateribus et gutture cineraceo paulum lavatis: remigibus rufis nigro anguste transfasciatis: rostro et pedibus obscure corneis: long. tota 11·0, *alæ* 5·2, *caudæ* 2·2, *rostri a rictu* 2·0, *tarsi* 2·0.

Hab. in insula "Lord Howe" dicta, maris Australiani.

Remarks.—This *Ocydromus* is readily distinguishable from *O. australis* and *O. earlei* of New Zealand by its small size, and by the rufous colour of the wings, which are narrowly banded across with black. Besides the New-Zealand species, the only other member of this genus known to me is the *O. lafresnayanus* of New Caledonia,

of which a fine living example is now in the Society's Gardens, presented by Dr. Bennett on the 10th of June last*. The last-named species appears to want entirely the rufous colour which ornaments the wings of the present bird and is also slightly apparent in *O. australis*.

The Secretary read the following extract from a letter addressed to him by Mr. Morton Allport, F.Z.S., dated Hobart Town, 10th of August, 1869:—

"The experiment now going on for the introduction of Salmon to the rivers of this colony has elicited one important scientific fact, which may be worth recording in the 'Proceedings of the Zoological Society.'

"Amongst the last shipment, which left Plymouth on the 8th of February, 1866, were 15,000 ova of Salmon Trout (*Salmo trutta*), of which a fair percentage hatched. The bulk of the fry were permitted to follow their natural instinct, and proceeded to sea on their reaching the smolt stage; but the Tasmanian Salmon Commissioners retained a few in a suitable pond having gravelly rapids adapted for spawning-ground attached. Twelve of these fish attained weights varying from ¾ lb. to 1½ lb.; and during the end of June and beginning of July last four pairs formed rids and deposited spawn, in which the embryo fish are now distinctly visible."

Mr. John W. Clark exhibited, and made remarks upon, some well-mounted and nearly perfect skeletons of the extinct Didine birds *Didus ineptus* of Mauritius and *Pezophaps solitaria* of Rodriguez, belonging to the Cambridge University Museum.

Mr. Edwin Ward exhibited a specimen of a variety of the common Woodcock (*Scolopax rusticula*), in which the head was nearly black, and the back and breast mottled with the same colour. The specimen was shot at Cromer, in Norfolk, and was stated to be the property of Mr. W. L. Barclay.

Mr. T. J. Quelch exhibited a specimen of a supposed hybrid fish of the genus *Rhombus*, and made the following remarks upon it:—

"This fish, for which at present there is no name, is caught on the Dutch coast, and, so far as I know, only in the spring time, when the trawlers from Hull and Grimsby commence fishing. It must be very scarce; for during the space of twenty years, in which time hundreds of thousands of Turbots and Brills have passed under my notice, I have not seen more than six or seven of this description, out of which I have secured the one exhibited, two for the Museum, one for Mr. Buckland, and one for Mr. Jonathan Couch.

"It resembles the Turbot in shape, but the head is like the Brill. It has neither the spiny protuberances of the Turbot nor the scales of the Brill, but is thickly covered with small horny plates, a sort of

* See P. Z. S. *antea*, p. 431.

compromise between the two. From all these circumstances I conclude it to be a hybrid between the Turbot (*Rhombus maximus*) and Brill (*R. lævis*), and as such I submit it to your judgment.

"This specimen is a male, and had the milt well developed; the one Mr. Buckland has is a female, and the ova were in a similar condition."

The following papers were read:—

1. On the Anatomy of the Proteles, *Proteles cristatus* (Sparrman). By WILLIAM HENRY FLOWER, F.R.S., F.Z.S., Hunterian Professor of Comparative Anatomy, and Conservator of the Museum, Royal College of Surgeons of England.

(Plate XXXVI.)

The first published indication of the existence of this very remarkable animal is contained in Sparrman's travels; but as his account of it has been overlooked by most subsequent writers, I will quote it in full:—

"An animal of the height of eighteen inches was known to the farmers here [Agter Bruntjes Hoogte, up the Klein Visch River] by the name of the *grey jackal*, as it approaches pretty near the common jackal in size, as well as in the shape of its head and body; but, to judge from the teeth alone, as far as I can recollect them at present, the grey jackal seems rather to bear the characteristic marks by which the *viverra*, or weasel kind, is distinguished in the 'System of Nature,' edit. xii.

"The hair with which the grey jackal was covered was a mixture of light grey and black; so that this creature was of a darkish ash-colour all over, excepting towards the tip of the tail, which for the length of three inches was quite black; it was besides pretty bushy, and reached down to the animal's heels. The hairs, indeed, over the whole body were pretty long and soft, but on the back they were about twice as long as in the other parts, so that they appeared to form a brush or comb; for which reason this animal may for the present be called the *viverra cristata*. I say *for the present*, as well on account that the stuffed skin of this creature was stolen out of my waggon by some hounds with which we had been out a hunting, before I had time to draw up a more accurate description of it, as likewise because it is very difficult as yet to define the genera belonging to the order of *feræ*. I made a drawing of the grey jackal's liver, and on going to examine it with this view, I found it divided in a singular manner. The right lung had four lobes, and the left three. The stomach had nothing but ants in it, or, to speak more properly, the white *termites* before mentioned; yet, that it may not be supposed from this circumstance that the animal here spoken of belongs to the genus of the *Myrmecophaga* of Linnæus, it may be proper to mention here that the character of this genus is

total want of teeth, and that, exclusively of our Swedish bears, the Hottentots themselves are likewise very fond of this food" *.

Subsequently M. Delalande brought three specimens from South Africa to the Paris Museum. These, after receiving some preliminary notices from both G. and F. Cuvier and Desmarest, formed the subject of a detailed descriptive and illustrated memoir by M. Isidore Geoffroy St.-Hilaire†, in which the animal is distinctly characterized, and named *Proteles lalandii*, the author having apparently been unacquainted with Sparrman's previous notice‡.

Although Isidore Geoffroy recognized the position of the animal as belonging to a genus distinct from, but allied to, *Hyæna*, and although Cuvier had previously called it provisionally a "*Genette hyénoïde*" §, De Blainville, in describing and figuring its skeleton in his great work on Osteology, places it among the *Canidæ*, treating it as if it only formed a subsection of the genus *Canis*, and endeavours to justify this position by its osteological characters.

In my remarks on the value of the cranial characters in the classification of the Carnivora, laid before the Society last January, I endeavoured to show that, as far as the cranial characters alone can indicate, its true position is intermediate between two groups, which I regard as nearly related, viz. the *Hyænidæ* and the *Viverridæ*, and that it is rather with the Herpestine section of the latter family that its relationship lies.

Proteles has hitherto been known only by the skin, skeleton, and dentition, no anatomist having had an opportunity of examining any other portion of its organization.

The arrival in the Society's Gardens early in the present year of three fine specimens, shipped from Port Elizabeth, and the subsequent death of one of them (on June 13th), has enabled me to supply some of the information that has been until now so great a desideratum.

External Characters.

The animal was a male and fully adult (see Plate XXXVII.). Its length, from the tip of the nose to the end of the hair on the tail, was 3′ 4″, from the tip of the nose to the root of the tail 2′ 3″, the length of the tail, without the hair, 10″; the length of the head 6″·2; the greatest width of the head at the zygomata 3″·6; from the shoulder-joint to the elbow 6″, from the elbow to the wrist 6½″, from the wrist to the tip of the middle claw 5½″, from the hip-joint

* A Voyage to the Cape of Good Hope &c., from the Year 1772 to 1776, by Andrew Sparrman, M.D. Translated from the Swedish original. London, 1786. Vol. ii. p. 177.

† Mémoires du Muséum d'Histoire Naturelle, tome xi. 1824, p. 354.

‡ M. St.-Hilaire gives the following explanation of the signification of the generic name which he gave to this animal:—"De προ, devant, et de τελήεις, parfait, complet. Je prends ici ce dernier mot comme équivalent de *pentadactyle*." "Le nom rappellera que les pieds antérieurs du nouvel animal sont complets, quant au nombre des doigts, par opposition avec ceux de la hyène qui ne sont que tétradactyles" (*loc. cit.* p. 355).

§ Ossemens Fossiles, t. iv. p. 388 (1823).

to the knee 5¾″, from the knee to the ankle 6¼″, from the heel to the tip of the middle claw 6½″.

The head is very broad and depressed posteriorly. It suddenly contracts in front of the eyes into a depressed, rather broad, and obtusely pointed muzzle, rather dilated laterally in front of its posterior constriction, and obliquely truncated at the apex from below upwards. The "muffle" is covered with a naked, black, and finely tuberculated skin. The nostrils are quite lateral, in the form of a longitudinal buttonhole-like slit, ·5″ long, with the anterior end rounded, dilated, and turning upwards. They are ·5″ apart in front, and ·9″ posteriorly.

On the under surface of the muffle is a longitudinal median groove, continued through the upper lip. The whole of the muzzle, or that part of the face in front of the eyes, is covered with a soft, dark brown or blackish, almost naked skin, having only very minute, delicate, light-coloured downy hairs, with a few scattered longer (·3″ to ·4″) hairs on the upper lip, and on each side seven or eight stout black vibrissæ or whiskers, the longest of which are 3½″. The lower lip and chin are also clothed only with soft downy hair, and a few scattered longer hairs in front. The true hairy covering of the skin commences a little in front of a line drawn through the angle of the mouth and the anterior angle of the eye, though the comparative nakedness of the muzzle extends on each side quite up to the eyes. There are a few slender black vibrissæ above the anterior corner of the eye, a single stout one an inch behind the angle of the mouth, and a group of three or four close to the middle line below, between the rami of the jaws, on a level with the angle of the mouth.

The distance from the tip of the nose to the anterior angle of the eye is 2″·7; the length of the orifice of the lids is ·8″; from the tip of the nose to the angle of the mouth 2″·6.

The edges of the eyelids are of the same dusky colour as the muzzle. The upper lid has a row of fine black cilia ·3″ in length. There are none on the lower lid. There is a well-developed nictitating membrane, white, with a dusky edge. The iris is dark brown; the pupil appeared to be nearly circular; the diameter of the cornea is ·6″. The axis of the eye is directed nearly forwards.

The ears are large, erect, and pointed; their external surface is of a dusky purplish-brown colour, and but sparingly covered with hair, except at the edges, where short, light brown hair grows more abundantly, but there is nothing like a tuft or pencil at the end. The inner surface of the pinna is white, naked at the central parts, and but thinly clothed with hair at the sides and towards the tip. The anterior edge is nearly straight and flattened outwards. The hinder edge is produced near the base into a slight "lobule," with a hollow to its inner side, separated from the "concha," or main concavity of the pinna, by a well-marked ridge. There is no distinct tragus. In the deep part of the hollow of the pinna, close to its base, are two small transverse corrugated folds. The length of the pinna is 4″·2, its greatest breadth 2″·3.

The animal appears to be perfectly digitigrade. All the feet have strong, blunt, subcompressed, non-retractile, slightly curved claws.

The fore foot has five toes: the third and fourth nearly equal in length; the second and fifth slightly shorter and equal; the first, or pollex, very much shorter, its claw being midway between the wrist-joint and the claws of the other toes. The hind foot has only four, subequal toes: the fourth slightly the longest; the third almost equal to it; the second and the fifth also nearly equal, but the second slightly the shorter of the two. Each foot has a single palmar or plantar naked pad, and one pad to each toe.

The fur generally consists of a thick, soft, woolly, rather long and loose, wavy under-fur, interspersed with sparsely scattered straight stiff hairs, which project beyond the others. There are fewest of these on the under surface, and they increase in relative number above. In a broad band along the back, extending from the occiput to the root of the tail, these stiffer hairs are elongated into a crest or mane, which falls over to one or the other side when the animal is quiescent, but can be erected when it is irritated. This crest is longest on the neck and shoulders, where the individual hairs attain the length of 8″.

On the face and cheeks the hair is short and stiff, gradually lengthening and becoming softer in passing backwards to the neck; on the throat it is soft and short; on the feet, below the wrists and hocks, the hair is comparatively short, stiff, and adpressed. The upper surface of the toes is thickly covered, the hair reaching to near the middle of the claws. The upper and under surface of the webs between the toes are nearly naked; but their edges are fringed with long stiff hairs, which project between the naked pads of the toes.

The hair is worn off from a small rounded patch in front of each wrist-joint, as if the animal were in the habit of going on its "knees" *. There is also a rounded bare patch, ·3″ in diameter, on the under surface of each heel; this appears normal and not worn. The rest of the hinder part of the tarso-metatarsal region is covered with hair as far as the plantar pad.

The tail is covered with long, stiff, bristly hair; that on the upper surface longest (5″) and forming a kind of crest, so that the whole tail appears compressed from side to side. The crest of the back is not quite continuous with that of the tail, as the long stiff hairs are almost wanting at the root of the tail.

The general ground-colour of the woolly fur all over the animal is a pale yellowish or reddish brown. The throat is paler, almost white. The chest, abdomen, and limbs are of a brighter or redder tint. The upper parts, from the greater admixture of the long stiff hairs, have a greyish hue, these hairs being yellowish white, with more or less of the tip black. Where they are very long, as in the mane and tail, besides a considerable portion of the tip being black, there is also a broad dark band across the hair, and in the extremely long hairs of the shoulders there are two bands. The greater part of the tail and the free edge of the mane is thus quite black.

* Mr. Bartlett informs me that this is the habit both of *Proteles* and the Hyænas, especially when fighting. He attributes it, at least in the case of the Hyænas, to an instinctive dread lest their feet should be seized and crushed by the powerful jaws of their adversary.

The upper part of the head is dark grey. The dorsal surface of the fore feet is dark brown; the posterior, or palmar, surface pale yellowish brown. The anterior, or dorsal, surface of the hind feet is pale brown, mottled or irregularly banded with dark, and becoming quite dark at the toes. The hair on the posterior surface of the feet is pale, that on the edges of the webs of the toes very dark.

Besides the general colour of the woolly hair mentioned above, there are certain conspicuous black bands or stripes, arranged as follows:—An oval longitudinal spot on the side of the neck; three nearly vertical bands on the shoulder, of which the hinder one is much the longest; some irregular bands across the outer side of the forearm; three vertical bands on the flank, of which the most posterior is the shortest; a long band across the upper part of the thigh, inclining obliquely downwards and forwards, from the rump to the knee; and some irregular bands on the outside of the thigh and leg.

The general resemblance of the animal externally to a small Striped Hyæna has often been noticed, and is well exemplified in the living specimens in the Society's Gardens. It should be remarked that there is a considerable variation in the tone of the colour of the different individuals in the collection, the one which was first received being much lighter or greyer generally, and having the dark bands much less distinctly marked, than the specimen which is the subject of the present notice.

Brain.

The brain, generally speaking, is broad and rather depressed. Its form and proportions, and the disposition of its surface-markings, are shown in the accompanying figures (figs. 1, 2, 3, and 4, pp. 480, 481).

The olfactory lobes are large. The corpora albicantia were quite distinct from each other posteriorly, though blended in front. I observed nothing in the base of the brain or in the form of the cerebellum or medulla oblongata notably different from those parts in other Carnivora.

The most characteristic portion of the brain, the cerebral hemispheres, requires more attention. The length of each hemisphere before hardening in spirit was exactly 2″; the greatest breadth of the pair 1·8″. Seen from above they form a broad oval, rounded at each end, slightly broader behind than in front. They are rather flattened above. The convolutions are simple, and clearly marked by deep sulci, with very few secondary furrows.

The Sylvian fissure (fig. 2, *S*) on the outside of the hemisphere, rather in front of the middle, is well marked, and runs upwards and backwards for a distance of a little more than half an inch, its superior extremity being slightly inclined forwards. As is usual among the Carnivora, the convolutions or gyri are arranged in a series of arches around and above this fissure.

There are three such gyri. The first, or lowest (*i i*), commences in the frontal lobe, above the supraorbital fissure (*O*), in common with the next; it ascends to the top of the Sylvian fissure, bends

ht angle, and then descends to the temporal lobe,
ng twice the breadth of the anterior, and in-
re parallel to the Sylvian.
yrus (*m m*), surrounds the last in the
g in the frontal and ending in the
At its posterior superior angle it
ort sulcus, which runs upwards
of the main sulcus separating

s) may be considered to commence
whence it extends along the upper part
ed within by the great longitudinal fissure,
extremity. Anteriorly it is broad, and is sharply
a sigmoid manner,—first winding round the supra-
s (*O*), and then round the crucial sulcus (*C*), which runs
irectly outwards from the great longitudinal fissure for the
ance of half an inch, very near the anterior end of the hemisphere.
On the inner surface of the hemisphere (fig. 4) the superior gyrus is seen to extend completely round the border, bounded below by the calloso-marginal sulcus, and interrupted near the front by the crucial sulcus. It terminates by joining the middle external sulcus at the posterior apex of the hemisphere. It has several indentations on its surface, notably a longitudinal one near its hinder end.

On the inner surface of the hemisphere, below the calloso-marginal sulcus, is the "internal" gyrus of Leuret (fig. 4, *h h*), which surrounds the corpus callosum, and may be traced backwards and downwards, around the great opening through which the crus passes into the hemisphere to form the great prominence of the temporal lobe. As the sulcus on the concave side of the lower part of this gyrus forms the hippocampus major, it may be called the hippocampal gyrus.

There are thus four distinct gyri—an inferior, middle, and superior external, and an internal or hippocampal gyrus.

I am not aware of any published description or figure of the brain of *Hyæna*; but a specimen is preserved in the Museum of the Royal College of Surgeons, the species, unfortunately, not recorded. This brain has the gyri and sulci of the cerebral hemisphere arranged on exactly the same plan as those of *Proteles*; but being a larger brain, the secondary sulci are rather more marked. The whole brain is rounder in form, both breadth and height being greater proportionally to length than in *Proteles*, and consequently the three external gyri make higher and shorter arches.

The cerebral convolutions of the *Felidæ* are also arranged on the same pattern, but are rather more complex†. On the other hand,

* Leuret determines this portion of the brain-surface as a distinct (supra-orbital) gyrus.

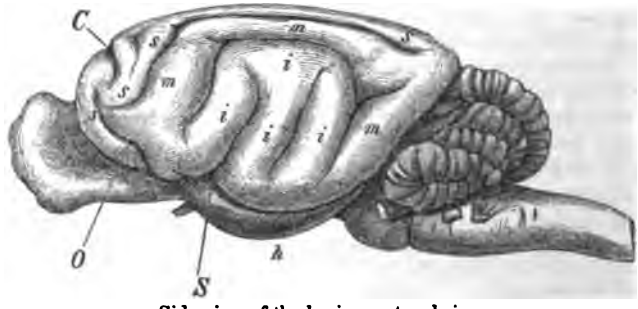
† The uniform character of the cerebral convolutions in various species of *Felidæ* was pointed out by Owen ("On the Anatomy of the Cheetah," T. Z. S. vol. i. p. 133). Much valuable information and some excellent figures of the brains of the Carnivora are contained in Leuret's 'Anat. Comp. du Système Nerveux,' vol. i.

Fig. 1.

Upper urface of the brain; natural size.

C. Crucial sulcus. *i.* Inferior external gyrus. *m.* Middle external gyrus. *s.* Superior external gyrus.

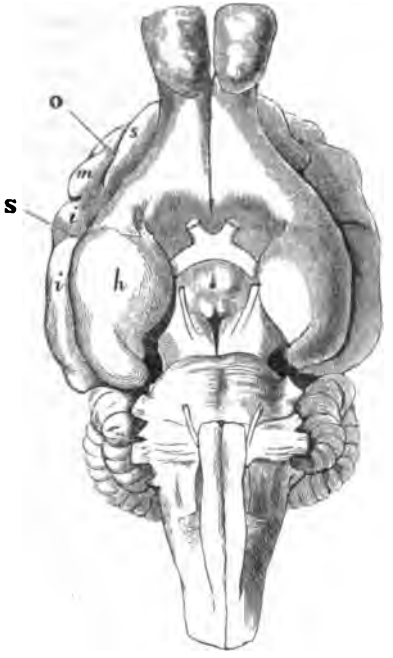
Fig. 2.



Side view of the brain; natural size.

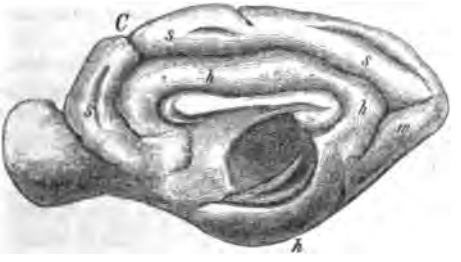
those of the *Viverridæ* present another variation of the same pattern in the direction of simplicity. For working out all the modifications of the brain-convolutions of the Carnivora, a larger number of

Fig. 3.



Under surface of the brain; natural size.
S. Sylvian fissure. *O.* Supraorbital sulcus. *h.* Hippocampal gyrus.

Fig. 4.



Inner surface of cerebral hemisphere; natural size.

specimens would be required than is at present accessible; but the series in the Museum of the College of Surgeons is sufficiently extensive to show that they will furnish important indications of affinity, and that these indications correspond remarkably with the evidence

afforded by characters of the cranium, digestive and reproductive organs*.

The Dogs (*Cynoidea*) are very uniform in their cerebral characters, having always four distinct and regular gyri surrounding the fissure of Sylvius, which is short and approaching a vertical direction. The first and second arched gyri have the anterior and posterior limbs equal, the third has the posterior limb broad and bifurcated.

All the other Carnivora have only three arched gyri on the outer surface, the first, or lower one of the Dogs, being either wanting or concealed beneath the second, within the fissure of Sylvius†.

In the *Arctoidea* the fissure of Sylvius is rather long and slopes backwards; the inferior gyrus has the limbs long, corresponding with the length of the Sylvian fissure; the anterior rather narrower than the posterior (especially in the true Bears); the middle gyrus is moderate and equal-limbed; the upper one large, very broad in front, and distinctly marked off from the second posteriorly as far as near the lower border of the temporal lobe‡. The crucial fissure is long and oblique, and situated further back than usual.

In the *Æluroidea* the Sylvian fissure is moderate and nearer to the vertical than in the last group. The gyrus which immediately surrounds it is wide, especially the posterior limb, which is generally twice the width of the anterior, and is divided by a vertical fissure, well marked in the Cats and Hyænas. In the Cats the anterior limb is also partially divided. In the Civet both limbs are simple§. The second gyrus is moderate and simple. The superior gyrus is wide in front, but small posteriorly, the sulcus which separates it from the second not extending quite to the hinder apex of the hemisphere.

Mouth, Tongue, etc.

The incisor teeth, both above and below, were worn down almost level with the gums; the ends of the canines were also truncated and broken. Behind the canines there were but three teeth above and two below on each side, all, as usual, quite small and rudimentary.

The roof of the mouth is broad and nearly flat. It has four strongly marked, sharp-edged, curved ridges passing completely across from side to side, with the concavity of their curve turned backwards. The first is between the incisors and the canines; the second is opposite to the latter. The middle of the fourth ridge is one

* See "On the Value of the Characters derived from the Base of the Cranium in the Classification of the Carnivora" (P. Z. S. 1869, p. 4).

† In the *Hyæna* its hinder limb is partly exposed.

‡ Except in the smaller members of the genus *Mustela*, where the sulcus separating the superior from the middle gyrus is less produced posteriorly than in others of the group. In *Galictis vittata*, however, the brain is quite a miniature of that of a Bear; but the middle convolution is united with the upper one at its superior anterior angle. According to Leuret, a similar union is found in the Otters.

§ The Suricate agrees with the Hyænas rather than with the Civets in the general characters of its brain-convolutions.

inch behind the incisors. Behind these are four more ridges, which do not pass across the middle line, being interrupted for a short space; and each half ridge forms an arch by itself, having both ends directed backwards. The last two are much smaller than the others. Between the foremost ridge and the incisor teeth are three not very distinct prominences of the mucous membrane, the largest of the three being in the middle. On the depressed surfaces between the ridges, especially between the fifth and seventh, are numerous small, rounded, white tubercles. The palate behind the last ridge (which is 2″·2 from the incisor teeth) is quite smooth.

There is no distinct uvula, only a median thickening of the arched posterior margin of the soft palate. The tonsils form prominent, oblique, narrow ridges on the sides of the fauces, half an inch in length.

The tongue is large, flat, rather spatulate, and very soft or lax in its tissues. Its length is 6″, and its greatest breadth (1″ behind the apex) 1″·8. The frænum is attached nearly three inches from the apex.

The circumvallate papillæ are rather small and only two in number, placed in the usual region of the tongue and half an inch apart. The dorsal surface of the tongue behind these papillæ is soft and glandular, and bears scattered, long, soft and pointed papillæ. All the middle portion of the dorsum is thickly covered with minute conical papillæ, with their apices directed backwards and towards the middle line. Interspersed with these are numerous circular, rather flat-topped fungiform papillæ. Rather in front of the middle of the dorsum, where the tongue begins to widen somewhat, the conical papillæ increase in size, and are gradually transformed into papillæ of very peculiar form, which cover the whole of the anterior third of the organ. These are very conspicuous (being quite white and very hard), short, rounded cones, or bosses, set in a smooth, soft, pink membrane. Their average diameter is upwards of $\frac{1}{20}$ inch, and the distance between them nearly equal to the diameter. At the margin and apex of the tongue they gradually diminish in size. In the fore part of this curious patch the axes of the papillæ are vertical to the plane of the dorsum of the tongue; but posteriorly their apices point backwards and they are flatter, and, as before said, pass insensibly into the minute conical papillæ of the middle part of the tongue. I am not aware of any lingual papillæ exactly like these. In *Hyæna*, however, there is a central rounded patch of conspicuously enlarged conical papillæ near the apex of the tongue.

In the septum of the tongue, near the extremity, is a very small subcylindrical lytta, proportionally smaller than in *Hyæna*.

The submaxillary glands are of very large size, composed of very distinct large lobules, and of a bright yellow colour, having when fresh much the appearance of fat. The anterior end of each gland abuts against the angle of the jaw, or rather the masseter muscle covering it; the posterior against the transverse process of the atlas. Above it is in contact with the inferior surface of the cartilaginous meatus auditorius externus. Superficially it is covered by the platysma. In general form it is pear-shaped, having the large

end, which is flattened and has a rounded outline, turned backwards. The front end is truncated, or, rather, hollowed to receive the angle of the jaw, and has a short process projecting inwards. The gland is, moreover, bent upon itself nearer the anterior than the posterior end, at an angle which varies according to the position of the head of the animal; when the head is stretched forwards it is straightened, and then measures 2″·2 in length. The greatest vertical thickness is 1″.

The duct (Wharton's) leaves the gland on the internal surface, near the anterior extremity. It is of the thickness of a small crow-quill, and runs forwards, internal to the external pterygoid muscle, between this and the mucous membrane, and along the floor of the mouth, to just in front of the frænum of the tongue, where it terminates in an orifice situated on the inferior surface of a flattened leaf-like projection of the mucous membrane with a dentated edge. This process is ·2″ in length, of the same breadth, and its inner edge is less than ·1″ from the median line.

The sublingual gland is long and narrow, and is in contact with the outer side of Wharton's duct for nearly the whole of its length. Its duct opens on the inferior surface of the same sublingual process, to the outer side of the orifice of Wharton's duct.

The epiglottis forms about half a cylinder, with an internal diameter of half an inch, and a length of ·7″. Its free extremity is rounded and everted.

The anterior portion of the thyroid cartilage is narrow vertically (·4″ in middle line), forming a wide rounded arch above, and with no fissure (as in the Bears) on the lower margin. Posteriorly its alæ form broad, well-marked, ascending and descending cornua, of which the former is broadest and most rounded. The posterior border is nearly straight, 1″·1 in height. The cricoid cartilage in the middle line in front is only ·3″ deep; posteriorly it is very high (·95″), rising to form a pointed apex in the middle line. The inferior border is nearly straight, with slight undulations, all round. The arytenoids are broad and low, placed very laterally, so that they do not rise so high as the apex of the cricoid.

The vocal cords form on each side two broad, flat, contiguous bands, with parallel borders, ·45″ long, and ·35″ (the two) from above downwards, about equal in size, and separated only by a slight groove, without any ventricle. The upper (or false) cord is softer and more rounded; the lower flatter and firmer, and more fibrous in appearance. Above the rounded margin of the upper cord, and separating it from the lateral part of the base of the epiglottis, is a deep narrow sinus*.

It will be observed that the structure of the larynx accords more with that of the *Felidæ* than of either the *Canidæ* or *Ursidæ*, as described by Cuvier†, though not precisely agreeing with either. I

* C. Mayer says, in *Hyæna striata* "only one vocal cord, the lower one, is present, and is broad and thick with folds, without ventricle" ("Ueber den Bau des Organes der Stimme," Nova Acta Acad. Naturæ Curios. vol. xxiii. 1851, p. 694.

† Leçons d'Anatomie Comparée, 2nd edit., tome viii. p. 786 (1846).

have, unfortunately, not the materials at hand for a comparison with the larynx of an Hyæna.

The thyroid bodies are unconnected with each other. Each is flattened, subtriangular, broad at the upper end, which reaches just above the lower border of the cricoid cartilage, and ending in a narrow tongue-shaped inferior prolongation. The entire length is 1″·1, the greatest breadth ·4″.

The hyoid arch consists of the number of bones usual in the Carnivora. The basihyal is straight and narrow, nearly flat in front, rounded and slightly concave (from side to side) behind, expanded at the ends, ·8″ long. The thyro-hyals are slightly curved, thick at their basal, and flattened and expanded at their thyroidal ends, ·8″. The three bones of the superior cornu are of equal length, ·6″; the distal, or that nearest the basihyal, is the stoutest, and has a prominent flattened expansion of the inner border, the edge of which is turned backwards; and the whole bone has a considerable inward curve. The middle bone is simple, flattened, and slightly curved; the proximal (stylo-hyal) is very slender, except at the extremities, slightly curved, and twisted upon itself.

Thoracic Viscera.

The trachæa is 5″ in length, and ·55″ in average width. It has thirty-six cartilaginous rings. It divides into two very short bronchi, which pass off nearly horizontally, and after a course of not more than ½″ enter the roots of the lungs, each dividing into as many branches as there are lobes to the lungs. The right bronchus is rather shorter than the left.

The lungs are deeply divided into distinct lobes—the right into four, the left into three. The mode of division is as follows:—A horizontal fissure separates each lung into two nearly equal portions; the lower one, slightly the larger, has no further division; the upper one is separated into two by a fissure running obliquely downwards and backwards from the middle of the anterior border to join the horizontal fissure near the posterior border of the lung; this separates from the upper a middle lobe, which is the smallest of the three. These divisions and lobes are almost exactly similar on the two sides; but the anterior margin of the left middle lobe has two deep notches, altogether wanting in the right.

On the right side a distinct lobe (the "azygous lobe") is superadded, having no corresponding portion on the left. It is triangular, about the size of the middle lobe, and placed on the inner side of the lung, its root being between those of the middle and inferior lobes. It lies to the inner side of the latter, behind the heart.

This arrangement of the lung-lobes is that which obtains in the Carnivora generally. In the lungs of an Hyæna (*H. striata*?), No. 41, Stores, Mus. R. C. S., the divisions are precisely similar, except that the clefts on the anterior edge of the left middle lobe are wanting. The same is the case in the lungs of an *Herpestes*.

The heart is short and broad. The aortic arch, as usual in the

allied forms, gives off two main branches close together; the first, after a course of ·6″, divides into the two carotids and the right subclavian; the second is the left subclavian.

Abdominal Viscera.

On opening the abdominal cavity, the liver was seen extending across the anterior part, occupying apparently as much of the left as the right side; next to it was seen a portion of the transversely lying stomach, then the great omentum (quite destitute of fat) completely concealing all the other viscera.

In the peritoneal cavity were numerous, very slender, white, hair-like, very stiff and elastic Nematode worms, 2½″ long; some few, otherwise similar in appearance, were of a blackish colour*. There were no Entozoa within the intestinal canal.

The stomach and the upper half of the small intestine were distended with straw, a closely impacted mass of which produced an absolute obstruction to the passage, evidently the cause of the animal's death. The way the intestines were twisted and knotted, together with numerous partial invaginations, showed that violent peristaltic movements had taken place without successfully overcoming the obstruction. The mucous membrane was also severely congested at several spots. The lower half of the small intestines and the colon were contracted and almost empty.

The stomach (fig. 5) was short and rounded, consisting of a large and globular left end or fundus, into the upper part of which the rather narrow œsophagus enters, and a comparatively small pyloric prolongation, divided in the middle by a slight constriction. The walls are very thick and muscular, especially towards the pyloric end†. Before its removal from the body it measured 5″ in length; its diameter, from the entrance of the œsophagus to the opposite point of the great curvature, was 3¼″.

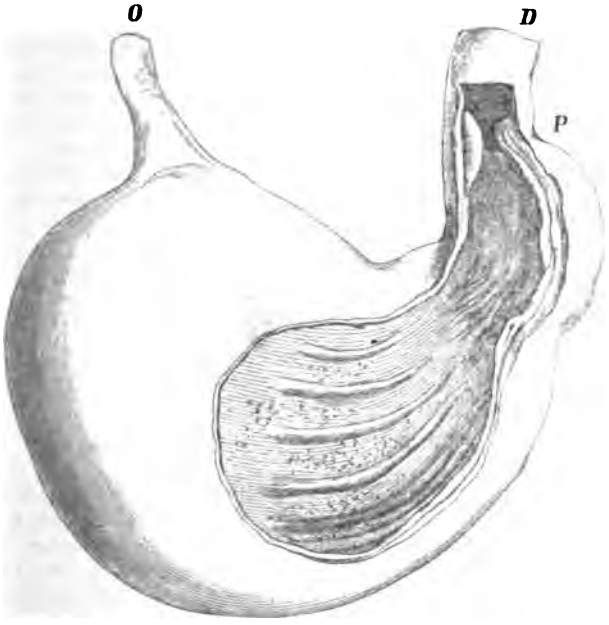
The interior of the stomach may be divided into three distinct portions:—1. The left end or cardiac portion, with a perfectly smooth pale-coloured lining membrane. 2. The middle portion, with a softer, granular-looking redder lining, and bearing a series of strongly marked longitudinal ridges or folds of the mucous membrane, most prominent and largest at the greater curvature, and extending over the lower two-thirds of the circumference, but wanting on the upper third, or that next the lesser curvature: they are nearly parallel, though more approximated to each other near the pylorus, and diverging towards the fundus, corresponding in this with the gradual enlargement of the walls of the cavity in this direction. 3. In the narrow right extremity of the stomach extending 2″ from the pylorus, the mucous membrane is again smooth, or only slightly raised into some

* Some of these have been forwarded to Dr. Cobbold for examination. He reports that they belong to a species hitherto undescribed, and proposes to give an account of their structure at an early meeting of the Society.

† Daubenton describes the walls of the stomach in the Hyæna as thin and semitransparent.

irregular longitudinal folds, not continuous with those described above. The epithelium here is very thick and white. Immediately above the pylorus the cavity is dilated on the right or great-curvature side. The opening of the pylorus is much contracted, and crescentic, being bounded by a strong transverse ridge rather more than half encircling the tube on the right or great-curvature side, and by an oblong very prominent valvular projection on the side of the lesser curvature*, which fits into the concavity of the opposite crescentic ridge.

Fig. 5.



Stomach, after being hardened by distention with spirit, and the removal of a portion of the anterior parietes: taken from the front; the drawing should have been reversed; half the natural size.

O. Œsophagus. *D.* Duodenum. *P.* Pylorus.

The small intestine, after it was laid open, measured 9′ 6″ from the pylorus to the ileo-cæcal valve. The circumference at the upper part was $2\frac{1}{2}''$, diminishing to $1\frac{3}{4}''$ at the lower end. There was no trace of valvulæ conniventes. The villi were abundant, especially near the upper part. Agminated glands commenced 2″ below the pylorus: the first was circular (·3″ in diameter); the largest was oval

* Similar to that observed in the Pig, Manis, Armadillo, and Sloth Bear, but not in the Carnivora generally. It may be remarked that the stomach of *Proteles*, both in form and structure, closely resembles that of the Armadillos, which are also carrion- and insect-eaters.

(2″ long), and situated close to the ilio-cæcal valve. There were altogether eight such patches.

The ileum entered the large intestine almost transversely from the left, inclining slightly backwards. The short globular cæcum (fig. 6)

Fig. 6.

Cæcum, distended with plaster of Paris; half the natural size.

lay on the right psoas muscle and the iliac vessels, its rounded extremity being turned backwards and to the left. The colon, nearly three times the diameter of the ileum, ascended for 2½ inches, till it came into contact with the under surface of the stomach, then took a rather sudden bend, curving downwards and to the left (there being no transverse colon, properly speaking) down to the left iliac fossa, a distance of 5″, then curved inwards, and finally backwards as it entered the pelvis.

The length of the whole of the large intestine when straightened was 15″. Its width was tolerably uniform, though contracted somewhat just above the sigmoid flexure, and dilated again in the rectal portion. It had smooth but thick muscular walls, the longitudinal bands being remarkably distinct. The mucous membrane was smooth, with numerous scattered solitary glands, especially abundant in the cæcum, at the apex of which they form a distinct cluster.

In the extreme shortness of the cæcum, *Proteles* differs both from the *Hyæna* (at least *H. striata*) and also from *Herpestes**. The intestinal canal, from pylorus to anus, is not five times the length of the body

* Daubenton figures the cæcum of the Hyæna which he dissected; it is given in the table of measurements as 9″ long. Reimann found the cæcum 6″ long in the same species (Spicileg. Observ. Anat. de Hyæna: Berol. 1811).

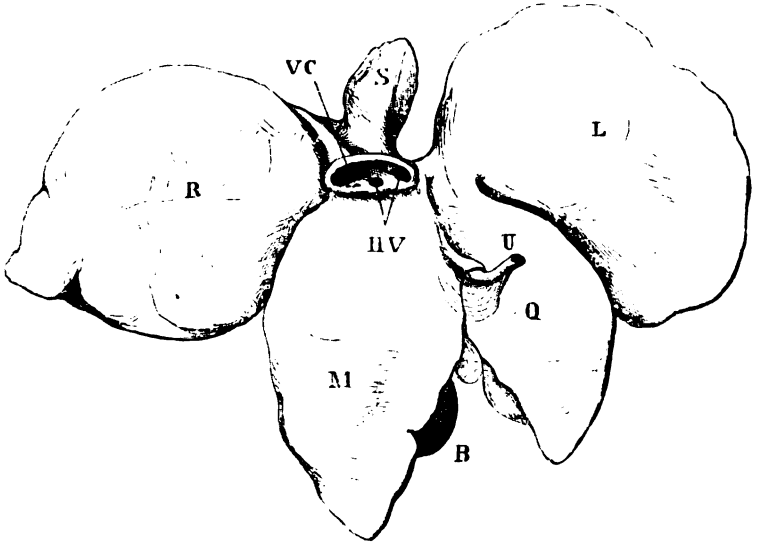
in *Proteles*; whereas in Daubenton's Hyæna it was more than eight times, and in one dissected by Reimann between six and seven times.

The liver (figs. 7 and 8) is large and deeply subdivided. As usual in the Carnivora, its main divisions are three, of about equal size:—1. The left lobe (*L*) is simple, flattened, rhomboid, without subdivisions. 2. The middle lobe (*M* and *Q*) is broad, deeply cleft at the umbilical fissure into two pointed tongue-shaped pieces, of which the left (*Q*) is the smaller. The right portion (*M*) has the gall-bladder (*B*) attached to the left side of its under surface, its fundus projecting beyond the margin of the cleft. Between these two portions is a small accessory lobule. 3. The right lobe (*R*) is pointed, or, rather, heart-shaped; near its upper edge are attached two accessory lobules—the Spigelian lobe (*S*), conical, pointed, and projecting backwards, and another (fig. 8, *A*), rather larger, with a truncated notched edge, turned to the right. On the under surface of the lobe, near the apex, is a triangular pointed prominence—a sort of second apex. The outer (right) border has two notches.

The entire width of the liver, when lying on a flat surface with the lobes spread out, is 8″. The left lobe is 4″·6 long, and 2″·6 broad; the middle lobe 3″·9 in greatest length, and 3″·6 broad; the right 4″·4 long, 3″ broad.

The gall-bladder was of a simple pyriform shape, without any

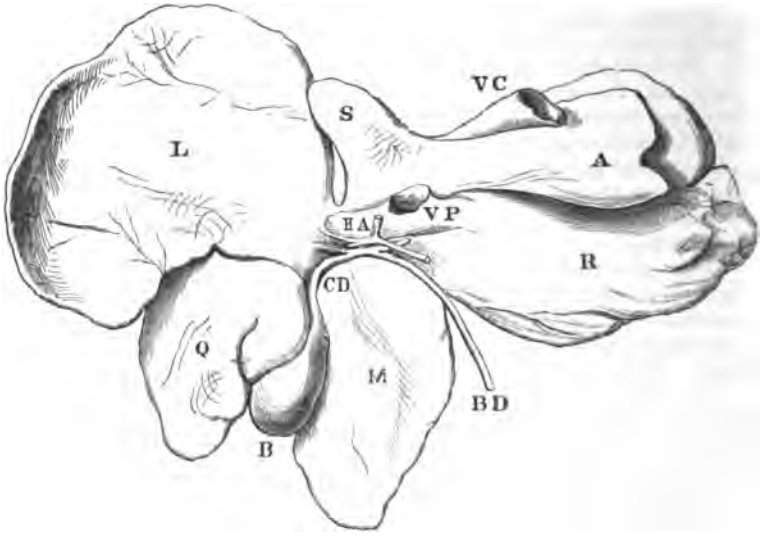
Fig. 7.



Upper surface of liver; half the natural size.

R. Right lobe. *L.* Left lobe. *M.* and *Q.* Divisions of the middle lobe. *S.* Spigelian lobe turned upwards. *B.* Gall-bladder. *U.* Remains of umbilical vein. *VC.* Vena cava. *HV.* Orifices of hepatic veins.

Fig. 8.



Under surface of liver; half the natural size.

R. Right lobe. *L.* Left lobe. *M.* and *Q.* Divisions of the middle lobe. *S.* Spigelian lobe. *A.* Accessory (caudate) right lobe. *B.* Gall-bladder. *CD.* Cystic duct. *BD.* Common bile-duct. *HA.* Hepatic artery. *VC.* Vena cava. *VP.* Vena porta.

doubling on itself at the neck as figured by Daubenton in the Hyæna. Its length is 1″·7, its greatest diameter ·8″. It passes gradually into the nearly straight cystic duct, which is ·7″ long. The hepatic duct is formed of two branches, one from the left and middle lobe, and one from the right lobe; just before they unite, the cystic duct joins the former. The common bile-duct is 2″ long, and enters the duodenum about 2″ below the pylorus, after running very obliquely through the intestinal walls, and being joined by the pancreatic duct.

The pancreas is very long and slender, 9″ in length.

The spleen is long, narrow, and flat. It has an oblique fissure on its outer surface near the upper end, and a slight longitudinal fissure near the middle of the same surface. The lower extremity is rather narrower than the upper. Its length is $7\frac{3}{4}$″, its greatest diameter 1″.

The right kidney was placed nearly an inch higher than the left. These organs are simple and of the usual form; 2″·4 long, and 1″·4 broad. The superficial veins have the same arborescent arrangement as in the Hyænas and *Felidæ*.

The suprarenal bodies were placed close to the inner side of the upper end of the kidney. They have a flattened rhomboid form, and are larger at the upper end. The length of each is ·9″; its width at the upper end ·5″, at the lower end ·35″.

Organs of Generation.

The penis is large and cylindrical, supported for rather more than half its length along the hinder part of the underside of the abdomen by a rather lax fold of skin. The terminal part (nearly 2 inches in length) is free and pendulous, and covered with a prepuce having a thin, delicate, and nearly white hairless integument. The entire length of the penis in its relaxed state is rather more than 4 inches; its diameter nearly uniform throughout, ·6″. The glans (fig. 9) is a flattened cone, without distinct corona. The upper surface is obliquely

Fig. 9.

Dorsal surface of glans penis; natural size.

m. Meatus urinarius.

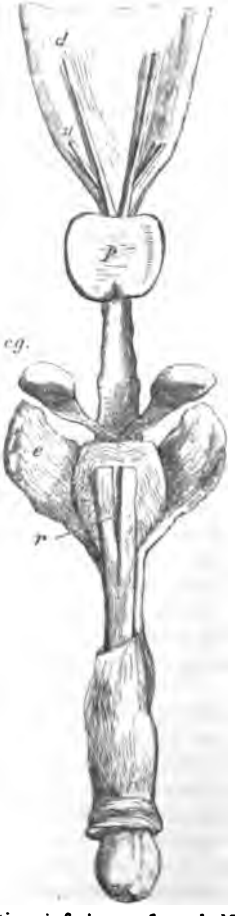
bevelled towards the apex, and presents a median slit, bordered by a pair of puckered, soft, dark-red lips. When these are separated (as in fig. 9), a conical body of cartilaginous hardness is disclosed. The rounded apex and dorsal ridge of this are white, smooth, and shining; the sides are pink, and beset with very minute white horny tubercles. Immediately under the apex of this body, which projects directly forwards, is the orifice of the urethra (*m*), wide enough to admit a large probe. The outer surface of the glans is covered with very minute recurved spines, except near the margins of the median dorsal fissure. There is an indistinct raphe below, but no frænum. The skin covering the under surface of the hinder part of the penis, immediately in front of the scrotum, is raised somewhat, for a space of 1″ in length and ·7″ in width, by a pair of oblong clusters of yellowish sebaceous glands, placed close to the middle line, but with a narrow non-glandular interval between them.

The scrotum is nearly naked. It forms a very slight prominence; but the outline of the two testes can just be distinguished through the skin. These are in contact posteriorly, but separated in front. Each is somewhat pyriform, with the smaller end forwards, 1″ long and ·6″ in greatest diameter, with a rather small subglobular epididymis attached to the larger or posterior extremity.

Between the scrotum and the tail is a considerable eminence, occasioned chiefly by the immense anal glands. Upon this is a large T-shaped aperture; the upper transverse part, $1\frac{1}{4}''$ in width, leads to a great follicle rather more than an inch deep. Within the lips of the lower, longitudinal part of the opening is placed the anus.

The prostate (fig. 10, *p*) is large and flat, projecting very considerably on each side of the urethra, concave from side to side on its under or rectal surface, and with both anterior and posterior margins, though especially the former, notched; so that the whole gland

Fig. 10.



Organs of generation, inferior surface; half the natural size.
u. Ureter. *vd*. Vas deferens. *p*. Prostate. *cg*. Cowper's gland. *e*. Erector penis muscle. *r*. Retractor penis muscle.

has the appearance of a broad bilobed disk. Its length in the middle line is ·8″, its greatest breadth ·1″, greatest thickness ·2″.

The vasa deferentia (*v d*) enter the upper part of the prostate without any manifest dilatation or trace of vesiculæ seminales.

The floor of the prostatic portion of the urethra is raised in the middle line into a distinct narrow ridge, which enlarges into a rounded prominence ·6″ below the neck of the bladder, and again immediately contracts, and after ¼ inch entirely subsides. On each side of the prominence is a tolerably deep depression. There is no distinct median *cul de sac*, or *uterus masculinus*; and the vasa deferentia appear to empty themselves on the anterior surface of the beforementioned eminence, as a minute orifice could be seen there, though too fine to admit a bristle.

The membranous portion of the urethra is 1″·8 in length and capacious. Its lining membrane is thrown into longitudinal folds. Near its anterior termination the ducts of Cowper's glands enter. These bodies are oval, with compressed sides meeting at an angle at one border, the other border being broad and rounded. The length of each is ·6″, its greatest width ·4″; the duct is ·7″ long.

The bulb is very prominent, with a thick muscular covering. The erector penis is large; and there is a pair of strong retractors on the underside of the organ. As far as can be ascertained by external examination, the penis agrees with that of the Hyæna in possessing no bone, though this structure, so conspicuous in most of the Carnivora, is represented by the hard central terminal portion of the glans before mentioned. Not wishing to injure this unique specimen, I have not made a section through this.

The generative organs of a male striped Hyæna are described by Daubenton. As far as can be made out from his account and the figure which accompanies it, they are an almost exact counterpart to those of *Proteles*.

In a specimen of the same parts of *Hyæna crocuta*, in the College-of-Surgeons Museum, the glans is very like that of *Proteles*; but the lips of the upper slit are less conspicuous and do not appear to meet over the hard apex, which also is much less prominent. The chief difference, however, is in the prostate, which, though of the same general form, is greatly reduced in size, being but half an inch in length, and rather less in breadth.

Anal Glands.

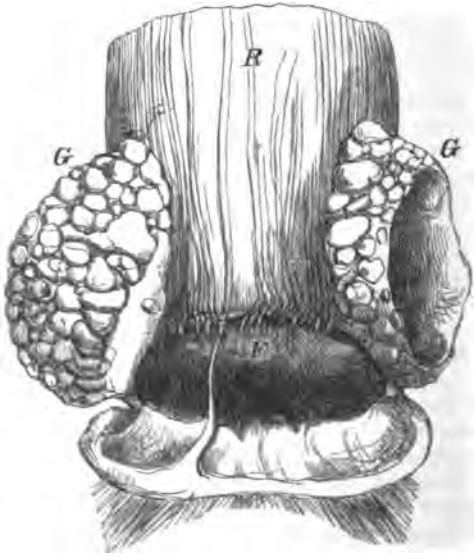
As before mentioned, immediately above the anus, and, in fact, having a common external aperture with the termination of the intestine, is a wide transverse follicle, or pouch, lined by a soft thin membrane of a greenish colour, studded over with minute orifices, each in the centre of a small papilla. This sac is 1½″ in width, and 1″ in depth; on each side, rather more than ½″ within the cutaneous margin, is an aperture large enough to admit an ordinary-sized probe.

The walls of the saccular depression are glandular, ·2″ thick, and of a very dark olive-green colour. Some of the longitudinal bands

of muscular fibres from the rectum pass over this sac and are inserted into the skin above it. Circular fibres pass around it, enclosing the follicle and anus in a common sphincter.

On making a section through the thick wall of this sac, it is seen to be composed of a number of pyramidal dark-coloured glandular bodies, with the broad ends at the outer surface, and their apices towards the inner wall of the follicle, and separated from each other by a thin layer of areolar tissue. Within the apical portion of each gland is an oval cavity containing a yellowish cheesy substance. Each of these little reservoirs communicates with the large sac by one of the minute round orifices previously noticed.

Fig. 11.



Termination of rectum and anal glands, from above; natural size.

R. Superior surface of rectum. *F.* Supraanal follicle. *G.* Lateral glandular sacs.

On each side of this median supraanal gland, and lying on the outer and upper surface of the rectum, is a conspicuous body (fig. 11, *G*) of a somewhat oval shape, 1·6″ in length, and 1″ wide at its thickest part. When cleaned from the investing lax cellular tissue and a not very distinct layer of muscular fibres, it is seen to be smaller at the upper and anterior end, broad at the posterior end (where it comes into contact with the skin), convex externally, and flattened or slightly concave on the surface which lies against the outer wall of the rectum. It is attached only by a very short pedicle ·2″ wide, which connects it with the lateral part of the supra-

anal follicle. Each of these bodies is a very thin-walled sac, with a large cavity within, and covered externally by a number of flattened glandular bodies of a brilliant orange-colour, and of various size and outline. These bodies are larger and more close together at the upper part of the sac; towards the sides they become smaller, and not so closely packed together; and on the under or rectal surface they are more sparse, especially near the pedicle, where the smooth sac-wall is bare for a considerable space. Each of these glands consists of a number of acini clustered round a central cavity, which communicates by a minute aperture with the cavity of the large sac.

When a section was made through the large sac, its wall was seen to be very thin and quite smooth within; the cavity has no partitions or septa, and but a single excretory orifice, which passes through the pedicle into the side of the transverse supraanal follicle, being the aperture before spoken of. The cavity was entirely filled with a bright reddish-orange substance of the consistence of cream-cheese, and with a very peculiar, powerful and penetrating, and decidedly disagreeable odour*.

A supraanal follicle, similar to that of *Proteles*, is found in both species of *Hyæna*†, also in the Suricate among the *Viverridæ*. In *Herpestes*, the mucous membrane along the upper border of the anus is beset with minute apertures, the ducts of numerous small, rounded, seed-like glands situated just beneath the skin, of a pale yellowish colour, placed a little distance apart from each other. The skin, however, is not inverted to form a distinct sac. In *Hyæna* these glands do not form such a dense compact mass as in *Proteles*, nor have they the same peculiar dark olive-colour.

The lateral glandular sacs‡ are common to *Proteles* and both forms of *Hyæna*, and, indeed, although modified in form and structure, to almost all the Carnivora. *Hyæna striata* has, in addition, another lateral group of glands of similar structure situated posteriorly to the sac, around a depression or pouch of the great supraanal follicle, but not constricted off so as to form a distinct cavity with a narrow orifice as in the anterior glands. These I do not find represented in *Proteles*, and they appear to be absent also in *Hyæna crocuta*; but of the anatomy of the last-named animal we have as yet very little reliable information.

Skeleton.

As the osteology of *Proteles* has been described both by Isidore

* This odour was confined to the secretion of these glands, and did not pervade the whole animal. Smuts says, "*hoc animal spargit odorem ingratissimum ac fœtidum, qui in ipsis pellibus siccis remanet*" (Enumeratio Mammalium Capensium, p. 23: 1832). The same circumstance has been noticed by other travellers, and is probably due to the creature's habit of feeding on putrid animal substances, as it was entirely wanting in the present specimen, which had been kept for several months on finely chopped fresh meat and milk.

† Fully described in *H. striata* by Daubenton. See also a preparation in Mus. Roy. Coll. Surgeons of the same parts in *H. crocuta*.

‡ "Les glandes en grappes," Daubenton.

Geoffroy (*loc. cit.*) and De Blainville (Ostéographie, tome ii., Genus *Canis*, p. 34, pl. 3 *bis*), it is not necessary to add much on the subject to these notes, except to make a correction as to the number of the vertebræ and ribs. The skeleton in the Paris Museum, which was the subject of the observations of the above-named authors, is stated to have seven cervical, fourteen dorsal, six lumbar, two sacral, and twenty-one or twenty-two caudal vertebræ. The present animal has fifteen well-developed pairs of ribs, of which eight directly join the sternum. As the skeleton in the Leyden Museum has the same number, it may be presumed that fifteen dorsal and five lumbar vertebræ is the rule. This affords another point of approximation to the Hyænas, which have generally fifteen (sometimes sixteen) pairs of ribs. The number of caudal vertebræ in the present skeleton is twenty-four. The scapula of this individual differs from that of the younger skeleton figured by De Blainville in having the upper half of the anterior border rather deeply excavated, as in the Ichneumons. Although De Blainville thought the contrary, it appears to me that the *tout ensemble* of the skeleton far more resembles that of a Hyæna than that of a Dog. The length and strength of the cervical region, and the large size of the anterior as compared with the posterior limbs (pointed out by Isidore Geoffroy), are thoroughly Hyænoid.

In conclusion, although I am still inclined to place *Proteles* in a family by itself, allied to both *Hyænidæ* and *Viverridæ*, the examination of this specimen shows that its affinities with the former family are closer than the examination of the skull alone led me to suppose.

Preparations of the brain, tongue, larynx, lungs, heart, stomach, cæcum, liver, spleen, kidneys, organs of generation, and anal glands, as well as the skeleton, are preserved in the Museum of the Royal College of Surgeons. It is from these that the drawings which illustrate this communication have been made.

2. On the Guemul, or Roebuck of Southern Peru. By Dr. J. E. Gray, F.R.S. &c.

Travellers in Chili have mentioned a two-hoofed animal, called *Guemul*, or *Huamul*. It has been so indistinctly indicated, that Molina regarded it as a Horse, Hamilton Smith as a Llama, and the compilers (such as Leuckart and Lesson) considered that it might be a peculiar genus, for which they have proposed the compound names of *Hippocamelus* and *Cervequus*. M. Gay (1835) regarded it as a new genus, but did not give a name to it.

In 1846 MM. Gay and Gervais, when preparing a work on the Mammalia of Chili, described a young specimen in the Paris Museum without horns under the name of *Cervus chilensis*.

In 1849 the Earl of Derby received from his brother-in-law, from Chili, an imperfect skin of a female, which he sent to the British Museum. The fur was of a different colour from that of the speci-

men described by MM. Gay and Gervais; and finding the animal to agree in size, colour, and kind of fur with the Roebuck of Europe, I described and figured it in the 'Proceedings' of this Society for that year under the name of *Capreolus leucotis**; and in the 'Proceedings' of the Society for the next year, and in my 'Catalogue of the Two-hoofed Quadrupeds in the British Museum,' p. 227, I regarded it as a species of *Furcifer*, under the name of *F. huamel*. In this work there are references to all these synonyms and to where they are mentioned.

Fig. 1.

Horns of *Xenelaphus huamel*, ♂.

Mr. Whitely, junior, has just sent from Tinta, in South Peru, to the British Museum a perfect male, female, and fawn of this species, and some skulls of the female, which prove that I was right in regarding the *Cervus chilensis* of Gay and my *Capreolus leucotis* as different stages of the same species. Those now received agree with Gay's description of the young animal in the Paris Museum, and are in the yellow state of the fur; but the female exhibits in the

* See P. Z. S. 1849, p. 64. Mamm. t. ix.

middle of the back some of the dark fur of the animal sent by the Earl of Derby, which I described.

As stated in my paper, this animal chiefly differs from the Roebuck of Europe in being without any glandular tufts on the outer side of the metatarsus; but we now discover that the horns are very peculiar, and unlike those of the Roebuck, or of the Tarush or Roebuck of Bolivia (*Furcifer antisiensis*), which is the type of the genus *Furcifer*.

The male now obtained had a well-developed but rather unsymmetrical pair of horns, which are so unlike the horns of any other Deer, that I propose to form for them a genus, which may be termed

Xenelaphus.

The horns divide from the base into two branches; the front one is erect, conical, and acute, with a short conical branch on the outer side, and in the middle one or two more or less elongate, basal anterior or interior snags. The hinder part of the base and sheath compressed, diverging horizontally into a strong, angular, tapering branch, which is nearly as long as the erect one, with several irregularly placed, more or less elongate, acute processes; the upper part, near the roots, with one or two cylindrical diverging branches on its upper and lower sides. Like the small branches on the erect part of the horn, they are not exactly similar on the two horns.

Fig. 2.

Skull of *Xenelaphus huamel*, ♀.

The metatarsus is without any glandular tuft on the outside. On the inner side of the hock is a large rounded tuft of such hairs. The fur consists of thick, elastic, tubular quills. The skull has a well-marked, deep, triangular pit in the front of the orbit. The female is without horns. This animal may be called *Xenelaphus huamel*.

It has been suggested that, as I have only seen one specimen of

the male, the horns may be those of an individual monstrosity, and not of the normal form; but this I consider to be very doubtful. If they are not quite of the normal form, it is clear they are not a monstrosity of the regularly forked horns of *Furcifer*.

3. Description of *Mauremys laniaria*, a New Freshwater Tortoise. By Dr. J. E. Gray, F.R.S. &c.

(Plate XXXVII.)

Mr. Bartlett has kindly obtained for me from a dealer a small young living freshwater Tortoise which had passed through several hands, and was therefore without any reliable history or habitat.

Mauremys laniaria, sp. nov. (Plate XXXVII., young.)

The head short, broad; nose very short, broad, rounded; the eyes very large and prominent, on the side of the head; front of face high; beak thick, convex; lips convex on the edge; central notch simple; lower beak short, convex externally; crown dark olive; neck minutely granular, blackish olive above, with some very narrow reddish lines underneath; sides and underside reddish, with many more or less wide black and green lines, those on the back of the throat widest.

Legs dark olive; fore legs olive, with large, irregular, prominent tubercles in front, and with a broad irregular streak on the lower half of the front side; the front toes or fingers short, thick, united by a narrow fleshy web to the claws, each finger with a series of larger triangular scales on the upper surface; claws short, acute. Hind feet large, square, the toes thick, united by a narrow fleshy web to the claws, and with one or two scales on the upper part of the base. Tail short, thick, granular, with some whorls of distant minute spines near the base (tip injured); the hinder part of a dark olive, with reddish streaks and minute spines.

Thorax depressed, rounded above, the side margin slightly revolute, dark olive-green above; the shields blackish horn-coloured, smooth or slightly annulated, and irregularly convex; the third, fourth, and fifth vertebræ slightly keeled; the marginal shields blackish olive, very obscurely and irregularly varied with reddish brown above and blackish beneath.

The sternum flat, truncated in front, and notched behind, raised on the sides, black, more or less varied with white on the margin of the front and hinder lobes, and on the sides of the central plates.

This animal is strictly carnivorous, and eats most ravenously in confinement.

This Terrapin agrees in the dull dark plain colour with a species described by me in the 'Proceedings' of the Society for 1860, under the name of *Emys fuliginosus* (p. 232, Rept. t. xxx.), which differs

from it in the form and length of the head, in the markings on the head and neck, and in having a more depressed shell.

This Terrapin (*Emys fuliginosa*) differs so much in the form of the jaws, that it is necessary to consider it the type of a new genus, characterized by the depth and length of the groove of the upper jaw, and the sharp simple edge of the lower jaw. It may be called

MAUREMYS.

The head elongate, covered with a smooth skin; nose with the nostrils near the upper edge; crown flat; eyes lateral, large, and very prominent; pupils circular.

Upper beak high, lower edge slightly arched, with an acute notch in the centre.

Lower beak convex, rounded below in front, scarcely reaching the angle of the mouth.

Palate slightly concave; inner nostrils near the middle of the palate, oblong, with a concavity behind each; alveolar edge of the upper jaw with a deep groove, with a strong acute ridge on the underside, extending nearly the whole length of the margin. The alveolar edge of the lower jaw sharp and narrow, broader, shelving inwardly in front.

(1) MAUREMYS FULIGINOSA.

Emys fuliginosa, Gray, Proc. Zool. Soc. 1860, p. 223, t. xxx.

(2) MAUREMYS LANIARIA.

4. Report on two Collections of Indian Reptiles. By Dr. ALBERT GÜNTHER, F.R.S., F.Z.S.

(Plates XXXVIII., XXXIX., XL.)

The British Museum has lately received two most valuable collections of Indian Reptiles. One was presented by Dr. A. H. LEITH, who collected for a number of years at several localities, of which the following require notice:—

1. Deesa, a military station in Ghozerat.
2. Matheran, a hill 2500 feet high, thirty miles east of Bombay.
3. Mahabuleshwur, 4500 feet above the level of the sea, some fifty miles south of Bombay.
4. Kotree, on the western bank of the Indus, opposite to Hyderabad.

This collection contained, beside several of the most common Reptiles, sixty-four species (most of them in numerous examples), which are enumerated in the following list. Four are undescribed.

The second collection was made by R. H. BARNES, Esq., in Ceylon. I do not give a list, as it would not advance our previous knowledge

of the geographical distribution of known species. Singularly enough two of the Snakes proved to be undescribed, showing that the zeal of a collector is rewarded even in localities apparently well explored.

I. *List of the Species collected by Dr. Leith.*

1. *Testudo elegans*, Schoepff. Sindh.
2. *Testudo leithii*, sp. n. Sindh.
3. *Emys thurgi*, Gray. Indus.
4. *Emys grayi*, sp. n. Bussora.
5. *Emys trijuga*, Schweigg.
6. *Pangshura tecta*, Gray. Deesa.
7. *Pangshura smithii*, Gray. Indus.
8. *Emyda granosa*, Schoepff. Bombay.
9. *Aspilus carinatus*, Gray. Poona.
10. *Gavialis gangeticus*, Gm. Indus.
11. *Varanus dracœna*, Shaw. Matheran, Goozerat.
12. *Euprepes rufescens*, Shaw. Bombay.
13. *Eumeces punctatus*, L. Matheran, Belgaum, Bombay.
14. *Eumeces hardwickii*, Gray. Matharan, Belgaum, Bombay.
15. *Chiamela lineata*, Gray. Matharan, Belgaum.
16. *Hemidactylus sykesii*, Gthr. Matharan, Poona.
17. *Hemidactylus coctæi*, D. et B. Bombay.
18. *Hemidactylus leschenaultii*, D. et B., var. Poona.
19. *Hemidactylus maculatus*, D. et B., var. Bombay.
20. *Gymnodactylus deccanensis*, Gthr. Matharan.
21. *Eublepharis hardwickii*, Gray.
    Var. *hardwickii* (Gray). Kandesh.
    Var. *fasciolata* (Gthr.). Sindh, Kurrachee.
22. *Calotes rouxi*, D. et B. Matheran.
23. *Calotes versicolor*, Daud. Sindh, Belgaum.
24. *Teratolepis* (g. n.) *fasciata*, Blyth. Sindh.
25. *Onychocephalus acutus*, D. et B. Matheran, Belgaum, Bombay.
26. *Typhops braminus*, Daud. Matheran.
27. *Typhlops exiguus*, Jan*. Belgaum.
28. *Stenostoma macrorhynchum*, Jan*. Sindh.
29. *Silybura macrolepis*, Ptrs. Matheran.
30. *Silybura elliotti*, Gray. Bombay.
31. *Oligodon subgriseus*, D. et B. Kurrachee, Sindh.
32. *Oligodon fasciatus*, Gthr. Matheran.
33. *Simotes russellii*, Daud. Bombay, Deesa.
34. *Ablabes humberti*, Jan. Bombay, Matheran.
35. *Cyclophis nasalis*†, Gthr. Matheran.
36. *Cynophis malabaricus*, Jerdon. Matheran.
37. *Ptyas mucosa*, L. Bombay.
38. *Zamenis ventrimaculatus*, Gray. Busheer, Kurrachee, Sindh.
39. *Zamenis diadema*, Schleg. Kotree (Sindh).
40. *Tropidonotus quincunciatus*, Schleg. Bombay.

* I am indebted to Prof. Peters for the determination of these two species.
† One præocular only, but ventrals 150–160.

from it in the form and length of the head, in the m
head and neck, and in having a more depressed she
This Terrapin (*Emys fuliginosa*) differs so m
the jaws, that it is necessary to consider it the
characterized by the depth and length of th
jaw, and the sharp simple edge of the lower

MAUREMY

The head elongate, covered with
nostrils near the upper edge; cr
very prominent; pupils circular
Upper beak high, lower ed ueran, Sindh.
in the centre.
Lower beak convex, ro ay.
ombay.
angle of the mouth. Bombay.
Palate slightly cor , Shaw. Matheran.
palate, oblong, with Belgaum.
upper jaw with a Shaw. Bombay.
underside, exte Schneid. (= *arenicola*, Boie). Sindh, Kur-
alveolar edge Deesa; Bushire.
inwardly in Schneid.

(1) M
Em *malabarica*, D. et B. Matheran.
maculatus, Gray. Matheran, Bombay.

Descriptions of New Species discovered by Dr. Leith.

LEITHII.

Shell broadly ovate, broader posteriorly than anteriorly, above, especially on the hinder half; the lateral margins slightly convergent. Its greatest width is rather more than depth, which is one-half of its length. ***The convexity of shell extends to the caudal plate only, which is almost flat inclined outwards, so that the outline between the last vertebral and the caudal is concave. The upper shell is deeply notched ante-*** The sternum is truncated in front, and has a shallow, obtuse-angular incision behind. Posterior margin of the shell slightly serrated.

Plates.—The plates are rather smooth, with the concentric striæ distinct. The areolæ of the three anterior vertebral plates are near the posterior margin. Nuchal plate triangular, pointed in front. The last vertebral as broad as the caudal. The two gular plates together broader than long, the sum of their posterior angles being nearly equal to a right angle. Abdominals as long as pectorals, postgulars, and gulars together. The suture between the anal plates as long as their posterior margin. Inguinal and axillary plates of moderate size.

Tail formed by twenty-two vertebræ.

Feet.—Claws 5-4, obtuse. The front of the forearm is covered

Fig. 1.

Fig. 3.

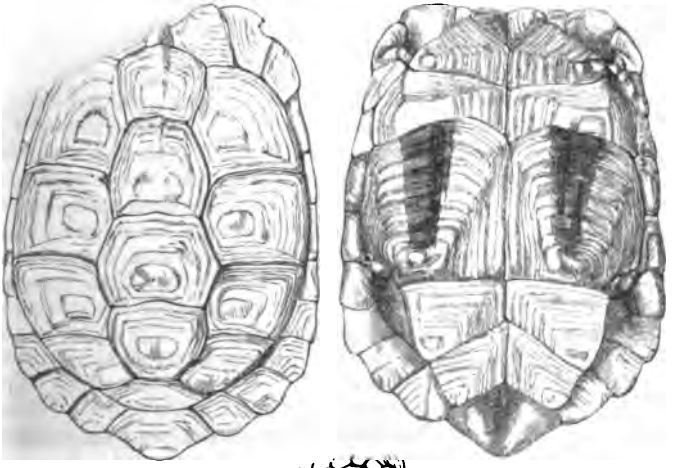


Fig. 4.

Testudo leithii.

Fig. 1. Side view; half nat. size.
2. Upper view; half nat. size.
3. Lower view; half nat. size.
4. Fore foot; nat. size.

41. *Tropidonotus stolatus*, L. Bombay.
42. *Tropidonotus plumbicolor*, Cant. Poona, Matheran.
43. *Psammophis condanarus*, Merr. Kotree.
44. *Psammophis leithii*, sp. n. Sindh.
45. *Dendrophis picta*, Gm. Matheran.
46. *Passerita mycterizans*, Gray. Matheran, Mahabuleshwur.
47. *Dipsas forsteni*, D. et B. Matheran.
48. *Dipsas trigonata*, Schneid. Bombay, Kurrachee.
49. *Dipsas ceylonensis*, Gthr. Bombay Presidency.
50. *Lycodon aulicus*, L. Matheran, Bombay.
51. *Gongylophis conica*, Schneid. Sindh.
52. *Eryx johnii*, Russ. Belgaum.
53. *Bungarus cæruleus*, Schneid. Bombay, Matheran, Sindh.
54. *Hydrophis cærulescens*, Shaw. Bombay.
55. *Hydrophis fasciata*, Schneid. Bombay.
56. *Pelamys bicolor*, Schneid. Bombay.
57. *Trimeresurus gramineus*, Shaw. Matheran.
58. *Hypnale nepa*, Laur. Belgaum.
59. *Daboia russellii*, Shaw. Bombay.
60. *Echis carinata*, Schneid. (= *arenicola*, Boie). Sindh, Kurrachee, Mahabuleshwur, Deesa; Bushire.
61. *Rana cyanophlyctis*, Schneid.
62. *Diplopelma ornatum*, D. et B.
63. *Hylorana malabarica*, D. et B. Matheran.
64. *Polypedates maculatus*, Gray. Matheran, Bombay.

II. *Descriptions of New Species discovered by Dr. Leith.*

Testudo leithii.

Form.—Shell broadly ovate, broader posteriorly than anteriorly, very convex above, especially on the hinder half; the lateral margins straight, slightly convergent. Its greatest width is rather more than its greatest depth, which is one-half of its length. ***The convexity of the upper shell extends to the caudal plate only, which is almost flat and inclined outwards, so that the outline between the last vertebral and the caudal is concave. The upper shell is deeply notched anteriorly.*** The sternum is truncated in front, and has a shallow, obtuse-angular incision behind. Posterior margin of the shell slightly serrated.

Plates.—The plates are rather smooth, with the concentric striæ distinct. The areolæ of the three anterior vertebral plates are near the posterior margin. Nuchal plate triangular, pointed in front. The last vertebral as broad as the caudal. The two gular plates together broader than long, the sum of their posterior angles being nearly equal to a right angle. Abdominals as long as pectorals, postgulars, and gulars together. The suture between the anal plates as long as their posterior margin. Inguinal and axillary plates of moderate size.

Tail formed by twenty-two vertebræ.

Feet.—Claws 5/4, obtuse. The front of the forearm is covered

Fig. 1.

Fig. 2.

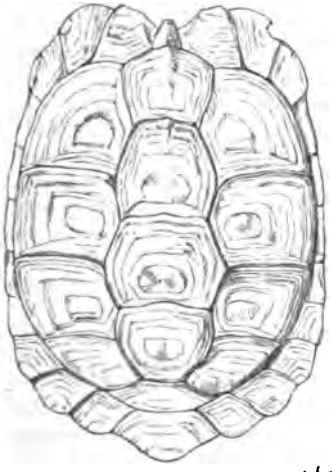


Fig. 3.

Fig. 4.

Testudo leithii.

Fig. 1. Side view; half nat. size.
2. Upper view; half nat. size.
3. Lower view; half nat. size.
4. Fore foot; nat. size.

by about fifteen large, smooth, imbricate, obtusely pointed scales, in five transverse series of three each.

Colour yellow, each of the vertebral and costal plates with a black margin in front and on the sides, but without black on the hinder margin. Each marginal plate with a black margin in front. Sternum entirely yellow, with a broad cuneiform longitudinal black band in the middle of each abdominal plate.

The shell of the single specimen, obtained in Sindh, is $4\frac{3}{4}$ inches long. Also the limbs and the skull are preserved.

Emys grayi. (Plate XXXVIII.)

Form.—Shell much depressed, with an obtuse median ridge along all the vertebral plates; no costal ridge (in the adult). The upper shell is subtruncated anteriorly, and provided with a very small notch posteriorly. Lateral margins slightly reverted, posterior not serrated. Width of the sternum between the axillary and inguinal incisions equal and more than one-half of its length. Sternum truncated in front, and with a deep, obtuse-angular incision behind.

Plates.—The areolæ have disappeared, but there is still a large fontanelle visible in the middle of the sternum. Nuchal plate broad, quadrangular, broader behind than in front. All the vertebrals broader than long; the first quadrangular, with the front margin convex, and with the hinder straight. Caudal plates nearly square. Gulars longer than broad, the suture between them being much longer than that between the postgulars. Postgulars, pectorals, and abdominals nearly equally long, but much shorter than præanals. The suture between the anals is rather shorter than their posterior margin. Axillary and inguinal plates large.

Colour.—Upper parts chestnut-brown, each vertebral and costal plate with an 8-like yellow figure; each marginal plate with a yellow 0-like figure, the enclosed brown spot lighter in the centre. The flat portion of the sternum brownish black, each plate with a narrow yellow margin. Each marginal plate with a narrow black margin on the lower side, and with a larger or smaller round black spot.

The shell of a single example, $3\frac{5}{8}$ inches long, was obtained at Bussora*.

Teratolepis, g. n.

Form of the head geckoid, covered with small non-imbricate scales. Apparently no external ear. Trunk somewhat depressed, covered with imbricate scales, those on the back being keeled, of moderate size, and about twice as large as those on the abdomen. Legs well developed; five clawed toes in front and behind; each toe

* Whilst this paper was passing through the press, Dr. Gray directed my attention to a young example in the British Museum obtained on the Euphrates Expedition. It is preserved in spirits, the shell being $1\frac{1}{4}$ inch long. The shell is coloured as in the adult, but provided with a distinct costal ridge. Neck with numerous parallel yellow longitudinal bands, some of which advance along the side of the head to the tip of the snout. Legs and tail (which is $1\frac{1}{8}$ inch long) with yellow stripes. Toes broadly webbed.

dilated, with a double series of rounded lamellæ below, the last phalanx being free. Tail about as long as the trunk, thick and flattened at the base, and tapering behind; it is covered with imbricate irregular scales, those on the upper surface being very large, much larger than the under ones.

TERATOLEPIS FASCIATA.

Homonota fasciata, Blyth, Journ. As. Soc. Beng. xxii. p. 468.

Back grey, with five brown longitudinal bands, which at regular intervals are interrupted by white spots, the spots of the same level forming a cross band; there are seven of those cross bands on the neck and trunk. Tail brown above, with whitish transverse spots. Lower parts whitish, tail with brown spots below.

Length of the head $\frac{1}{2}$ inch, of trunk 1 inch, of tail 1 inch, of fore leg $\frac{5}{8}$ inch, of hind leg $\frac{6}{8}$ inch.

Unfortunately there is one example only in Dr. Leith's collection, from Sindh; and this is in a very bad condition, having the head crushed, and having been dried before it was put in spirits. However, the imbricate scales and the white cross bands are characters by which the example could be determined as a Lizard referred by Mr. Blyth* to *Homonota*, a South-American genus with narrow toes and without the double series of lamellæ. It could be predicted that *Homonota* was not the correct place for this Lizard; but as the author did not mention anything about the structure of the toes, it was not possible to assign it to its proper place. It is one of those aberrant Geckoid forms with imbricate scales of which two other genera have been described within the last few years (*Teratoscincus* of Strauch, and *Geckolepis* of Grandidier); from both it is readily distinguished by important structural characters.

CYNOPHIS MALABARICUS.

A specimen was found by Dr. Leith, 51 inches long; it is much less beautifully coloured than younger examples, the white spots having disappeared, and only the black markings remaining.

PSAMMOPHIS LEITHII. (Plate XXXIX.)

Body slender; head rather narrow and pointed, distinct from neck; eye of moderate size. Rostral shield as high as broad; anterior frontals small, subtruncated in front; posterior frontals rather longer than broad. Vertical narrow, elongate, bell-shaped; nasal?; loreal large, elongate. One concave præocular, which reaches the vertical; two postoculars. Eight upper labials, the fourth and fifth entering the orbit. Temporals 1+2+3. Scales lanceolate, smooth, in seventeen rows. Ventrals 168, not keeled; anal entire; subcaudals 98. Ground-colour of the upper parts light reddish olive; trunk with four brown longitudinal bands edged with black; the two middle (dorsal) bands extend forwards to the end of the snout, run-

* I have to apologize to Mr. Jerdon for having assigned the determination and description of "*Homonota fasciata*" to him instead of to Mr. Blyth, who intercalated it into a paper of Mr. Jerdon's (Rept. Brit. Ind. p. 90).

ning along the occipital and supraocular shields; a narrow brown line along the median line of the vertical shield and occipital suture. The dorsal bands of the trunk are confluent into one on the tail. The lateral band runs from the nostril along the loreal, through the eye, occupying the second outer series of scales and the adjacent halves of the nearest series; it gradually disappears on the tail. The lower half of the outermost series of scales and the abdomen white; lower labials, throat, and foremost ventrals slightly marbled with blackish.

A single example, with the head much damaged, has been obtained in Sindh; it is 26½ inches long, the tail being 8½ inches, and the head ¾ inch.

III. *Descriptions of Species discovered by Mr. Barnes.*

Dendrophis caudolineolata. (Plate XL. fig. 1.)

This is the Ceylonese representative of *D. caudolineata*. Scales in thirteen rows, those of the vertebral series conspicuously larger than the others. Head as in *D. picta*; eye rather large. Loreal longer than high. The præorbital touches the vertical; occipitals obtusely rounded behind. Two postoculars. A large temporal shield in contact with the postoculars. Eight upper labials, the fourth and fifth entering the orbit. Ventrals 149, strongly keeled; anal bifid; subcaudals 125. Brownish, with green metallic lustre; sides of the anterior part of the trunk with oblique narrow black streaks; every second and third ventral shield with a blackish line on the upper margin; these markings are confluent into a black line on the hinder part of the trunk and tail; a pair of similar dorsal lines make their appearance in the same region as the lateral, running along the back of the tail; a black line along the meeting edges of the subcaudals, and indistinctly continued for some distance along the median line of the abdomen. A horizontal black temporal streak.

Mr. Barnes obtained one example, 24 inches long; and a second smaller one was purchased for the British Museum a short time ago.

Dipsas barnesii. (Plate XL. fig. 2.)

Body much compressed and very slender; head broad, depressed, short; neck very slender; eye rather large. Palatine teeth not enlarged; the last maxillary tooth feeble but grooved. Loreal as high as long; three præoculars, the uppermost not reaching the vertical; two postoculars. Eight upper labials, the fourth and fifth entering the orbit. Temporals numerous, scale-like. Scales in nineteen rows, those of the vertebral series not quite twice the size of those in the series adjoining. Ventrals 219; anal entire; subcaudals 98. Dark grey, finely powdered with brown; irregular brown band-like markings on the back, and irregular black spots along the lower part of the sides; abdomen finely mottled with brown. Head dark brown above; a dark band from the eye to the angle of the mouth; throat white.

One example, 23 inches long, was obtained by Mr. Barnes.

RICOLA, Jerdon.

t by Mr. Barnes from Ceylon agrees well with
Mr. Jerdon, who obtained his examples

urus fulgens.

MPSON, M D.

(Plate XLI.*)

s called by the Bhoteahs *Wook Dongka*, and by
cŭm; but the name "*Wah*," by which it is usually
turalists, I have never heard applied to it. Possibly
be the Nepalese term, though I have never been able to
ain it. It might be worth while to consult Mr. Hodgson on
e point, as I believe he has described the animal. It is usually found at an elevation of about 7000 to 9000 feet above the sea, and lives chiefly in trees in dense forests. I have never succeeded in getting the specimens which I had to eat animal food in any shape. They were fed chiefly on milk and rice, and browsed freely on grass and bamboo-leaves. Rose-leaves and peaches seemed also to be a favourite food with them. They drank the milk much more eagerly if a little sugar were mixed with it.

As far as I have been able to ascertain, this animal is unknown in the Himalayas of the North-west—but to my certain knowledge extends to the extreme east of the range, as in the beginning of 1868, when on the north-east frontier, I saw several natives (Mishmees) whose caps were made of the skin of the *Ailurus*. Dr. J. Anderson also informs me that skins were brought to him by the inhabitants of the countries through which he passed on his way to Bhamo, showing that it exists in those regions also. The animal's cry is very peculiar. When attacked or angry, it rises on its hind legs like a bear and emits a sound which can be very easily imitated by opening the mouth and drawing in the breath through the nose several times in quick succession; in fact it is a series of *snorts*, if I may use the expression. The usual cry of the animal, however, is quite different; it is very like the chirping of a bird, or a series of short whistles. The only other particular regarding the animal which I will here mention is its power of emitting a strong odour of musk when excited.

6. Additional Notes on the Genus *Ceyx*.

By R. B. SHARPE.

As I stated in my recent paper on this genus (P. Z. S. 1868, p. 587), I had been in correspondence with Count Salvadori, of

* The figure is taken from Mr. Wolf's drawing of the individual brought home by Dr. Simpson, and now living in the Society's Gardens (Nov. 11th).—P. L. S.

Turin, on the subject of these birds; for, curiously enough, we had been each of us, unknown to the other, gathering materials for a monograph of the genus. In November last I had the honour to lay before the Society the results of my labours; but, as is so often the case even with the most painstaking ornithologist, no sooner had I published my paper and finished, as I hoped, satisfactorily, than specimens reached me which entirely overthrew my conclusions, and obliged me to recommence my studies afresh.

It may be as well to recapitulate the leading facts of my arrangement of the genus *Ceyx*. I proposed to divide it into two sections, viz. those with the head lilac-rufous, and those with the head black-spotted or banded with cobalt. I have little to say with regard to the birds included in the latter section; but concerning the rufous-headed *Ceyces* I find it necessary to add a few remarks. I admitted four species belonging to this section, as well characterized and distinct, viz. *C. rufidorsa*, Strickl., *C. dillwynni*, Sharpe, *C. tridactyla* (Pall.), and *C. melanura*, Kaup. As to the specific distinctness of these species I entertained no doubt, and fondly imagined that the last point of the *vexata quæstio* of the true *Ceyx tridactyla* had been settled. Scarcely, however, had I congratulated myself on this happy result when I received from Lord Walden a specimen of a rufous-headed *Ceyx* which completely upset my equanimity. I had taken the blue spot on the side of the neck as a good characteristic whereby to separate the rufous-headed *Ceyces* into two subsections, viz. those which possessed this blue spot, and those in which it was absent. In *C. rufidorsa* and *C. dillwynni* it is not found. Both Count Salvadori and myself had never seen the true *Ceyx rufidorsa* from Malacca, and Strickland's type was at that time inaccessible, as the collection was packed up at Cambridge awaiting its removal into the museum of that town. We had, however, concluded that the Sumatran bird, of which we had seen several, was identical with the Malaccan; and Strickland's description seemed to confirm this view. The first specimen from the Malayan peninsula that I had seen was kindly lent me by Lord Walden, and on its receipt I rather hastily concluded that this *must* be the true *C. rufidorsa* of Strickland. It was a bird with a blue ear-spot and black scapularies; and there is nothing in Strickland's description that would lead one to suppose that his *C. rufidorsa* possessed neither of these characters. Here is his diagnosis*:—

"CEYX RUFIDORSA, Strickland.

"C. *capite, dorso, tectricibus caudaque totis læte rufis, splendore lilacino variantibus; corpore subtus aurantio-flavo, mento albo, loris et macula aurium obscure cæruleo-nigra.*

"This species, which also occurs at Malacca, is very closely allied to the last [*C. tridactyla*], but differs in having the beak larger in all its dimensions, and in having the whole back and wing-coverts, as well as the crown, rump, and tail, rufous, with a brilliant lilac tint. The dark blue spot on the front and ears is much less marked than

* P. Z. S. 1846, p. 99.

in *C. tridactyla*. Lower parts orange-yellow; chin white. This bird was supposed by Pallas, in his 'Spicilegia Zoologica' (part 6, p. 13), to be the female of *C. tridactyla*. It is figured by Messrs. Jardine and Selby, in the 'Illustrations of Zoology' (ser. 1, pl. 55, fig. 2), as *C. tridactyla*."

In the type, as in all other specimens of *C. rufidorsa* which I have examined, I have never seen any auricular blue spot; and I consider that, considering this character is clearly designated in Strickland's description, and the scapularies are not distinctly stated to be rufous (in which case the reader would infer that they did not differ from *C. tridactyla*), it was not wonderful if we supposed Lord Walden's specimen (from Malacca, whence Strickland's type came) must be the true *C. rufidorsa*. The only point which prevents it agreeing with Strickland's diagnosis is that the centre of the back of the Malaccan specimen has a trace of black, and on one feather a blue lustre is apparent. The greater portion of the back, however, is rufous.

Believing that I had been misled in my former paper, I asked and obtained Lord Walden's permission to send over the Malaccan specimen, along with the type of my *C. dillwynni* and all my other *Ceyces*, to Count Salvadori, in order that he might be able to examine the whole quostion for himself and correct the mistake. My friend agreed with me in my conclusions; and shortly after appeared his paper in the 'Atti' of the Turin Natural-History Society, on which I desire to make a few remarks.

The species admitted by Count Salvadori and by myself are as follows:—

Salvadori.	Sharpe.
1. *Ceyx melanura*, Kaup.	1. *Ceyx melanura*, Kaup.
2. —— *tridactyla* (Pall.).	2. —— *tridactyla* (Pall.).
3. —— *rufidorsa*, Strickl.	3. —— *rufidorsa*, Strickl.
4. —— *dillwynni*, Sharpe.	4. —— *dilwynni*, Sharpe.
5. —— *sharpii*, Salv.	5. —— *cajeli*, Wall.
6. —— *innominata*, Salv.	6. —— *wallacii*, Sharpe.
7. —— *cajeli*, Wall.	7. —— *lepida*, Temm.
8. —— *wallacii*, Sharpe.	8. —— *europygialis*, Gray.
9. —— *lepida*, Temm.	9. —— *philippinensis*, Gould.
10. —— *solitaria*, Temm.	10. —— *solitaria*, Temm.

It will thus be seen that Count Salvadori admits the same number of species as myself, but arrives at this conclusion in a different manner. *C. melanura*, *C. tridactyla*, *C. dillwynni*, *C. cajeli*, *C. wallacii*, *C. lepida*, and *C. solitaria* are admitted by both of us to be clearly characterized species. His *C. rufidorsa* is Lord Walden's Malacca bird; and *C. sharpii* is a new species from Borneo, which he did me the honour to name after me. *Ceyx innominata* of Salvadori = *C. rufidorsa*, auct., and of my paper. He also unites *C. europygialis* to *C. lepida*, a point on which I am inclined to agree with him; and, lastly, he refers *C. philippinensis* to the genus *Alcyone*. On this subject I have already expressed myself in my

paper on the latter genus; I think that it is correct to class these two species together, but I should prefer that they were considered aberrant *Ceyces* instead of aberrant Alcyones. On the receipt of Count Salvadori's paper, an early copy of which he had the goodness to send me, I wrote to him expressing my admiration of the elaborate way in which he had worked out the genus, only adding that, although I believed he had taken the right view of the case, I trusted an examination of Strickland's type would confirm his conclusions.

As, however, I did not consider the matter settled until I had examined for myself the type of Strickland's *C. rufidorsa*, I went to Cambridge as soon as the collection was arranged, on purpose to satisfy myself on this point. Every facility was kindly afforded me by Mr. J. W. Clark, the Superintendent of the Museum, and I had no difficulty in discovering the bird I wanted to see. I was at once astonished to find that Strickland's *C. rufidorsa* was the *C. rufidorsa* of authors, and that, after all, *C. innominata* must give way, and be added as a synonym. But, then, what could the bird which we had taken to be the true *C. rufidorsa* really be? This I could not determine for a long time; but on further comparison I found that it must be the young bird of *C. tridactyla* (Pall.). This never struck me before; and because I was bent on noticing the points of difference between the bird and *C. dillwynni* and *C. rufidorsa*, auct., I had never compared it with *C. tridactyla*.

It now remains only to clear up the confusion which exists with regard to the rufous-headed *Ceyces* resulting from the above error, for which, however, I blame myself especially, as it was originally my suggestion to Count Salvadori. My previous paper may be taken as a correct exposition of the synonymy of the various *Ceyces*; for the mersion of *C. uropygialis* in *C. lepida*, and the separation of *C. philippinensis* as an *Alcyone*, are questions which a further knowledge of the birds and a further acquisition of specimens alone can satisfactorily determine.

A new synoptical arrangement of the rufous-headed *Ceyces* is necessary; and it seems to me that Count Salvadori has grasped the salient points of difference in his "clavis" of the different species.

A. Capite et uropygio lilacinio: rostro corallino.
  a. Macula ad latera colli cærulea nulla.
    a'. Scapularibus lilacinis.
      a''. Tectricibus alarum rufis, haud cæruleo lavatis ..... *C. rufidorsa*.
      b''. Tectricibus alarum nigris ac rufis, cæruleo lavatis ..... *C. sharpii*.
    b'. Scapularibus nigris cæruleo lavatis ..... *C. dillwynni*.
  b. Macula ad latera colli cærulea.
    a'. Major: interscapulio et scapularibus rufis ..... *C. melanura*.
    b'. Minor: interscapulio et scapularibus nigris cæruleo lavatis ..... *C. tridactyla*.

For the arrangement of the blue-backed section, see my paper (P. Z. S. 1868, p. 587) and that of Count Salvadori (Atti R. Accad. Torino, iv. p. 440).

Granting, then, that my synonymy of the above species is correct, we have the following additions to make:—

1. CEYX RUFIDORSA, Strickl.; Sharpe, P. Z. S. 1868, p. 592.

Ceyx innominata, Salv. Atti R. Accad. Tor. 1869, p. 459.

2. CEYX SHARPII, Salv. Atti R. Accad. Tor. 1869, p. 463.

Ceyx tridactyla, Reich. Handb. *Alced.* p. 8, t. ccccciii[b]. fig. 3388 (nec fig. 3389).

Count Salvadori has most kindly sent over the types of this new species for my inspection; and, as far as I can see, it is sufficiently distinct. The only species with which it can be confounded is *Ceyx dillwynni*; and I confess there is some chance of its ultimately proving to be identical with this latter bird. It is evident, from the case of *C. tridactyla*, that these little *Ceyces* are a long time gaining their adult plumage; and at present *Ceyx sharpii* only differs from *C. dillwynni* in the scapularies and wing-coverts. In neither of the type specimens of *C. sharpii* are the wing-coverts entirely black washed with blue; in both a rufous feather is to be seen here and there. In *C. dillwynni* the wing-coverts are rufous for the most part, but here and there a black feather appears. The scapularies also have a mixture of rufous on some of the feathers; and in *C. sharpii* there is an admixture of black below the rufous. If, however, we merge the two species, we must admit that the rufous scapularies are the adult stage—a process exactly opposite to that exhibited by the analogous species *C. tridactyla*. It is evident that many more specimens are necessary to solve the riddle satisfactorily; and until we get them we must be satisfied with the evidence before us, which certainly makes *C. sharpii* a distinct species.

3. CEYX DILLWYNNI, Sharpe, P. Z. S. 1868, p. 593; Salv. Atti R. Accad. Torin. 1869, p. 461.

4. CEYX MELANURA, Kaup; Sharpe, P. Z. S. 1868, p. 594; Salv. Atti R. Accad. Torin. 1869, p. 453.

5. CEYX TRIDACTYLA (Pall.); Sharpe, P. Z. S. 1868, p. 593.

Ceyx rufidorsa, Strickl. apud Salv. Atti R. Accad. Torin. 1869, p. 459.

7. Remarks on some of the Fishes in the Calcutta Museum. By Surgeon FRANCIS DAY, F.Z.S. & F.L.S., Madras Army.—Part I.

Having obtained leave, through Col. Strachey, F.R.S., to remain a limited period in Calcutta for the purpose of examining the fishes in the Government Museum, and having at the same time had access

to Buchanan-Hamilton's original drawings, I am enabled to lay the results of some of my investigations before the Zoological Society.

The collection of fishes is extensive and exceedingly interesting. Its nucleus was formed by the Asiatic Society of Bengal; while amongst the contributors to it were Dr. M'Clelland, and more especially Mr. Blyth, most of whose type specimens I have thus had the opportunity of examining. It is not unlikely that some few of the fishes, such as the *Barbus sophore*, may have been derived from Buchanan-Hamilton's collection—my reason for asserting this being that the specimen is evidently very old, whilst the species was never, I believe, recognized by M'Clelland or Blyth. The typical collection presented to the British Museum by Mr. Waterhouse does not appear to have possessed it. In the following paper I have described some species said to be "insufficiently known," as well as others which appear to be new.

SERRANUS LANCEOLATUS, Bloch.

Serranus horridus, C. & V.

In the 'Proceedings of the Zoological Society,' 1865, p. 6, and again in my 'Fishes of Malabar,' p. 4, and plate 1. figs. 1 & 2, I gave my opinion that the adult form of this species is identical with that termed *S. horridus*, C. & V. Dr. Günther, however, in the 'Fishes of Zanzibar,' p. 4, holds a different opinion, and observes:—"Mr. Blyth was the first to refer *lanceolatus* as a synonym to another species, namely *S. coides*, H. B. (=*S. serillus*, C. & V.) (J. A. S. Bengal, xxix. p. 111). Mr. Day, without referring to this paper, also represents *lanceolatus* as a young *Serranus*, but takes it to be that of *horridus*, K. & v. H. We may remark at once, to judge from the figure given by Mr. Day, that this appears rather improbable, and he does not explain, or even notice*, the difference in the length of the dosarl spines in the two fishes;" and concludes by remarking, "we do not venture to say what the species stated by Mr. Day to be the old state of the *lanceolatus* may prove to be" (p. 5). Had a name been given, it would, in my opinion, only have added one more synonym to the *S. lanceolatus*.

I overlooked the note of Mr. Blyth thus referred to, until after my work had been printed. To find short remarks on species in a work destitute of an index is always difficult. Thus Dr. Günther, in vol. iii. of his catalogue, dated July 1861, places the three following species of Mr. Blyth amongst his doubtful ones—*Gobius breviceps*, Blyth, *Periophthalmus fuscatus*, Blyth, and *Salarias olivaceus*, Blyth; but in the year 1860 Mr. Blyth had already stated them to be *Gobius albopunctatus*, C. & V., *Periophthalmus papilio*, Bl. Schn., and *Salarias lineatus*, C. & V. (J. A. S. Bengal, xxix. pp. 111, 147, 111). I only mention these instances to show how the most accurate observers may overlook casual remarks.

* Dr. Günther has overlooked the following observation I made at p. 5 in the 'Fishes of Malabar':—"In young specimens the proportionate height of the dorsal spines (as in some other *Serrani*) is greater than in the adult."

In Madras, during the last two years, I have obtained several of the young *S. lanceolatus*, and on dissection discovered that cæco-pyloric appendages were invariably absent. I was in hopes of obtaining the adult form to dissect, but in this I have been disappointed. On the other hand, I have now had the opportunity of personally examining Mr. Blyth's specimens, and commence answering the before-mentioned criticism by objecting to the words after *S. coides*, H. B. (= *S. serillus*, C. V.). I admit, *S. coides*, H. B., and *S. serillus*, C. V., are identical; but Mr. Blyth's specimens turn out to be the same as the one I have figured as *S. horridus*, which is *certainly not S. serillus*, C. & V.

Some of the specimens in the Calcutta Museum are as follows; the others offer no particulars calling for notice:—

a. *S. lanceolatus*, 4 inches long, stuffed, presented by the Madras Museum. Coloration as shaded in Bloch & Russell's figures.

b. A stand of three specimens, collected by Mr. Blyth to demonstrate his views, and marked in his own handwriting. In Mr. Blyth's deductions I most entirely concur, only objecting to his name *S. coides*, H. B.; for the adult is identical with what I figured as *S. horridus*, C. & V.

c. 9½ inches long, still showing the markings of the immature; but the yellow portion is being broken up by bands.

d. 18 inches long, the bands on the body have disappeared, and the black bands on the fins are broken up into black blotches.

e. 22 inches long, the mature *S. horridus*, C. & V., exactly like pl. 1. fig. 2 in the 'Fishes of Malabar.'

In the museum of the Medical College in Calcutta, I had an opportunity of examining another fine collection of stuffed fish, mostly brought together by the late Dr. Walker. Amongst them is a beautiful specimen of the adult *S. horridus*, C. & V., 34 inches in length.

I have not deemed it necessary to advert to the specimens Captain Mitchell sent to the British Museum; the number of cæco-pyloric appendages in the *S. serillus*, C. & V., and *S. bontor*, C. & V., at once show they cannot be the adult *S. lanceolatus*, Bloch. Probably Captain Mitchell only gave his opinion after reading Mr. Blyth's paper, which is incorrect, as the species he terms *S. coides*, H. B., is the one which I have figured as *S. horridus*, and amongst Hamilton Buchanan's MS. drawings I find an unfinished sketch of his *S coides*, which at once shows it to be the same as *S. serillus*, C. & V.

Thus a personal inspection of the specimens in the Calcutta Museum has distinctly proved that the species I figured as the adult *S. lanceolatus*, Bloch, is identical with what Mr. Blyth considered to be the mature one. It therefore appears the more likely to be a correct conclusion, having been come to by two different persons in distant places, who were ignorant of each other's investigations, which were made from two distinct series of specimens. Only one thing appears to be now requisite, namely, to examine whether the *S. horridus*, C. & V., has or has not cæco-pyloric appendages, as at present

its external conformation in every respect shows it to be the mature *S. lanceolatus*, Bloch.

Whilst mentioning this question of cæcal appendages, I may observe that the following are the numbers which I have found existing in specimens in Madras during the last two years:—

S. serillus, C. & V., and *S. bontor*, C. & V., from 50 to 60; *S. hexagonatus*, 32; *S. sonnerati*, C. & V., 12 to 13; *S. cyanostigmatoides*, Bleeker, 12.

MESOPRION THERAPON, sp. nov.

B. viii. D. 10/14. P. 15. V. 1/5. A. 3/8. C. 18. L. l. 54. L. tr. 6/17.

Length of head $\frac{1}{3\frac{1}{3}}$, of pectoral fin $\frac{2}{9}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{1}{4}$, of body $\frac{1}{3}$ of the total length.

Eyes. Diameter $\frac{2}{9}$ of the length of head, $1\frac{1}{2}$ diameter from end of snout, 1 diameter apart.

The posterior extremity of the maxilla extends to beneath the anterior margin of the orbit. Preopercle with a wide open notch, its vertical margin finely serrated.

Teeth villiform, with a pair of canines on either side of the middle of the upper jaw, the external being very large; an outer enlarged row in the lower jaw, the largest being posterior; a triangular villiform patch on the vomer; and a band on the palate.

Fins. Third dorsal spine the longest. Pectoral pointed. Third anal spine slightly the longest and strongest. Caudal lobed.

Colours. In spirit, whitish, with six black horizontal bands from the head along the body, and six short, badly marked, vertical ones from the dorsal fin, the crossing of the two sets forming large white spots on the upper third of the body. A deep-black mark at the base of the caudal fin. A white band across the occiput, which is continued over the preopercle. Fins stained grey.

One specimen, 6 inches long, from Ceylon, and a second, 9 inches long, from the Andamans.

DIAGRAMMA ALTA, sp. nov.

B. vi. D. 14/16. V. 1/5. A. 3/7. C. 15. L. l. 59. L. tr. 10/24.

Length of head $\frac{3}{7}$, of pectoral $\frac{2}{11}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{3}{4}$, of body nearly $\frac{1}{2}$, of dorsal spines $\frac{1}{6}$, of dorsal rays above $\frac{1}{8}$, of anal spines $\frac{1}{6}$ of the total length.

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

Body elevated and strongly compressed.

Preopercle serrated, most coarsely towards its angle. The posterior extremity of the maxilla extends to below the anterior third of the orbit. A few small pores exist under the mandible.

Teeth villiform, without canines.

Fins. Dorsal spines strong, the third and fourth the longest, interspinous membrane rather deeply notched. Second anal spine much the longest and strongest. Caudal truncated.

Scales ctenoid.

Colours. Purplish on the body; tips of the dorsal spines, outer third of dorsal and anal rays, as well as the caudal fin, white.

Two specimens, nearly 4 inches long, in the collection, but no notice where they came from. I have since procured the species at Akyab.

AMBASSIS NOTATUS, Blyth, J. A. S. of Bengal, 1860, p. 138, is the *A. baculis*, H. B.

BOGOTA INFUSCATA, Blyth, *l. c.* p. 139.

D. $10|\frac{1}{10}$. V. 1/5. A. 3/8. C. 17.

Preopercle strongly serrated, with large teeth at its angle. A spine directed backwards, apparently on the subopercle. A long spine on the opercle.

Preorbital entire. Lower jaw the longest.

Teeth. In the jaws, villiform.

Fins. Second anal spine the longest.

Scales. None visible now.

Colours. Brownish-black, except the fins, which are of a dirty yellowish-white.

The specimen is half an inch long and in a very bad condition. The occiput is broken across; in fact, it is too damaged to describe from. One thing is evident, that it does not belong to the genus *Ambassis*; it may be the fry of a species of *Priacanthus*.

AMPHIPRIONICHTHYS ZEYLONENSIS, sp. n.

B. iv. D. 7/14. P. 13. V. 1/2. A. $\frac{2}{11}$. C. 15.

Length of head $\frac{1}{3}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{2}$ of the total length.

Eyes. Upper surface, near the profile, 1 diameter apart, $1\frac{1}{2}$ diameter from end of snout.

Body elevated and strongly compressed, head slightly depressed.

Mouth anterior, jaws of equal length. Preorbital with a strong spine directed backwards. Preopercle with five spines, the two lowest the longest. Opercle very narrow, having two badly marked spines. A serrated ridge passes from the back of the orbit towards the occiput. Gill-membranes not entirely covered by the opercles.

Teeth. Villiform in jaws, none on vomer or palate.

Dorsal fin has a notch between its two portions.

Body and head studded with minute prickles. Lateral line distinct.

Colours. Bluish along the upper half of the body, becoming dirty-brown on the abdomen. An irregular series of about eight yellow blotches along the back, increasing in numbers towards the abdomen. Fins light-coloured.

Three specimens, up to $2\frac{1}{2}$ inches in length, are in the collection. They were dredged up off Galle by Dr. J. Anderson.

CORVINA CUJA, Ham. Buch.

Sciænoides asper, Blyth, J. A. S. of Bengal, 1860, p. 140.

The typical specimens of Mr. Blyth's species are six in number, and up to 2 inches in length. They are the fry of a *Corvina*, and, it appears to me, of the *C. cuja*.

OTOLITHUS RUBER, Schn.

Otolithus submaculatus, Blyth, J. A. S. of Bengal, 1860, p. 141.

The four specimens in the Calcutta Museum, up to $6\frac{1}{2}$ inches in length, and which are marked *O. submaculatus*, Blyth, belong to this species.

BOLA PAMA, Ham. Buch.

Sciænoides hardwickii, Blyth, J. A. S. of Bengal, 1860, p. 139.

The three typical specimens are up to $2\frac{3}{4}$ inches in length, and appear to be the fry of the *B. pama*, H. B.

GOBIUS GOBIODON, sp. nov.

D. $6\left|\frac{1}{8}\right.$. P. 21. A. 10. C. 15. L. l. 22.

Length of head $\frac{1}{3}$ of length of body. Height of body $\frac{1}{3}$ of total length.

Eyes in anterior half of the head, $\frac{1}{2}$ a diameter from end of snout, $1\frac{1}{2}$ diameter apart.

Form of body similar to that of the genus *Gobiodon*.

Anterior portion of head and lower jaw covered with warty tubercles. Anterior cleft of mouth very oblique; the posterior extremity of the maxilla does not extend to under the anterior margin of the orbit. Gill-openings narrow, and only opposite the base of the pectoral fin.

Teeth. Villiform in both jaws, with a posterior canine in the centre of the lower jaw.

Fins. Ventrals united, not adherent to the abdomen. Caudal rounded; none of the rays produced, nor those of pectoral silk-like.

Scales ctenoid, extending anteriorly to opposite the middle of the first dorsal fin, and in a line between that situation and the base of the pectoral. Nine rows between the anterior portion of the base of the second dorsal and that of the anal fins.

Colours. Brownish. Ventral fin blackish, with a reddish margin. Caudal reddish.

Hab. Andamans or adjacent islands. Seven specimens, up to $1\frac{3}{10}$ inch long, in the Calcutta Museum.

BOLEOPHTHALMUS INORNATUS, Blyth, J. A. S. of Bengal, 1860, p. 168, is the *B. pectinirostris*, Gmelin.

PERIOPHTHALMUS SCINTILLANS, Blyth, J. A. S. of Bengal, is the *Periophthalmus koëlreuteri*, Pallas.

ELEOTRIS FELICEPS, Blyth, J. A. S. of Bengal, 1860, p. 146.

D. $6|\frac{1}{10}$. P. 15. V. 1/5. A. 11. C. 13. L. l. 27.

Length of head $\frac{1}{4}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{1}{5}$ of the total length.

Eyes approximating, 1 diameter from end of snout.

Head slightly depressed; snout pointed.

Lower jaw the longest. Cleft of mouth small; the maxilla only extends halfway to below the orbit.

Teeth villiform.

Fins. Dorsal spines filiform, central caudal rays the longest.

Scales cycloid as far as the base of the anal fin, where they become strongly ctenoid. Scales extend as far forwards as the posterior margin of the orbit, and cover the cheeks and opercles. Twelve rows exist between the second dorsal and anal fins.

Colours. Brownish-white, irregularly spotted and blotched with a darker colour. Dark bands pass downwards from the orbit. Fins more or less spotted.

One specimen exists, received from the Andamans, where it was collected by Captain Hodges.

ELEOTRIS FUSCA, Bloch.

E. incerta, Blyth, J. A. S. of Bengal, 1860, p. 146.

Three typical specimens of the latter in the museum are identical with *E. fusca*.

ELEOTRIS CAVIFRONS, Blyth, J. A. S. of Bengal, 1860, p. 145.

D. $6|\frac{1}{8}$. P. 13. V. 6. A. 8. C. 13. L. l. 65. L. tr. 17.

Length of head $\frac{2}{7}$, of pectoral $\frac{2}{11}$, of caudal $\frac{1}{5}$ of the total length. Height of the head $\frac{1}{7}$, of body $\frac{1}{5}$, of first dorsal $\frac{2}{15}$, of second dorsal $\frac{2}{13}$, of anal $\frac{1}{6}$ of the total length.

Eyes. Diameter $\frac{1}{6}$ of length of head, $1\frac{1}{2}$ diameters from end of snout, 2 diameters apart.

Body subcylindrical; head depressed. A deep sulcus before the orbits. Snout rather elevated.

Lower jaw the longest. The posterior extremity of the maxilla extends to under the posterior margin of the orbit.

Teeth villiform, with an outer enlarged row, which are more numerous in the lower than in the upper jaw.

Fins. Caudal wedge-shaped.

Colours. Light brown; dark lines radiate from the orbit. Fins barred in spots.

Six specimens, up to 4 inches in length, exist in the Museum. They were received from Captain Hodges, who procured them at the Andamans.

ELEOTRIS SCINTILLANS, Blyth, J. A. S. of Bengal, 1860, p. 146.

One specimen, in rather a damaged state, exists in the museum.

It agrees in appearance with *E. ophiocephalus*, but has small scales on the nape, and otherwise corresponds with *E. cantoris*, Günther, excepting that it has a black ocellus at the upper part of the caudal fin. The specimen, however, is only $2\frac{1}{8}$ inches long; so the ocellus may be a mark of its being immature.

AMBLYOPUS CÆCULUS, Bloch.

Amblyopus cirrhatus, Blyth, J. A. S. of Bengal, 1860, p. 147.

The typical specimen, $8\frac{1}{2}$ inches in length, is in the collection.

SALARIAS DUSSUMIERI, C. & V.

Specimens of this species are labelled *S. olivaceus*, Blyth. Whether the latter name should be considered a synonym of *S. lineatus*, C. & V., as stated by Mr. Blyth, or of *S. dussumieri*, C. & V., as shown by the typical specimens, must be doubtful, unless, by some accident, the label had been placed on the wrong bottle of specimens, as is not improbable.

SALARIAS LEOPARDUS, sp. n. *

D. 12/12. P. 15. V. 4. A. 2+13. C. 11.

Length of head $\frac{2}{7}$, of pectoral $\frac{2}{9}$, of base of first dorsal a little above $\frac{1}{3}$, of base of second dorsal $\frac{2}{9}$, of caudal $\frac{2}{9}$, of anal $\frac{2}{9}$ of the total length. Height of head $\frac{2}{7}$, of body above $\frac{1}{3}$, of first dorsal $\frac{1}{6}$, of second dorsal $\frac{1}{8}$, of ventral $\frac{1}{6}$, of anal $\frac{1}{7}$ of the total length.

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

Head large, with a transverse crest of tentacles crossing the occiput, and a fringed orbicular tentacle half as long as the eye. Lips thick and fringed, having two bifid tentacles on either side of symphysis of the lower jaw. The posterior extremity of the maxilla extends to below the anterior margin of the orbit. Gill-opening wide.

Teeth in a single row, imbedded in the gums in both jaws. No canines.

Fins. A notch between the two dorsals; the second dorsal is not continued on to the caudal; the latter is cut nearly square. Two fleshy prominences anterior to the anal fin.

Lateral line curves to opposite the end of the pectoral fin, whence it proceeds direct to the centre of the base of the caudal.

Colours. Of a rich brown, becoming white on the chest, and blotched all over with black marks, leaving narrow interspaces of a lighter colour. Fins spotted.

Specimen, 4 inches long, dredged up off Galle Harbour by Dr. J. Anderson.

ANDAMIA EXPANSA, Blyth.

D. 16/18. P. 15. V. 3. A. 26. C. 9.

Length of head $\frac{2}{13}$, of pectoral $\frac{2}{13}$, of caudal $\frac{2}{11}$ of the total length. Height of head $\frac{1}{10}$, of body $\frac{1}{5}$ of the total length. The breadth of the head equals its width.

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

Body subcylindrical and compressed.

Snout rounded anteriorly. A short fringed tentacle over the posterior third of the orbit; a small, simple, nasal one. Snout with a lateral lobe, the two lips continuous, the lower forming a broad adhesive sucker behind the symphysis of the lower jaw, with a distinct posterior fold. The upper edge of the lower lip is coarsely fringed. Gill-openings wide, extending on to the lower surface of the head.

Teeth in a fine single row, implanted in the gums of both jaws. No canines.

Fins. Dorsals divided by a notch, or continuous. The first dorsal commences a short distance behind the occiput; its spines are free to a greater or less extent; in some specimens the second is the longest. The soft dorsal mostly equals in height the posterior third of the first dorsal; sometimes the second dorsal is higher than the first, but it does not appear to ever be higher than the body. Anal lower than the dorsal, all its rays free in their external half. Pectoral arises close to the gill-opening, its lower seven rays are free at their extremities. Extremity of caudal rays undivided and free.

Colours. Olive, banded with a darker shade, the bands and the ground-colour being about equal in width. Head spotted. All the fins with dark margins, except the anal, which is tipped with white.

Many specimens, up to $3\frac{1}{2}$ inches in length, exist in the Calcutta Museum. All were received from the Andaman Islands.

OSPHROMENUS NOBILIS.

Ctenops nobilis, M'Clelland, Calc. Journal of Natural History.

D. $\frac{5-6}{7-8}$. P. 12. V. $\frac{1}{5}$. A. $\frac{5}{23}$. C. 16. L. l. 28-30.

Snout elongated, lower jaw the longest, lower margin of preopercle denticulated. Preorbital large, also denticulated. Opercle entire, ending in a soft pointed extremity. Intermaxillaries very protractile. The posterior extremity of the maxilla extends two-thirds of the distance to below the anterior margin of the orbit.

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

Head acute, depressed, dorsal profile nearly horizontal.

Teeth in pointed tufts, or two incomplete rows on the margin of the intermaxillaries.

Fins. Dorsal small, situated in the posterior portion of the back. Pectoral short. Anal extending almost to the caudal, from which it is separated by a slight notch.

Scales ctenoid. Lateral line absent.

An accessory cavity exists above and behind the gills.

Colours. A white band passes from the eye to the centre of the caudal fin, a second from the pectoral along the side, and a third along the base of the anal fin.

Three specimens (not in a good state) exist, given by Dr. J. C.

Jerdon, who obtained them at Purneah. He informs me "its habitat is not *mountain-streams*, but rivers *in the plains* of Northern Bengal."

TRICHOGASTER FASCIATUS, Bloch.

I obtained a large number of specimens of this species from the Calcutta market, and was enabled to form a complete series showing how the preorbital changes with age. At 3 inches the whole of its lower margin is serrated; at about $3\frac{1}{2}$ inches the serrations become mere denticulations, fewer in number and wider apart; at 4 inches some of the specimens have the preorbital entire.

This species is given as *Trichopodus colisa* by Hamilton Buchanan, and figured at pl. 15. f. 40. The original drawing is marked *Trichopodus beje*; it may therefore be safely assumed that these two names belong to one and the same species.

Amongst the MS. drawings are beautiful coloured figures of:—the *Trichogaster lalius*, H. B., marked *T. ruber*; *Trichogaster chuna*, H. B., marked *T. vittatus*; *Trichogaster sota*, H. B., marked *T. fuscus*; *Trichogaster cotra*, H. B. marked *T. cærulescens*.

TRICHOGASTER LALIUS, H. B.

D. 16/8. P. 9. V. 1. A. $\frac{17}{13\text{-}14}$. C. 15. L. l. 24-26.

Preorbital denticulated, also the horizontal margin of the preopercle, the teething becoming gradually coarser posteriorly.

Lateral line either absent or only just visible for a few scales.

Fourteen rows of scales between the dorsal and anal fins.

This lovely little fish is the most beautiful amongst the numerous species of freshwater fishes I have ever seen. It is vertically banded with scarlet and light blue, each scale having one half of each colour. The vertical fins are banded with scarlet dots. I kept four dozen of this species in my rooms in Calcutta for six weeks, hoping, but in vain, to get a ship captain to convey them to the Zoological Society's Gardens.

TRICHOGASTER CHUNA, H. B.

D. 18/18. P. 11. V. 2. A. $\frac{19}{14}$. C. 15. L. l. 26.

Preorbital and preopercle serrated.

Lateral line only a puncture on a few scales.

Colours. A black band from the eye to the end of the caudal fin.

Only one specimen, an inch long, is in the Museum: it may be a variety of the last; but more specimens are required to decide.

There are several interesting specimens amongst the *Ophiocephalidæ* in this fine collection, a few of which deserve a passing notice.

OPHIOCEPHALUS GACHNA, H. B. (*variety*).

B. v. D. 37. A. 25. L. l. 46.

The body is banded, and has a general orange tinge. None of the teeth are enlarged. The pectoral fin reaches to above the anal, and

the ventral extends to the third anal ray. Three specimens, up to 6 inches in length, are in the collection received from Captain Godwin-Austen, who obtained them at Cherra Poonjee. Another specimen, 7 inches long, was sent by S. Teal, Esq., from Seeb Sangor, in Assam.

OPHIOCEPHALUS BARCA, H. B.

Variety *amphibius*.

This is the typical specimen of the *Bora chang*, described in the J. A. S. of B. viii. p. 550, is as follows :—

D. 52. A. 37. C. 12. L. l. 80. L. tr. 9/17.

It differs very slightly from the *O. barca* of Calcutta, and is evidently the same species. It is from Bootan.

ANABAS OLIGOLEPIS, Bleeker.

D. 16/8. P. 15. V. 1/5. A. 10/9. C. 17. L. l. 26. L. tr. $\frac{4}{9\frac{1}{2}}$.

Two specimens, 9 inches long, exist in the collection; they were obtained in the Calcutta bazar.

MASTACEMBELUS ZEBRINUS, Blyth.

D. 29/52. P. 19. A. 3/56. C. 19.

Length of head $\frac{1}{7}$ of the total length, and equal to the height of the body.

Eyes small, situated before the middle of the length of the head.

Angle of preopercle armed with three strong spinous teeth; a spine also present below and slightly before the orbit.

Colours. Olive, with bluish vertical bands alternating with golden ones. Dorsal and caudal fins banded in dots; anal with the bands of the body continued on to it. In preserved specimens the bands on the body are black.

This species is the common sort throughout British Burma, and is also found in the Irrawaddi, far above Ava.

MASTACEMBELUS ARMATUS, Lacép.

A fine specimen of the spotted variety, 14 inches long, exists in the Museum. It has a single row of large black spots along the base of the dorsal fin; no bands exist on its sides. D. 38/70. It was obtained from the Calcutta bazar.

GLYPHIDODON NOTATUS, sp. n.

D. $\frac{13}{13}$. P. 19. V. 1/5. A. 2/13 L. l. 30. L. tr. 5/12.

Length of head $\frac{1}{4}$, of pectoral $\frac{2}{9}$, of caudal above $\frac{2}{9}$ of the total length. Height of head $\frac{1}{4}$ of the total length.

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

Body oval, compressed. Opercles entire.

Teeth in a single row.

Fins. Third dorsal spine the longest, rays much longer than the spines. Ventral does not extend to the anal, the second spine of the latter the longest. Caudal deeply forked.

Scales ctenoid; small ones exist over the soft dorsal and anal fins. Lateral line ceases opposite the middle of the soft dorsal, but is again continued, in the form of a round hole in the middle of each scale, along the central line of the body.

Colours. Brownish, each scale with a light centre. White bands cross from the back to the abdomen; the first passes from the first dorsal spine to the base of the pectoral fin, the second from the middle spine to the base of the ventral, the third from the last three spines to the anal, the fourth over the free portion of the tail at the end of the soft dorsal fin. A black spot in the axil of the pectoral fin. Caudal whitish.

Seven specimens exist in the collection, up to $3\frac{1}{8}$ inches in length. They were received from Captain Hodges, who obtained them at the Andaman Islands.

BREGMACEROS ATRIPINNIS, sp. n.

D. 1/20 + xv. + 22. P. 21. V. 6. A. 22 + 10 + 26. C. 17. L. l. 70. L. tr. 18.

Length of the head $\frac{2}{11}$, of pectoral $\frac{2}{13}$, of caudal $\frac{2}{21}$ of the total length. Height of head $\frac{2}{11}$, of body $\frac{1}{5}$, of dorsal fin $\frac{1}{5}$, of anal $\frac{2}{9}$ of the total length.

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

Body elongated and compressed.

Posterior extremity of maxilla reaches to below the posterior third of the orbit.

Teeth in jaws, none in vomer or palate.

Fins. First dorsal consists of a single ray, which arises on the summit of the head, and is continued backwards to opposite the posterior extremity of the pectoral. First portion of the second dorsal higher than the body, its intermediate rays very low. Pectoral commences under the throat and is extended as far as the posterior third of the body. The anterior portion of the anal is not quite so high as that of the dorsal. Caudal slightly emarginate.

Scales cycloid, in parallel rows.

Lateral line absent.

Colours. Of a rich brown, becoming lighter on the abdomen. Dorsal, pectoral, anal, and caudal fins black; ventral of a dirty white.

Numerous specimens, up to 5 inches long, presented by Major Tickell in 1864, probably from Burmah.

CYNOGLOSSUS BUCHANANI, sp. n.

D. 78. V. 4. A. 71. C. 12. L. l. 101.

Length of head $\frac{1}{8}$ of the entire length. Height of body nearly $\frac{1}{5}$ of total length.

Eyes. Upper orbit in advance of the lower. Eyes minute.

The length of the snout equals $\frac{1}{3}$ of that of the head. The rostral hook extends to beneath the posterior margin of the anterior orbit. A nostril exists between the orbits. No fringe to the lips. Mouth twisted round to the right side.

Teeth minute, and on the right side only.

Fins. Ventral fins confluent, pectorals absent.

Scales strongly ctenoid on both sides, with a dark line along their centres.

Lateral lines two, with sixteen to seventeen rows of scales between them in the widest part. Four to five rows of scales between the superior lateral line and the anterior portion of the base of the dorsal fin.

Colours. Coloured side brown, with wide irregular vertical bands.

Two specimens exist in the Museum. One is 4 inches in length.

PSEUDORHOMBUS ARSIUS, H. B.

D. 72. P. 12. V. 6. A. 55. C. 15.

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

Eyes. Diameter $\frac{1}{4}$ of length of head, 1 diameter from end of snout, not $\frac{1}{6}$ of a diameter apart.

Teeth. About six conical ones in the lower jaw on either side, and four in the upper.

Fins. Dorsal arises opposite the anterior margin of the orbit, it does not join the caudal; the latter is rather pointed.

Colours as described by H. B.

Dr. Günther mentions in his 'Catalogue of Fishes,' vol. iv. p. 427, that "a coloured drawing of this fish is in the collection of drawings presented by General Hardwicke to the British Museum." I find one also exists $2\frac{8}{10}$ inches in length amongst Hamilton Buchanan's MS. drawings.

This species grows to 6 or even 8 inches in length, and is common in Burmah.

SILURUS COCHINCHINENSIS, C. & V.

Silurichthys berdmorei, Blyth.

These two species, as suggested by Dr. Günther, I find to be identical, the typical specimen of the latter is $4\frac{6}{10}$ inches in length.

ARIUS SONA.

Pimelodus sona, Ham. Buch.

I believe that this species, as suggested by Dr. Günther (Cat. of Fishes, v. p. 143), is not identical with *Bagrus arioides*, C. & V., as it was considered to be by Mr. Blyth (J. A. S. of B. 1860, p. 151). Five specimens of the former and one of the latter are in the collection.

D. 1/0. P. 1/9. V. 7. A. 3/15. C. 17.

Length of the head $\frac{2}{5}$ of the total length. Height of body $\frac{1}{6}$, width of head nearly $\frac{1}{5}$ of the total length.

The maxillary cirri extend to the end of the pectoral fin, the external mandibular pair to the posterior third of the pectoral, the inner pair to the base of the pectoral. Head rugose superiorly, occipital process keeled, granulated, as long as wide at the base, and extending in a concave extremity; basal bone crescent-shaped. The superior longitudinal furrow on the head extends to opposite the end of the opercle.

Fins. Dorsal spine upwards of $\frac{1}{4}$ of the total length, serrated on both sides on its upper half, rugose anteriorly in its lower half, having a short termination. Pectoral spine rather stronger but not nearly so long, being only $\frac{1}{5}$ of the length of the head, serrated on both sides. Adipose dorsal low. Caudal lobed.

GLYPTOSTERNUM TELCHITTA, Ham. Buch.

In Hamilton Buchanan's MSS. is one of this species termed *Pimelodes ? nibriundus*. The drawing is $3\frac{1}{2}$ inches long. Six specimens exist in the collection; they are identical with the three typical specimens of *G. trilineatus*, Blyth.

In the genus *Hara*, Blyth, there are examples of the *H. buchanani*, Blyth, and *H. filamentosus*, Blyth. The species given in the 'Fishes of Malabar' as *H. malabarica*, Day, does not belong to this genus, but is a *Macrones*.

In the genus *Amblycetis*, Blyth, the two specimens of *A. mangois*, H. B., and *A. tenuipinnis*, Blyth, are identical. As to the *A. cæcutiens*, Blyth, the specimens are not in a good state; they, however, appear very similar to *A. mangois*, H. B.

EXOSTOMA ANDERSONII, sp. n.

D. $\frac{1}{8}$/0. P. 1/11. V. 6. A. 1/7. C. 15.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{6}$, of base of first dorsal $\frac{1}{12}$, of base of adipose dorsal $\frac{1}{4}$, of base of anal $\frac{1}{12}$, of caudal $\frac{1}{7}$ of the total length. Height of head $\frac{1}{10}$, of body $\frac{1}{7}$, of first dorsal $\frac{1}{10}$, of ventral $\frac{2}{13}$, of anal $\frac{1}{10}$ of the total length.

Eyes. Very minute and covered by skin, situated on the upper surface of the head, midway between the snout and posterior extremity of the opercle, whilst their space apart equals their distance from the posterior nostril. A cirrus exists between the two nostrils, which are situated close together and a little posterior to the short maxillary cirrus, which has a widely dilated base consisting of a flap of skin having a second attachment which passes to the lower lip. Mandibular cirri on a transverse line; they are rather short, but the outer pair are the longer. Lips thick and studded with glands. The isthmus is divided by a slight sulcus from the body, but is continuous with the branchial membrane. Branchial aperture narrow, not extending on to lower surface of head. Upper surface of head covered with skin. Humeral process large. Head depressed, rounded anteriorly. Mouth transverse.

Teeth flattened, in a single row in both jaws, none on vomer or palate.

Fins. Dorsal commences opposite the posterior third of the pectoral, which latter is horizontal in its external, and vertical in its internal half. Dorsal and pectoral spines enveloped in skin, the pectoral much the strongest. The external two-thirds of the ventral is horizontal, its internal third vertical; the two fins at their bases are separated by a distance asunder which is equal to two-thirds of their length. The external ray is thickened and enveloped in skin. The anal is situated midway between the root of the ventral and that of the caudal. Adipose dorsal very low, extending from opposite the posterior extremity of the ventral to the upper margin of the base of the caudal. Caudal cut square.

Lateral line passes along the middle of the body.

Colours. Deep leaden, the skin being everywhere covered by minute elevations, which during life were probably yellow.

Two specimens, 5 and 6 inches long, are in the Calcutta Museum, taken at Hotham, and presented by Dr. J. Anderson; there are also two more from Ponsee, China.

EXOSTOMA BLYTHII, n. sp.

D. $\frac{1}{6}$/0. P. 1/17. V. 6. A. 4. C. 13.

Length of head nearly $\frac{1}{5}$, of pectoral $\frac{2}{9}$, of caudal $\frac{2}{13}$ of the total length. Height of the head $\frac{1}{10}$, of body $\frac{1}{5}$ of total length.

Eyes small, on upper surface of head, and in the centre of its entire length.

Width of head equals its length.

Nasal cirri about three times as long as the orbit. Maxilla externally dilated into a fleshy appendage, but without cirri. Lips thick and reflected round the mouth. Two pairs of cirri on the symphysis of the lower jaw, placed at some distance asunder, the outer slightly the longest. Mouth inferior; snout broad.

Teeth in both jaws.

Fins. Pectoral subhorizontal, its rays plaited below, it arises under the branchial aperture, which is entirely superior. Dorsal is slightly anterior to the ventral, its spine is weak. Ventral subhorizontal. Caudal slightly forked, its lower lobe the longest.

Colours. Brown.

Two specimens, $2\frac{1}{2}$ inches long, exist in the Calcutta Museum.

EXOSTOMA LABIATUM, M'Clelland.

Glyptosternon labiatus, M'Clelland, C. J. of N. H. ii. p. 588.

D. $\frac{1}{6}$/0. P. 1/11. V. 6. A. 1/5. C. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{9}$, of body $\frac{1}{8}$ of the total length.

Nasal cirri arise between the nostrils, and reach the end of the snout. The maxillary cirrus extends to the pectoral fin. Jaws in the form of a double crescent or ∽ shape. The two lips broad and continuous, widest laterally and inferiorly. The lower lip is in the

form of one central lobe with a smaller one on either side and a short cirrus between.

Fins as in the other species.

Two specimens 4 inches long. Old Collection.

EXOSTOMA BERDMOREI, Blyth.

Blyth, Journal A. S. of Beng. 1860, p. 155.

The typical specimen is 4 inches in length, but in a very bad state. Its snout is more pointed than in the other species.

D. $\frac{1}{8}$/0. P. 1/10, A. 6.

One specimen from the Tenasserim Provinces, presented by Major Berdmore.

In the genus *Hemirhamphus* the following species exist in the Museum :—*Hemirhamphus buffonis*, C. & V., twelve specimens from the Calcutta bazar, labelled *H. striga*, Blyth ; *Hemirhamphus ectuntio*, Ham. Buch., many specimens, to 7 inches in length, labelled *H. brachynotopterus*, Blyth ; *Hemirhamphus commersonii*, C. & V., one specimen 11 inches in length, from the Calcutta bazar, and labelled *H. notatus*, Blyth.

HEMIRHAMPHUS PLUMATUS, Blyth.

J. A. S. of Bengal, xxvii. p. 288.

D. 2/13. P. 10. V. 7. A. 2/11. C. 16. L. l. 66.

In both specimens the extremity of the mandible is broken.

Length of head, in the best specimen (with the lower jaw), $\frac{2}{5}$ of the total length. Upper jaw $\frac{1}{3}$ longer than wide. Pectoral short.

Eyes rather nearer to the posterior extremity of the head than to the anterior extremity of the upper jaw, $1\frac{1}{4}$ diameter apart.

Upper surface of head flat.

Teeth in numerous villiform rows in the upper jaw, less numerous in the lower.

Fins. Ventral arises in the posterior $\frac{1}{3}$ of the length from the snout to the base of the caudal fin ; it reaches to under the base of the dorsal, which last is in advance of the anal. Caudal forked, lower lobe the longest. Upper margin of dorsal fin concave.

Lateral line in lower fifth of the body.

Colours. Bleached, silvery stripe visible.

Two specimens, 8 inches long, from Ceylon.

HEMIRHAMPHUS NEGLECTUS, sp. n.

H. ectuntio, Blyth (not Ham. Buch.).

D. 14. P. 9. V. 6. A. $\frac{2}{8-10}$. C. 15. L. l. 48.

Length of head about $\frac{1}{3}$ of the entire length, of the lower jaw (anterior to the upper) $\frac{1}{5}$ of the total length.

Eyes $2\frac{1}{2}$ diameters from end of snout, $1\frac{1}{4}$ diameter apart, $2\frac{1}{4}$ diameters from the posterior extremity of the opercle.

Upper surface of head nearly flat, and covered with pores. Upper jaw twice as long as broad at its base.

Teeth rather coarse in both jaws, none on the palate.

Fins. Ventral commences in the posterior third of the distance from the orbit to the base of the caudal fin; it is short, only extending halfway to the anal. Caudal rounded.

Colours. Silvery stripe distinct, end of mandible milk-white.

Many specimens exist, from the Calcutta bazar. This species is also found in Burmah. The specimens in the Museum are labelled "*H. ectuntio*, H. B."

November 25, 1869.

John Gould, Esq., F.R.S., in the Chair.

Mr. Sclater spoke of the condition of the various Zoological Gardens on the Continent which he had visited during the vacation, and made remarks on the new and rare animals observed in these establishments.

At Rotterdam, in the Gardens of the Zoological Society of that city, one of the chief attractions noticed was a pair of the Anoa of Celebes (*Anoa depressicornis*). These had already bred once in the Gardens, and a second calf was shortly expected. A bird which Mr. Sclater had not previously seen alive was an African Spoonbill (*Platalea chlororhyncha*).

At Amsterdam, the Gardens of the Society "*Natura artis magistra*" were found to be in their usual excellent state of arrangement and condition. One of the best living series lately brought together here was that of the genus *Bos* and its immediate allies, amongst which were examples of the male, female, and young of *Bos sondaicus*.

The Zoological Gardens of Hamburg, now under the direction of Dr. F. Hilgendorf, C.M.Z.S., had recently acquired specimens of many very interesting and little-known species, amongst which might be specially noticed examples of *Bassaris astuta* and *Tapirus indicus*, and a pair of *Otocyon delalandii*, all formerly represented in the Society's collection, but not now. A fine male Kudu (*Strepsiceros kudu*) seemed to be in excellent condition, but was, unfortunately, without a mate. The rarest bird in the collection was, perhaps, *Numida vulturina*, represented by two specimens. Two examples of the rare West-African Monkey *Cercopithecus erythrogaster** had been likewise recently obtained, but had died and were now in the Museum of the city.

The Zoological Gardens of Berlin were about to be disconnected from State control, and to become the property of a new Society, whereby large means would be obtained for their augmentation and improvement. Dr. Bodinus, now Director of the Gardens at Co-

* Gray, P. Z. S. 1866, p. 168, t. xvi.

logne, had accepted the post of Director of the new establishment, which seemed likely to become one of the most flourishing institutions of the sort on the Continent.

In the Zoological Gardens of Cologne Mr. Sclater had likewise seen much that was of interest, including breeding pairs and young of *Crax yarrelli* and *Dendrocygna arborea*.

The well-known Gardens of Antwerp, under the care of M. Vekemans, F.Z.S., remained unrivalled as regards their collection of Antelopes and breeding *Phasianidæ*. Amongst the former series were pairs of both Gnus (*Catoblepas gnu* and *C. gorgon*), the Kob (*Antilope unctuosa*), the Dama Antelope (*Gazella dama*), the Leucoryx (*Oryx leucoryx*), and the Bless-bok (*Damalis albifrons*); besides single specimens of the Bontebok (*D. pygargus*), the Bubal (*Boselaphus bubalus*), the Hartebeest (*B. caama*), and the Reh-bok (*A. capreolus*). There was likewise a fine male Prongbuck (*Antilocapra americana*), believed to be the only example ever brought to Europe, except that formerly in the Society's collection. This animal had regularly shed its horns during the two autumns it had passed at Antwerp, and had thus confirmed the previous observations of Mr. Bartlett and Dr. Canfield on this subject*.

The Secretary exhibited, on behalf of Mr. John Brazier, C.M.Z.S., a specimen of an egg of a species of *Megapodius* from Banks's Island, and read the following notes by Mr. Brazier concerning it:—

"The egg I send to the Society I obtained, with four other specimens, at Vavua Lavu, or the Great Island in Banks's Islands, 13° 52′ S. lat., 169° 4′ E. long., situated near the New Hebrides group. The bird is well known to the inhabitants of Banks's Island; and my specimens were purchased of a native. The Megapode that lays this egg builds its mound on the mountains near the sulphur-springs. The natives told me that the mound is large, or, as they expressed it, a 'big-fellow house.' The contents of the egg were good eating. When I was on shore collecting shells &c. at Sandwich Island, New Hebrides, a native offered me two eggs for sale, but he wanted more than I felt inclined to give him for them. I believe my friend Sir W. T. Wiseman took four or five of the very same egg, that had been brought alongside of the ship at Vavua Lavu, or Great Island. When I had bought my specimens from the native, I set out at once for the mountains to obtain, if possible, some of the birds; but it came on to rain, and, night setting in, I had to return to the ship. Our stay there was only one day, for the greater part of which it rained. I was the first naturalist that had ever landed on the island to collect specimens of natural history. I should mention that I obtained the eggs on the 21st of August, 1865. I send you one specimen; one I keep myself; and the other has gone to Mr. Krefft for our National Museum."

Mr. Sclater stated that he was not aware of any previous record

* *Cf.* Partlett, "On the Affinities of the Prongbuck," P. Z. S. 1865, p. 718, and Canfield, "On the Habits of the Prongbuck," P. Z. S. 1866, p. 105.

respecting the existence of *Megapodius* in the group of New Hebrides, except the short notes of Dr. Bennett (P. Z. S. 1862, p. 247), where he alluded to the occurrence of this form in the islands of Tanna and Sandwich. Mr. Sclater had compared the present specimen with the series of eggs of the birds of this genus in the British Museum, and found it to come nearest to that of *Megapodius pritchardi*, G. R. Gray (P. Z. S. 1864, p. 41, t. VI.), which is figured in Hartlaub and Finsch's 'Ornithology of Polynesia,' plate 2. But it was larger and more deeply coloured than that egg, and appeared to indicate the existence of an undescribed species of Megapode in Banks's Island, for which, following Mr. Gray's example, he suggested the name *Megapodius brazieri*.

The Secretary stated that, in reference to the preceding discussion as to the present existence of the Rhinoceros in Borneo, he had addressed letters to Mr. W. T. Fraser, C.M.Z.S., of Soerabaya, Java, and Mr. Pope Hennessy, Governor of Labuan, requesting them to endeavour to obtain information on the subject. From Mr. Fraser he had received the following reply, dated Soerabaya, August 30th, 1869:—

"I duly received your note of the 30th of April regarding the existence of the Rhinoceros in Borneo. There have lately been arrivals of several prahus from Koeti, and I have been able to question the crews on the matter. They tell me that the animal has often been met with in the interior, in the centre of the forests; but they say that they have not heard of any having been caught. They seem to think that it is quite impossible to obtain either skulls or teeth of the animal. I promised them a good reward if they brought me any the next time they returned from Koeti; and perhaps this may have some effect. If I hear any thing further regarding the matter, I shall immediately let you know. I believe you can accept it as a certain fact that the Rhinoceros is an inhabitant of Borneo."

The following letter was read, addressed to the Secretary by Mr. E. L. Layard, F.Z.S., dated Cape Town, October 19, 1869:—

"Sir,—The 'Proceedings of the Zoological Society' for the year 1869, Part I., reached me by this mail; and on looking through them, at page 143, in Mr. A. D. Bartlett's very interesting account of the pellets thrown up by the male Hornbill (*Buceros*) I find Mr. Bartlett stating that 'he believed' Dr. Livingstone was the first person who called attention to the singular habit of the Hornbill in imprisoning the female in her nest during the term of incubation. He refers to the 'Missionary Travels in South Africa' (p. 613). This book was published in 1857.

"If Mr. Bartlett will refer to the 'Ann. and Mag. of Nat. Hist.' (series 2. vol. xi. p. 234), published in 1853, he will find that in my 'Rambles in Ceylon' I have already noticed the fact, on equally good testimony as that of Dr. Livingstone. I do not, however, think that

I was the first to do so. If my memory serves me, when I communicated my 'wondrous tale' to my old friend and early ornithological guide, Mr. E. Blyth, he told me the circumstance was well known in India. I could, if I had time, refer to his letters still in my possession, ranging back three and twenty years, when Dr. Templeton and myself, aided by Mr. Blyth, began to work out the ornithology of Ceylon.

"I am, Sir, yours faithfully,

"E. L. LAYARD."

Mr. A. Murray exhibited some specimens of articles sold as food in the markets of Old Calabar. These consisted of examples of a species of *Pteropus* ready trussed, specimens of a rare burrowing Crustacean (*Callianassa turnerana*), and larvæ of a longicorn Beetle found in decayed palm trees.

Mr. R. B. Sharpe exhibited a specimen of a very rare Indian Kingfisher (*Alcedo grandis* of Blyth). The specimen in question had been recently obtained in the Darjeeling Terai by a shikaree in the employ of Dr. John Anderson, Curator of the Indian Museum, Calcutta. This gentleman had sent the specimen to England for Mr. Sharpe to figure in his 'Monograph of the *Alcedinidæ*.'

Mr. H. J. Elwes, F Z.S., exhibited a fine pair of horns of the Sinaitic Ibex (*Capra sinaitica*, Hempr. et Ehrenb.), obtained by Mr. Palmer during the Sinaitic survey of last year.

Mr. H. E. Dresser, F.Z.S., exhibited, and made the following remarks on, some eggs of the Little Gull (*Larus minutus*):—

"I have much pleasure in offering for inspection carefully identified eggs of the Little Gull (*Larus minutus*), together with a skin of the adult bird in breeding-plumage, obtained with the eggs, they being a portion of a series of eggs and skins of this Gull yesterday received from Russia. I am the more glad to be able to exhibit these eggs, as I have not hitherto seen authentic eggs of *Larus minutus* in any collection. I myself have for long endeavoured to obtain them, but until now in vain. When in Russia two winters ago I made careful inquiries as to the breeding-place of this bird, and was assured that it bred no nearer to St. Petersburg than the Volga or Kama rivers, and that eggs had been procured from near Perm. Last year I procured through Dr. Baldamus, the well-known German oologist, two eggs which he assured me could be nothing but those of *Larus minutus*, and which were taken near Smyrna by Herr von Gonzenbach. However, I now find that they cannot be the eggs of the Little Gull, as they differ so very much from those above referred to.

"The eggs I now exhibit (five in number, viz. a clutch of three taken on the 3rd of June, and a clutch of two taken on the 5th of June, this year) were collected at the upper part of Lake Ladoga, in

Russia, by Mr. W. Mewes, the well-known Swedish ornithologist, who has been collecting in Russia this last summer. The bird was procured with the first-named clutch of three eggs on the 3rd of June.

"Mr. Mewes writes me that he found the Little Gull breeding not uncommonly on the Ladoga, and that he had no trouble in identifying the eggs. Further particulars respecting its nidification he does not give, but promises to do so ere long.

"The eggs of *Larus minutus* are, as will be seen, in size about similar to those of *Sterna arctica*, and in general appearance not unlike dark eggs of this Tern; indeed I have seen some eggs of the Arctic Tern that could almost be mistaken for those of the Little Gull. The ground-colour is dark brown or else greenish olive, and the spots and blotches, which are generally distributed over the egg, are greyish brown and dark umber-brown. In a series of twenty-five eggs I have received I do not observe much variation, and none of them have a light ground-colour."

The following papers were read:—

1. Notes on some Spiders and Scorpions from St. Helena, with Descriptions of New Species. By the Rev. O. P. Cambridge.

(Plate XLII.)

The small collection of Spiders kindly placed in my hands in May 1869 by T. J. Melliss, Esq., must be considered a very scanty sample of the Araneidea of the island of St. Helena. The collection contained twenty-two species, of which two (of the genera *Drassus* and *Clubiona*) were too immature to be accurately determined, nine appeared to be undescribed, and eleven were referable to species already known and described by various authors. As far as so small a number of species may justify a general remark upon the character of the Araneidea of St. Helena, it appears to bear a thoroughly European stamp, one alone belonging to any genus not indigenous to Europe (*Ariadne mellissii*). Four (if not five) species contained in the collection have been recorded as indigenous to Great Britain, viz. *Segestria perfida*, *Dysdera rubicunda*, *Tegenaria atrica*, *Pholcus phalangioides*, and *Epeïra solers*; the identity, however, of this last with the European *E. solers* I am not satisfied about. Two species (*Theridion punicum* and *Theridion fulvo-lunulatum*) are described by Mr. Lucas as indigenous in Algeria; and three others (*Argyropes aurelia*, *Salticus adansoni*, and *S. illigeri*) are among those described by Savigny in his work on Egypt. *Pasithea pulchra* (closely allied to *Pasithea viridis* (Bl.) of Algeria, the *Oxyopes littoralis* (Simon) of Spain, was first described from examples received by Mr. Blackwall from the east of Central Africa. Among the species described as new there is but little to denote a locality so

near the tropics; possibly this may be due to the generally barren, rocky nature of the island. It will be very interesting to ascertain whether a closer search (which Mr. Melliss has promised to make) into the Spiders of St. Helena will sustain the general observations above made; equally interesting also to know whether such observations are applicable to the *Insect* orders of the island.

Fam. Dysderides.

Gen. Segestria.

Segestria perfida (Walck.), Hist. Nat. des Ins. Apt. tome i. p. 267.

Segestria florentina, Hahn, Die Arachn. Bd. i. p. 5, t. 1. f. 1; Koch, Die Arachn. Bd. v. p. 72, t. 164. f. 385, 386.

S. cellaria, Latr. Gen. Crust. et Ins. tome i. p. 88.

Several adults of both sexes of this fine six-eyed Spider were contained in Mr. Melliss's collection. Its usual habitat is in crevices of rocky banks and interstices of walls; in these it spins a silken tube of considerable length, at the extremity of which it resides. I found this species not unfrequent in the island of Corfu in 1864, in holes and crevices of ancient olive-trees, whence it was exceedingly difficult to dislodge them. They would suffer themselves to be crushed rather than quit their abode; and the only way by which I could obtain an uninjured specimen was by screwing a small stick with a jagged end into the web and carefully drawing the whole fabric out, upon the chance of the inmate coming out with it.

Gen. Dysdera.

Dysdera rubicunda, Koch, die Arach. Bd. v. p. 79, t. 165. f. 390, 391.

Though very difficult to be distinguished in the female sex from *D. erythrina* (Walck.), I feel but little doubt concerning the identity of an adult female in the St.-Helena collection with *D. rubicunda* (Koch).

Fam. Drassides.

Gen. Clubiona (Bl.).

Clubiona dubia, n. sp. (Plate XLII. fig. 1.)

Female adult, length 4 lines.

The prevailing colour of this species, like that of many others of the genus, is yellow, clothed more or less all over with short, somewhat silky, yellowish-grey hairs. The cephalothorax is tinged with reddish, especially on its fore part, or caput; this portion is rather elongate, but yet broad and bluff at its fore extremity, much resembling the form of a British species, *C. deinognatha* (Camb.). The normal furrows and indentations are fairly marked, and are indicated by dusky lines, which converge to a small longitudinal indentation towards the hinder part; two very fine dark longitudinal lines run

close together and nearly parallel to each other, backwards from between the two hind central eyes towards the small indentation above mentioned.

The *eyes* are small, but do not differ much in relative size. They are arranged in two transverse nearly straight rows, the hinder row being the longest, and its eyes equidistant from each other; those of the front row, which is straight and placed immediately above the lower margin of the clypeus, are also equidistant from each other.

The *falces* are strong, projecting, and rather prominent near their base in front, also slightly excavated at their inner extremities. They are of a dark reddish-yellow colour, and furnished with a few projecting, black, bristly hairs in front.

Legs strong, moderately long, and of a clear yellow colour. They are armed with a few black spines of various lengths, those beneath the fore legs being the longest; the metatarsi and tarsi of the first two pairs are thickly clothed beneath with short close-set brown hairs; each tarsus has some papillæform hairs on its underside, and terminates with two curved and pectinated claws, beneath which is a small scopula.

The *abdomen* is of a dull yellow colour, clothed with yellow-grey hairs; in the median line of the fore part, on its upperside, is a narrow stripe of a clearer yellow than the rest, and pointed at its hinder extremity; on either side of the posterior half of this stripe are two small dark punctures or depressions; the four form a square the fore side of which is rather narrower than the hinder one. The spinners are rather long and prominent, and the external sexual organs sufficiently conspicuous, though not very large, the aperture having the form of the Greek omega. Possibly the specimen here described may be the female of some already described male; but in the absence of examples of males from the same locality as the present specimens, it seems best to describe it and give an accurate figure of its sexual aperture; the form and structure of this part seems to be the best differential specific character among the many very similar females of this group of the genus *Clubiona*.

A single adult female in Mr. Melliss's St.-Helena collection.

Fam. Agelenides.

Gen. Tegenaria.

Tegenaria atrica, Koch, Die Arach. Bd. x. p. 105, t. 353. f. 825; Blackwall, Brit. and Ir. Spiders, part i. p. 165, pl. 11. f. 106.

Two immature females were contained in the collection.

Fam. Theridides.

Gen. Pholcus.

Pholcus phalangioides, Walck. Hist. Nat. des Ins. Apt. tome i. p. 652.

Pholcus opilionides, Koch, Die Arachn. Bd. iv. p. 95, t. 135. f. 311.

P. phalangioides, Blackwall, Brit. and Ir. Spiders, p. 208, pl. 15. f. 137.

Adult examples of both sexes in the collection.

Gen. Ariadne.

Doleschall, Bijdrage tot de Kennis der Arachniden van den Indischen Archipel; in Naturkundig Tijdschrift voor Nederlandsch Indië, xiii. p. 400.

Prognatha, Camb. MS., and Illustrations of Spiders of Syria and Palestine.

Ariadne mellissii, n. sp. (Plate XLII. fig. 2.)

Female adult, length 3½ lines.

Cephalothorax oval, flattened, depressed behind the occiput, and with a deep transverse indentation at the junction of caput and thorax; the other normal furrows and indentations are strongly marked: the one showing the junction between the hinder part of caput and thorax is broadly marked with dark brown, and the thoracic portion has two longitudinal dusky bands, the general colour being pale yellow. The clypeus is prominent.

Eyes. The four central ones form a large square, the two foremost of which are rather the largest, and black; the hinder ones are pearly white, narrowly margined with black; those of each lateral pair are contiguous to each other, and seated on a slight tubercle; the posterior eyes of these pairs are in a straight line with the two posterior eyes of the central square, but each of these is nearer to the hind lateral eye on its side than they are to each other. The fore eye of each lateral pair is minute, and, in consequence of its position relatively to the hinder eye, is removed considerably back from the line of the fore central pair; from behind each hind lateral eye a fine blackish line joins the stronger dark line which indicates the junction of caput and thorax.

Legs very long, slender; colour yellow, the extremities of the femora, tibiæ, and metatarsi being more or less strongly tinged with red-brown; they are furnished with slender hairs; and their relative length appeared to be 1, 4, 2, 3.

Palpi short, slender, hairy, of a pale yellow colour, terminating with a rather conspicuous and abruptly bent black claw.

Falces moderately strong, and similar in colour to the legs.

Maxillæ long, slightly inclined to the labium, enlarged about their middle, and terminating in a somewhat pointed form.

Labium short, broad, and of a somewhat triangular form.

Sternum long, heart-shaped; all these latter parts are similar in colour to the falces.

Abdomen large, very slightly furnished with hairs; of a somewhat elongate triangular shape, its upper convexity being prolonged behind into a considerable pointed eminence, with a very slight lateral prominence on either side towards its extremity; its colour is of a somewhat golden metallic lustre, broken up as if into scales by fine

intersecting lines; the portion near and behind the small lateral prominences above mentioned is the darkest in colour, and the upperside has a broad longitudinal median band of silvery hue extending nearly to its extreme hinder point; the hinder extremity of this band is trifid, and along its longitudinal centre is a dark line enlarged triangularly at several points and sending off short lateral lines on either side; on each side near its middle also is a dark dot. The sides have two conspicuous dark spots, one near its fore extremity, the other about the middle; *beneath* (*i. e.* between the cephalothorax and spinners on the underside) the abdomen is of a pale yellow-brown hue, and its central portion is charged with three broad longitudinal bands, the external ones being of silvery metallic lustre, the central one deep black. The *spinners* are situated less than halfway between the cephalothorax and the extreme hinder point of the abdomen; on either side of their base are two conspicuous metallic silvery blotches, and behind them is a prominent kind of anal protuberance or coccyx.

A single adult female of this pretty and very distinct Spider was found in the St.-Helena collection sent me by Mr. Melliss, with whose name I feel great pleasure in connecting it.

Gen. THERIDION.

THERIDION PUNICUM, Lucas, Explorations en Algérie, Zool. tome i. p. 256, pl. 16. f. 3.

A single female of this species was contained in the collection from St. Helena.

THERIDION FULVO-LUNULATUM, Lucas, Explorations en Algérie, Zool. tome i. p. 267, pl. 17. f. 9.

A female of this species, which much resembles some species of *Latrodectus* in colour and markings, in the St.-Helena collection.

Fam. EPEÏRIDES.

Gen. TETRAGNATHA.

TETRAGNATHA DIGNA, n. sp. (Plate XLII. fig. 3.)

Female adult, length 4 lines.

Cephalothorax oval, not very convex above; caput somewhat produced; normal furrows and indentations strongly marked; colour yellow, with deep-red-brown lateral margins, and a longitudinal central band or stripe of the same colour; clypeus retreating, and about equal in height to the length of the space occupied by the fore and hind central pairs of eyes.

Eyes eight, seated on black spots, but little difference in their relative size; they form two rows, the hinder row straight, the fore one curved, the curve directed forwards; the four central eyes form a short oblong figure, whose longest width is in the longitudinal line of caput; on either side of this oblong figure, and separated from it by a space equal to its length, are the lateral pairs; the eyes of each

of these pairs are contiguous to each other, seated on a slight tubercle, and parallel to the central oblong figure.

Legs long, those of the first pair greatly the longest—at least three times the length of the Spider; they are moderately strong, and their relative length is 1, 2, 4, 3; colour yellow; femora of first pair tinged with reddish brown; the extremities of all the femoral, genual, and tibial joints are dark red-brown; all the legs are furnished with hairs and black spines, of which latter those of a double longitudinal series on the tibiæ of the first two pairs are most conspicuous.

Palpi slender, not very long, of a pale yellow colour; the digital joints are furnished with conspicuous black bristles; a long prominent one also issues from the anterior extremity of each cubital joint, and another (not far from it) from the inner side of each radial joint.

Falces rather long, powerful, but very slightly divergent at their extremities, prominent in front near their base, and similar in colour to the cephalothorax.

Maxillæ long, strong, divergent and enlarged at their extremities, which are rounded on the inner sides, where their colour is pale, the rest being of a deep brown.

Labium short, oblong, rounded at the apex, and transversely indented or rugulose.

Sternum heart-shaped, of a deep rich brown colour, with some long black prominent bristles in front.

Abdomen oblong-oval, projecting greatly over the base of the cephalothorax, and rather flattened above; its colour is yellowish brown, more or less suffused with dull golden metallic spots; a broad longitudinal, strongly dentated band of a browner hue, but similarly suffused, occupies almost the whole of the upperside, narrowing as it approaches the spinners; this band has on its outer margins a broken but strong and conspicuous edging of black spots and markings, forming two irregularly dentated black lines; on the fore half of this band is a central longitudinal brown line, crossed by another about midway, and with its hinder extremity trifid; this crossed line is formed by the greater suffusion and covering of the surrounding space by metallic spots; the sides are marked with two or three inconspicuous oblique dark lines; and the underside has a broad longitudinal black bar edged on either lateral margin by a conspicuous bar of pale metallic golden spots, a blotch of the same forming a continuation of each on either side of the spinners; these are short and almost concealed beneath the extremity of the abdomen; the sexual organs outwardly only present a small inconspicuous aperture at the base of a large squarish maroon-brown-coloured patch.

A single adult female in Mr. Melliss's St.-Helena collection.

TETRAGNATHA INDIGNA, n. sp. (Plate XLII. fig. 4.)

Male immature, length 2½ lines.

In form, structure, prevailing colour, and general appearance this

species resembles *T. digna*, but it differs remarkably in the pattern formed by the colours on the abdomen.

The lateral lines and longitudinal median stripe on the cephalothorax are less strong than in *T. digna*; the extremities of the joints of the legs are also less deep in colour. The *abdomen* is of a pale dull yellowish hue tinged with brown and freckled with metallic spots of a pale golden colour; the fore half of the upperside has only a short black streak on the hinder part, in continuation of which are some black and yellow-brown angular lines and markings, altogether forming an oblong figure, expanding above the spinners laterally into a large deep-black irregular patch, occupying nearly half the hind lateral portion of the abdomen; this black patch sends forth a curved lateral stripe towards the cephalothorax; the underside resembles that of *T. digna*, but is less deeply coloured. In an example of the immature female there was a dull whitey-brown-coloured cruciform marking on the fore half of the upperside of the abdomen, and no short black streak visible; probably some variety in this respect would be also visible in the adult state.

An immature male and female in Mr. Melliss's collection, though nearly allied to the foregoing (*T. digna*), appeared to be decidedly distinct from it.

Gen. Epeïra.

Epeïra solers, Walck. Ins. Apt. tome ii. p. 41?

Several adult examples were contained in the St.-Helena collection. They were larger than the typical European species and less pubescent; but the pattern on the abdomen was similar, though in general more neatly and distinctly defined. I have received examples of the same species from Bombay and Ceylon; and a collection of Spiders received by Mr. Meade from the south-east of Africa contained numerous individuals of it, all females, and of a larger size still. In all the adult specimens examined I could perceive no structural difference in the process (or epigyne) connected with the sexual organs.

Gen. Argyropes.

Argyropes aurelia, Walck. Ins. Apt. tome ii. p. 107, and references there quoted; Savigny, Description de l'Egypte, Hist. Nat. t. 1, 4e partie, p. 122. no. 5, ou tome xxii. p. 331, édit. in-8vo, *Arachnides*, pl. 2. f. 5.

Several examples of this handsome Spider were contained in the St.-Helena collection. The collection above alluded to from South-east Africa also contained specimens of it.

Fam. Thomisides.

Gen. Philodromus.

Philodromus signatus, n. sp. (Plate XLII. fig. 5.)

Female immature, length $1\frac{3}{4}$ line.

The general form and structure of this Spider is sufficiently near

to those of the European species (*P. aureolus* and *P. cespiticolis*) to make it unnecessary to do more than point out the differences of pattern and colour.

The *cephalothorax* is of a deep bistre-brown colour, with a broad longitudinal central yellowish band, and the sides are thinly marked with some irregular spots of the same colour; the central band contains a conspicuous and characteristic clear white marking of a somewhat blunt-pointed V-shape, behind which is a short dark brown longitudinal line indicating the point of junction of the thoracic segments.

The *legs* are moderately strong; those of the second pair are much the longest, and those of the third pair slightly the shortest; their colour is a rather clear yellowish, blotched and marked with deep blackish brown, and near the articulations of some of the joints with white; they are furnished sparingly with hairs and some spines, the latter mostly beneath the tibiæ and metatarsi.

The *abdomen* is of an oval form, and of a warm yellowish-brown hue; the upperside has on its fore part a deep-brown oblong marking, broadest near its middle, and with several projecting angular points on either side; this marking is strongly bordered with a broken line of yellowish white, and is followed towards the spinners by several small angular markings of a similar colour, and decreasing gradually in size as they approach those organs. Towards either side of the abdomen is a curved longitudinal row of obscure pale spots, followed behind by a somewhat curved and angular black dash; these dashes converge backwards, and the ground-colour included between them is rather darker than that of the rest of the upperside of the abdomen, and continues to a point just above the spinners; on the outer margin of the above-mentioned black dashes are some blotches of a pale yellowish colour; the sides have a dark patch forwards, and are generally spotted and marked with the same colour. The abdomen is yellowish beneath, thinly spotted with deep brown, and with three longitudinal broken stripes or dashes, the centre one of which is the clearest and most distinct.

The *sternum* also is yellow, marked with dark brown spots on its outer margin, and a short central longitudinal stripe at its hinder extremity.

The collection contained an immature female of this pretty and distinctly marked *Philodromus*, which appears to be hitherto undescribed.

Gen. Olios.

Olios tridentiger, n. sp. (Plate XLII. fig. 6.)

Male adult, length 4½ lines.

Cephalothorax short and broad; *caput* truncate on the anterior margin; the *thoracic* portion nearly circular; sides somewhat flattened; surface densely pubescent, with warm salmon-grey-coloured hairs, and with a broad somewhat irregular curved band of greenish brown on either side of the median line; the form and distribution of this band indicate the grooves formed by the junction of the

thoracic segments; the clypeus is rather less in height than the length of the space occupied by the four central eyes.

Eyes eight, in two curved rows, of which the curves are directed backwards; the front row is the shortest and least curved; the two fore central eyes are the largest of the eight, and the hind laterals slightly the smallest; those of the front row are equidistant from each other, and those of the hind central pair are rather nearer to each other than each is to the hind lateral on its side; the four central eyes form very nearly a square.

Legs moderately long and strong, furnished with hairs, bristles, and spines, of which latter those beneath the tibiæ and metatarsi are most conspicuous; colour yellowish brown, clothed with a greyish-yellow pubescence; the tarsi are thickly set on their undersides with short hairs, and terminate with two strong claws, beneath which is a blackish scopula.

Palpi darker in colour than the legs, especially the digital joints, which are of a long, narrow, pointed-oval form, and equal in length to the radial and cubital joints together; the radial is longer than the cubital, it is rather produced at its extremity in front, and has two projections from its outer side, one (which is the smallest of the two) at the extremity, rather beneath, projecting over the base of the palpal organs, and with a curved dark red-brown spine issuing from above it, whose sharply bent point is in contact with the margin of the digital joint; it was difficult to see whether this spine issued from the *radial* joint or from the base of the palpal organs, but I believe it to be from the former; the other projection issues from near the *base* of the radial joint on its outer side, it is very strong and has three corneous prong-like projections or claws at its extremity; the two upper ones sharp-pointed, the lower one broad and obtuse; the palpal organs are of a deep red-brown colour, well developed but not very complicated; they consist of a principal corneous lobe, at the extremity of which, near the outer side, are one or two strong curved points.

Falces long, strong, conical, vertical, of a deep rich red-brown colour approaching black, and the surface rough as if from innumerable minute tubercles; they have also on their surface many bristly reddish hairs.

Maxillæ strong, curved, rounded on their outer sides, and obliquely truncate at their inner extremities.

Labium short, broad, and square at its apex, which has its corners slightly rounded off; these parts are of a dark red-brown colour, glossy, but furnished with hairs.

Sternum short-oval, of a reddish yellow-brown colour covered with yellow-grey pubescence.

The *abdomen* was much shrunken; but its form appeared to be oblong-oval, truncate at its fore extremity; its colour (formed by a uniform pubescence) was greyish yellow; on the fore half of the upperside was a central longitudinal somewhat oblong band of dark black-brown, followed towards the spinners by a series of similarly coloured and strongly marked chevrons whose apices had been

to those of the European species (*P. aureolus* ... es. An adult to make it unnecessary to do more than point ... pattern and colour. ... e contained in Mr.

The *cephalothorax* is of a deep bistre- ... nstead of being pre- longitudinal central yellowish band, ar ... with some irregular spots of the sar ... tains a conspicuous and charac ... ES. somewhat blunt-pointed V-shar ... THEA. longitudinal line indicating ... segments. ... te XLII. fig. 7.)

The *legs* are moder ... w. Ann. and Mag. Hist. xvi. 3rd ser. much the longest, ar ... their colour is a r ... deep blackish b ... with white; t ... the latter r ... Gen. LYCOSA.

The *o* ... hue; ... ing, ... po ... b ... LYCOSA LIGATA, n. sp. (Plate XLII. fig. 8.)

Male adult, length $4\frac{3}{4}$ lines.

In general proportions, form, and appearance this species does not vary from the ordinary types of the genus, differing chiefly in the pattern formed by the distribution of its colours and markings, and in the structure of the palpi and their peculiar organs.

The cephalothorax is of a dark brown colour tinged with yellow, and furnished sparingly with yellowish and other hairs; it is margined narrowly with a blackish line, above which is a broken band of yellow, in some individuals almost obsolete, in others consisting of broken-edged detached spots; the central median line of the cephalothorax is occupied by a well-defined yellow band of a peculiar form; commencing narrowly between the eyes it enlarges suddenly into a nearly square form, behind which it narrows abruptly again into a neck, whence it continues in a spear-head form with the point directed backwards; this spear-head portion encloses the point of junction of the cephalic and thoracic segments, which is marked by a short dark longitudinal line; the fore part of this central longitudinal band is marked with some brown spots and markings; and the junctions of the thoracic segments are also marked by converging lateral lines of dark brown; the immediate region of the eyes is black. Some variety exists in different individuals in the exact form of the central band, but its general character is similar in all that have come under my notice.

Of the four eyes forming the large hinder square, the two fore ones are the largest and much nearer together than the two hinder ones; of the four forming the front line, the two centrals are the smallest; this line is equal in length to that formed by the two fore ones of the posterior square, and the four are about equidistant from each other.

Legs and *palpi* yellow, banded with dark brown, and furnished with hairs, bristles, and spines; the relative length of the legs is 4, 1, 2, 3; the tibiæ, especially of the hinder pair, are conspicuous and characteristic from being of a deep brown colour, with a broad-

-al transverse band of yellow; the metatarsi have each two
ɔsverse bands; and the tarsi are yellow, clouded only with
he cubital joints of the palpi are slightly clavate, but
shorter than the radials; the digital joints are brown
, longer than the radials, and blunt-pointed at
e palpal organs, placed in the concavity of the
digital joint, are small, not very prominent nor
of two small lobes, in conjunction with which
ort dark prominent spiny points.
ong and vertical, of a deep brown colour tinged with
, and clothed with dull yellowish hairs.

Maxillæ strong, and of a dark yellow-brown colour, curved towards the labium, rounded on their outer sides, and obliquely truncate on their inner extremities.

Labium oblong, of a deep rich red-brown colour, except the apex, which is yellowish red.

Sternum dark blackish brown, the fore part divided longitudinally by a narrow yellowish stripe; this stripe was nearly obsolete in the adult male, but conspicuous in the female and in some immature examples.

Abdomen dark black-brown on the upperside, which has the central longitudinal line occupied forwards by the normal narrow marking or band, which is of a reddish-yellow colour, and pointed at its hinder extremity; this band is followed towards the spinners by several broken yellow chevrons, each of the broken portions having a black dot within it; from either side of the fore extremity of the normal marking an irregular broken stripe of yellow runs obliquely backwards, and a large conspicuous blotch of a similar colour on either side of the chevrons forms a sort of continuation and end of the broken stripe; the underside of the abdomen is yellowish brown marked with blackish, and with an indistinct pale lateral longitudinal line on either side; the spinners are of a dull yellow colour and prominent. An adult female differed in being rather smaller, but was similar in colour and markings.

Adult and immature examples of both sexes were contained in Mr. Melliss's collection. The species evidently belongs to the group of which we may take *Lycosa picta* (Hahn) as the type.

LYCOSA INEXORABILIS, n. sp. (Plate XLII. fig. 9.)

Female adult, length 5½ lines.

This Spider may be easily distinguished from *L. ligata* (just described) by the greater depression of the sides of the cephalothorax, and by the central pale yellow-brown longitudinal band of that part being simple, narrow, and without enlargements; the cephalothorax is dark brown with a yellowish tinge, narrowly margined with black, and clothed with short yellowish-grey hairs; the normal furrows and indentations are indicated by blackish lines, and there are some faint indications of a pale yellowish lateral band on either side; the central longitudinal band runs through between the four large eyes, and is moderately furnished with whitish hairs behind.

broken off, leaving two opposed rows of oblique stripes. An adult female differed only in being rather darker-coloured.

The adult male and female above described were contained in Mr. Melliss's collection, but were dry and pinned instead of being preserved in spirit of wine.

Fam. Lycosides.

Gen. Pasithea.

Pasithea pulchra. (Plate XLII. fig. 7.)

Pasithea pulchra, Blackw. Ann. and Mag. Hist. xvi. 3rd ser. p. 338 (1865).

An adult female of this beautiful Spider preserved in spirit, as well as one dried and pinned, were contained in the St.-Helena collection.

Gen. Lycosa.

Lycosa ligata, n. sp. (Plate XLII. fig. 8.)

Male adult, length 4¾ lines.

In general proportions, form, and appearance this species does not vary from the ordinary types of the genus, differing chiefly in the pattern formed by the distribution of its colours and markings, and in the structure of the palpi and their peculiar organs.

The *cephalothorax* is of a dark brown colour tinged with yellow, and furnished sparingly with yellowish and other hairs; it is margined narrowly with a blackish line, above which is a broken band of yellow, in some individuals almost obsolete, in others consisting of broken-edged detached spots; the central median line of the cephalothorax is occupied by a well-defined yellow band of a peculiar form; commencing narrowly between the eyes it enlarges suddenly into a nearly square form, behind which it narrows abruptly again into a neck, whence it continues in a spear-head form with the point directed backwards; this spear-head portion encloses the point of junction of the cephalic and thoracic segments, which is marked by a short dark longitudinal line; the fore part of this central longitudinal band is marked with some brown spots and markings; and the junctions of the thoracic segments are also marked by converging lateral lines of dark brown; the immediate region of the eyes is black. Some variety exists in different individuals in the exact form of the central band, but its general character is similar in all that have come under my notice.

Of the four eyes forming the large hinder square, the two fore ones are the largest and much nearer together than the two hinder ones; of the four forming the front line, the two centrals are the smallest; this line is equal in length to that formed by the two fore ones of the posterior square, and the four are about equidistant from each other.

Legs and *palpi* yellow, banded with dark brown, and furnished with hairs, bristles, and spines; the relative length of the legs is 4, 1, 2, 3; the tibiæ, especially of the hinder pair, are conspicuous and characteristic from being of a deep brown colour, with a broad-

ish central transverse band of yellow; the metatarsi have each two yellow transverse bands; and the tarsi are yellow, clouded only with brownish; the cubital joints of the palpi are slightly clavate, but stouter though shorter than the radials; the digital joints are brown in colour, narrow, longer than the radials, and blunt-pointed at their extremity; the palpal organs, placed in the concavity of the hinder portion of the digital joint, are small, not very prominent nor complex; they consist of two small lobes, in conjunction with which are one or two short dark prominent spiny points.

Falces strong and vertical, of a deep brown colour tinged with reddish, and clothed with dull yellowish hairs.

Maxillæ strong, and of a dark yellow-brown colour, curved towards the labium, rounded on their outer sides, and obliquely truncate on their inner extremities.

Labium oblong, of a deep rich red-brown colour, except the apex, which is yellowish red.

Sternum dark blackish brown, the fore part divided longitudinally by a narrow yellowish stripe; this stripe was nearly obsolete in the adult male, but conspicuous in the female and in some immature examples.

Abdomen dark black-brown on the upperside, which has the central longitudinal line occupied forwards by the normal narrow marking or band, which is of a reddish-yellow colour, and pointed at its hinder extremity; this band is followed towards the spinners by several broken yellow chevrons, each of the broken portions having a black dot within it; from either side of the fore extremity of the normal marking an irregular broken stripe of yellow runs obliquely backwards, and a large conspicuous blotch of a similar colour on either side of the chevrons forms a sort of continuation and end of the broken stripe; the underside of the abdomen is yellowish brown marked with blackish, and with an indistinct pale lateral longitudinal line on either side; the spinners are of a dull yellow colour and prominent. An adult female differed in being rather smaller, but was similar in colour and markings.

Adult and immature examples of both sexes were contained in Mr. Melliss's collection. The species evidently belongs to the group of which we may take *Lycosa picta* (Hahn) as the type.

LYCOSA INEXORABILIS, n. sp. (Plate XLII. fig. 9.)

Female adult, length 5½ lines.

This Spider may be easily distinguished from *L. ligata* (just described) by the greater depression of the sides of the cephalothorax, and by the central pale yellow-brown longitudinal band of that part being simple, narrow, and without enlargements; the cephalothorax is dark brown with a yellowish tinge, narrowly margined with black, and clothed with short yellowish-grey hairs; the normal furrows and indentations are indicated by blackish lines, and there are some faint indications of a pale yellowish lateral band on either side; the central longitudinal band runs through between the four large eyes, and is moderately furnished with whitish hairs behind.

broken off, leaving two opposed rows of oblique [illegible]ora paler, female differed only in being rather darker-colo[illegible]e furnished

The adult male and female above described [illegible]our is greyish Melliss's collection, but were dry and pin[illegible] served in spirit of wine. [illegible]ir base in front; [illegible] red-brown colour.

Fam. Lyco[illegible] especially at the fore

Gen. P[illegible] bristly nature, curving [illegible]; their colour is dark,

PASITHEA PULCHRA. (Pl[illegible] middle; the colour of the

Pasithea pulchra, Black[illegible] characteristic marking on the p. 338 (1865). [illegible]yellowish colour and narrow, espe-

An adult female of [illegible]ch is blunt-pointed; on either side of well as one dried and[illegible] abruptly to contract is a roundish yellow lection. [illegible]-brown point in its centre; the normal band is [illegible] indistinct indications of transverse yellowish mark- [illegible] broken chevrons; the whole of the upperside and [illegible] abdomen are more or less mottled with yellow points

LYCOSA L[illegible] Male a[illegible] In ge[illegible] vary [illegible] pat[illegible] ir[illegible] the under part has an indistinct yellow longitudinal line [illegible] side. moderately long, prominent, and of a yellowish colour. This Spider is closely allied to the *Lycosa agretyca* of Savigny (the *L. trucidatoria*, Walck.), but is, I think, distinct from it. A single adult female in Mr. Melliss's St.-Helena collection.

Fam. SALTICIDES.

Gen. SALTICUS.

SALTICUS NIGRO-LIMBATUS, n. sp. (Plate XLII. fig. 10.)

Female adult, length 4 lines.

Cephalothorax oblong-oval, truncate before; upper surface nearly level, and its convexity somewhat flattened; colour black, with the upper part more or less clothed with short greyish-yellow hairs, and a narrow marginal lateral band on either side of pale whitish sulphur-yellow hairs.

Legs short, strong, furnished with hairs and a few spines; of a yellow-brown colour, irregularly marked and suffused with deeper brown; each tarsus has a small black scopula beneath its terminal claws.

Palpi short, of a reddish-yellow colour, clothed with greyish-yellow hairs.

Falces strong, nearly vertical, of a deep reddish-brown colour.

The maxillæ, labium, and sternum were destroyed by the pin with which the specimen was transfixed.

Abdomen longish-oval, pointed behind, truncate before, of a uniform dull sandy yellow-grey colour, formed by its hairy clothing or pubescence (the underside being of rather a clearer yellow); two black stripes, irregular on their inner margins, form lateral bands to the upper surface; these stripes do not appear to unite at the fore

ity, where there are some strong yellowish-grey recurved

rather prominent, and darker-coloured than the ab-

ale of this plainly but very distinctly marked species the dry and pinned specimens captured at St. liss.

Savigny, Egypte, p. 171, pl. 7. f. 20; Walck.

, both in spirit and dry, were contained in the ction.

ICUS ADANSONII, Savigny, Egypte, p. 169, pl. 7. f. 8; Walck. s. Apt. tome i. p. 427.

Attus nigro-fuscus, Vinson, Aranéides des Iles de la Réunion, Maurice et Madagascar, p. 59, pl. 10. f. 8.

An adult female in the collection from St. Helena.

Order SCORPIONIDEA.

Fam. SCORPIONIDES.

Gen. LYCHAS (Koch).

LYCHAS MACULATUS, Koch, Die Arach. Bd. xii. p. 1, t. 397. f. 960.

A single example of the above was contained in the collection received from St. Helena.

LYCHAS AMERICANUS, Koch, Die Arach. Bd. xii. p. 2, t. 397. f. 961.

A single example also of this species accompanied the former.

List of Species.

ARANEIDEA.

Segestria perfida.
Dysdera rubicunda.
Clubiona dubia, n. sp.
Tegenaria atrica.
Pholcus phalangioides.
Ariadne mellissii, n. sp.
Theridion punicum.
—— *fulvo-lunulatum.*
Tetragnatha digna, n. sp.
—— *indigna*, n. sp.
Epeïra solers?
Argyropes aurelia.
Philodromus signatus, n. sp.
Olios tridentiger, n. sp.
Pasithea pulchra.
Lycosa ligata, n. sp.
—— *inexorabilis*, n. sp.
Salticus nigro-limbatus, n. sp.
—— *illigeri.*
—— *adansonii.*

SCORPIONIDEA.

Lychas maculatus.
Lychas americanus.

DESCRIPTION OF PLATE XLII.

Fig. 1. *Clubiona dubia*, p. 532.
a. Epigyne.
b. Natural length of Spider.
2. *Ariadne mellissii*, p. 534.
a. Fore-right view of cephalothorax, showing position of the eyes.
b. Falces, maxillæ, labium, and sternum.
c. Natural length of Spider.
d. Underside of abdomen.
f. Profile view of Spider, without legs.
3. *Tetragnatha digna*, p. 535.
a. Underside of abdomen.
b. Natural length of Spider.
c. Fore-right view of eyes and falces.
d. Profile without legs.
4. *Tetragnatha indigna*, p. 536.
a. Profile view, without legs.
b. Natural length.
d. Fore-right view of eyes and falces.
5. *Philodromus signatus*, p. 537.
a. Natural length.
b. Underside.
c. Fore-right view of cephalothorax and falces.
6 *Olios tridentiger*, p. 538.
a. Fore-right view of eyes and falces.
b, *c*, *d*. Right palpus in three positions.
e. Natural length of Spider.
7. *Pasithea pulchra*, p. 540.
a. Fore-right view of eyes and falces.
b. Profile of Spider without legs.
c. Epigyne.
d. Underside, showing maxillæ, labium, and sternum.
e. Natural length.
8. *Lycosa ligata*, p. 540.
a. Palpus.
b. Natural length.
c. Fore-right view of eyes and falces.
9. *Lycosa inexorabilis*, p. 541.
a. Natural length.
b. Epigyne.
c. Fore-right view of eyes and falces.
10. *Salticus nigro-limbatus*, p. 542.
a. Profile without legs.
b. Natural length.

2. On a small Collection of Birds from the Tonga Islands. By Dr. O. Finsch, C.M.Z.S., and Dr. G. Hartlaub, F.M.Z.S.

In our book on the ornithology of the Feejee, Samoa, and Tonga group we have enumerated thirty-one species of birds hitherto known to inhabit the latter group of Pacific Islands. One of these, the *Rallus forsteri*, we now consider to be only a variety of age or season of the well-known *R. pectoralis*, more of which hereafter. Of the remaining thirty species there are five which seem to be con-

fined to the Tonga Islands, viz. *Platycercus tabuensis*, *Pachycephala jacquinoti*, *Ptilinopus porphyraceus*, *Rallus hypoleucus*, and *Megapodius burnabyi*. Now, the museum of Mr. J. C. Godeffroy at Hamburg has been enriched of late by a small series of birds from the Tonga Islands, which has been submitted to our scientific examination. This collection comprises in the whole eleven species, the following three of which are additional to the above list:—*Lalage terat*, *Ptilinopus perousii*, and a very remarkable and typical new species of the genus *Myiolestes*.

1. STRIX DELICATULA, Gould; Finsch et Hartl. Beitr. Orn. Centralpol. p. 11.

One specimen in spirits. Agrees in every respect with our description.

Long. al.	caud.	culm.	tars.	dig. med.
9½″	4″ 2‴	9‴	2″ 2‴	14‴

2. PLATYCERCUS TABUENSIS, Gmel.; Finsch. et Hartl. *l. c.* p. 17.

Five specimens, all deeply in moult. Chin and upper part of throat of a dark-brown colour, which deepens more or less into black. The colour of the under parts is rich and deep brownish purple, each feather having a green band across the middle; the uropygium is in three of the specimens of a uniform green; in the two others the green feathers have red-brown margins; the fine blue nuchal collar is in one bird very distinct and broadly developed, in the four others it appears rather narrow.

Long. al.	caud.	culm.	tars.
8″ 3‴–9″ 2‴	7″ 8‴–9″ 3‴	11½–15‴	11–12‴

3. HALCYON SACRA, Gmel.; Finsch et Hartl. *l. c.* p. 32.

Six specimens. One in the adult plumage, as described by us on page 33. In the five others a fulvous ocular stripe and nuchal band are more or less distinctly visible; one bird has the wing-coverts narrowly but distinctly margined with ferruginous, and on the sides of the breast are faint traces of darker undulations. "Iris brown."

Long. al.	rectr. med.	culm.	tars.	dig. med.
3″ 8‴–4″	2″ 6‴–2″ 9‴	16½–17‴	7‴	8‴

4. PTILOTIS CARUNCULATA, Gmel.; Finsch et Hartl. *l. c.* p. 58.

Three specimens. Not differing from our description; but the upper margin of the naked lobe of a fine sulphur-yellow. Very variable in size.

Long. tot.	al.	caud.	culm.	tars.
7–8″	3″ 11‴–4″ 1‴	2″ 11‴–3″ 3‴	9–10‴	13–14‴

The relative length of the wing in these Tonga birds is rather curious. In nine specimens from the Samoan Islands the wing did not exceed 3″ 8‴.

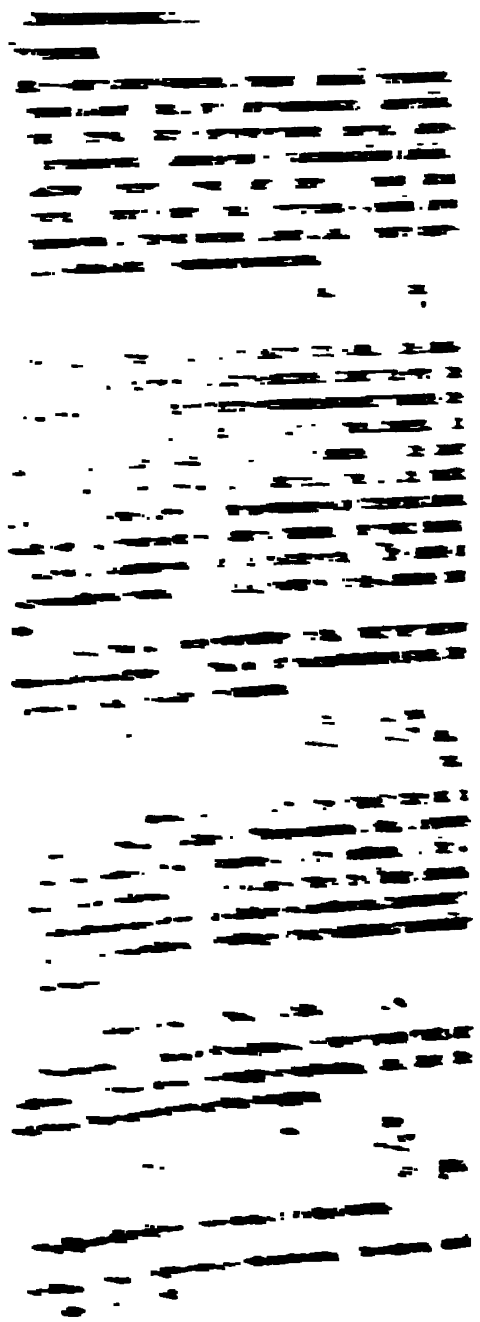


Fig. 1. *Clubi*
a.
b.
2. *Aria*
a.
b.
c.
d.
f.
3. *Tet*
a.
b.
c.
d.
4. *Tet*
a.
b.
d.
5. *Phil*
a.
b.
c.
6 *Oli*
a.
b.
e.
7. *Pasi*
a.
b.
c.
d.
e.
8. *Lyco*
a.
b.
c.
9. *Lyco*
a.
b.
c.
10. *Saltic*
a.
b.

2. On a sm
By Dr.
F.M.Z.

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7. Aplonis tabuensis, Gm.; Finsch et Hartl. *l. c.* p. 103.

Three specimens. Not different from our description. The lanceolate feathers of the head have a distinct purpurescent or copper-coloured glitter, which varies under a certain light into green; the dirty-white shaft-stripes of the under parts not very distinct. The wings are a little longer than in Viti birds. "Iris yellow."

Long. al.	caud.	rostr.	tars.	dig. med.
4″ 1‴–4″ 2‴	2″ 1‴–2″ 3‴	7½–9‴	11½–13‴	9‴

8. Ptilinopus porphyraceus (Forst.); Finsch. et Hartl. *l. c.* p. 119 (fid. Forster).

Four specimens.

Ad. *Pileo læte et circumscripte purpureo-violascente, diluto flavo circumdato, mento gulaque media pallide flavis; capite reliquo, collo toto, interscapulio, gutture, pectore et epigastrio pallide cano-virentibus, plumis basi cinereis; epigastrii plumis apice distincte flavescentibus; dorso, tergo, uropygio, tectricibus alarum et caudæ psittacino-viridibus; remigis primi parte apicali valde attenuata tota nigra, reliquis pogonio externo obscure virentibus; secundariis distinctius viridibus, pogonio externo nonnihil aureo-fuscescentibus, limbo marginali externo strictissimo flavo; omnium pogoniis internis dilute cinereis; scapularibus pogonio externo apiceque viridibus, 3–4 ultimis macula anteapicali latiuscula cærulescenti-viridi; macula abdominis medii obscure violacea, lateribus viridi-flaventibus, abdomine imo crissoque flavis; subcaudalibus flavis, apice aurantiacis; subalaribus dilute cinereo viridique variis; rectricibus mediis viridibus, lateralibus pogonio interno nigris, omnibus apice late canis, limbo apicali ipso virente; cauda subtus obscure grisea, apice late albida; rostro plumbeo, apice pallidiore; pedibus grisescentibus.*

Long. rostr. a fr.	al.	caud.	tars.
6‴	5″ 3‴	2″ 3‴	8‴

We describe a fine adult bird. In two others the violet-coloured abdominal spot is wanting, and the apical part of the tail-feathers is of a dirty greenish shade. These two specimens may be females.

In a fourth and apparently younger specimen the epigastrium is green, and there are faint traces of a dark green middle spot; vent and under tail-coverts yellow; head and neck more decidedly grey; chin whitish.

Long. al.	rostr. a fr.	caud.	tars.	dig. med.
4″ 10‴–5″ 2‴	5‴–6‴	2″ 4‴–2″ 7‴	8‴	9‴

This rare and beautiful *Ptilinopus* seems to be confined to the Tonga Islands. The description in our Polynesian Ornithology was copied from Forster, we not knowing the bird by autoptical examination. We even suspected it not to be different from *Pt. fasciatus*; and this species, of some neighbouring groups of islands, the Viti and Navigator's, it really resembles very much. But the

differences are nevertheless very conspicuous. The yellow margin around the red skull-cap is very distinct in *Pt. porphyraceus*; very faint and pale in *Pt. fasciatus*. The median abdominal spot, of a dark blackish violet in *Pt. porphyraceus*, is of a purplish wine-red in *Pt. fasciatus*. The chin and upper part of throat are of a pure white in *Pt. fasciatus*, of a pale yellow in *Pt. porphyraceus*; and, lastly, in *Pt. porphyraceus* we miss the greyish-lilac anteapical spot in the longest scapulars, so conspicuous in the allied species.

9. PTILINOPUS PEROUSII, Peale; Finsch et Hartl. *l. c.* p. 110.

One adult specimen. Fully agreeing with a Upolu specimen in the Bremen collection.

Hitherto not known from the Tonga Islands.

Long. al.	rostr.	caud.	tars.
5″ 1‴	4¾‴	3″ 1‴	9½‴

10. RALLUS PECTORALIS, Less.; Finsch et Hartl. *l. c.* p. 157.

Rallus forsteri, nob. *l. c.* p. 162.

One specimen; without the rufous pectoral band. It is certainly disagreeable to kill one's own children; but as to *Rallus forsteri* we are fully convinced of our error. In a set of specimens from the Pelew Islands, some had the rufous pectoral band, in two others it was entirely wanting, and in one bird there was only to be seen faint traces of it.

Long. al.	caud.	rostr.	tars.	dig. med.	
5″ 1‴	2″ 1‴	12‴	17‴	15‴	(Tonga.)
5 5	2 1	15	17	15	(Upolu.)
5 1	2 2	13	19	17	(Pelew Islands.)

11. CHARADRIUS FULVUS, Gmel.

One specimen in winter plumage; like others in the Bremen collection from New Zealand and the Pelews.

Long. al.	caud.	rostr.	tars.	dig. med.
6″ 3‴	2″ 1‴	9½‴	19‴	10‴

3. Remarks on some of the Fishes in the Calcutta Museum. By FRANCIS DAY, F.Z.S. & F.L.S.—Part II.

I have already forwarded to the Society a communication relating to some of the fishes in the Calcutta Museum, which appeared to me to be entirely new or imperfectly known, and I now propose to offer some remarks upon the *Cyprinidæ* in the same collection.

Genus APUA, Blyth.

Body elongated and compressed. A small, erectile, bifid suborbital spine. Eight barbels—one rostral, one maxillary, and two

mandibular pairs. Dorsal fin in the posterior third of the body, but anterior to the anal. Ventral fins absent.

APUA FUSCA, Blyth, J. A. S. of Bengal, 1860, p. 169.

B. iii. D. 2/6. P. 11. A. 2/6. C. 16.

Length of head $\frac{1}{3}$, of pectoral $\frac{1}{11}$, of caudal $\frac{1}{9}$ of the total length. Height of body $\frac{1}{3}$ of the total length.

Eyes small, $\frac{1}{3}$ of length of head, 4 diameters from end of snout.

Body strongly compressed.

A small, erectile, bifid spine below the orbit. Eight barbels—two rostral, two maxillary, and four mandibular. Anterior nostril long and tubular.

Fins. Dorsal commences in the posterior third of the total length; it is half as high as the body. Anal arises behind the vertical from the posterior extremity of the dorsal. Caudal rounded.

Colours. Brownish, with a darker longitudinal line.

Three specimens, to $2\frac{1}{2}$ inches long. Pegu (*Major Berdmore*).

PROSTHEACANTHUS SPECTABILIS, Blyth,

is, as suggested by Dr. Günther, identical with *Acanthopsis choirorrhynchus*, Bleeker.

BOTIA NEBULOSA, Blyth, J. A. S. of Bengal, 1860, p. 165.

B. iii. D. 3/12. P. 13. V. 8. A. 2/5. C. 17.

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

Eyes. Diameter $\frac{1}{3}$ of length of head, 2 diameters from the end of the snout, 2 diameters apart.

Profile of back slightly elevated.

A bifid, erectile (damaged) suborbital spine.

The two pairs of rostral barbels extend as far as to the anterior margin of the orbit, the maxillary ones are slightly longer. Lips thick and glandular; on either side of the symphysis of the lower jaw is a slight elevation studded with pores.

Fins. Dorsal commences midway between the snout and posterior margin of the anal fin. Ventral commences under the sixth dorsal ray. Caudal slightly rounded.

Scales small, thirteen rows between the lateral line and the base of the ventral fin.

Lateral line straight.

Colours. Brownish, with a leaden band along the side. Dorsal and caudal barred in spots. An ocellus at the upper margin of the base of the caudal fin.

One specimen, $4\frac{1}{2}$ inches long, from Darjeeling, is in the collection; it was sent by Dr. Wallich.

BOTIA BERDMOREI.

Syncrossus berdmorei, Blyth, J. A. S. of Bengal, 1860, p. 166.

B. iii. D. 2/9. P. 15. V. 8. A. 2/5. C. 20.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{7}$, of base of dorsal $\frac{1}{7}$, of base of anal $\frac{1}{15}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{7}$, of body $\frac{1}{5}$, of dorsal fin $\frac{1}{8}$, of anal $\frac{1}{7}$ of the total length.

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

The rostral barbels are about equal in length to the diameter of the orbit; the maxillary and mandibular ones are short. A bifid erectile spine commences slightly anterior to the orbit, ending opposite its centre.

Fins. Dorsal commences midway between the base of the caudal and the anterior margin of the orbit; it is slightly in advance of the ventral. Caudal deeply forked.

Scales absent.

Lateral line straight.

Colours. Buff, with ten vertical darkish bands, extending from the back to the abdomen. Head likewise banded. Numerous oblong blotches over the lower half of the body, from opposite the orbit to the end of the pectoral fin. Dorsal fin with three or four rows of spots. Caudal with five or six.

Five specimens, up to $5\frac{1}{2}$ inches in length, are in the collection; they were sent by Major Berdmore from the Tenasserim provinces.

BOTIA HISTRIONICA, Blyth, J. A. S. of Bengal, 1860, p. 166.

B. iii. D. 2/8. P. 15. V. 8. A. 2/5. C. 19.

Length of head $\frac{1}{4}$, of pectoral $\frac{1}{5}$, of base of dorsal $\frac{1}{7}$, of base of anal $\frac{1}{11}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{1}{4}$, of dorsal fin $\frac{2}{11}$, of ventral $\frac{2}{11}$, of anal $\frac{2}{11}$ of the total length.

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

Suborbital spine very strong, and extending to opposite the posterior margin of the orbit.

Fins. Dorsal arises nearer the base of the caudal than the end of the snout; it is slightly in advance of the ventrals. Caudal deeply forked.

Scales inconspicuous.

Lateral line straight.

Colours. Olive, with five dark vertical bands on the body and two or three on the head. All the fins with two broad brown bars.

One specimen, 4 inches long, is in the museum; received from Major Berdmore at Pegu.

COBITIS BERDMOREI.

Acanthopsis berdmorei, Blyth, J. A. S. of Bengal, 1860, p. 168.

B. iii. D. 2/7. V. 7. A. 2/5. C. 16.

Length of head $\frac{2}{11}$ of the total length, and more than the height of the body.

Eyes small, and situated before the middle of the length of the head.

All the three pairs of barbels long.

Fins. Dorsal commences in the middle of the total length, and is slightly posterior to the ventral. Caudal cut square.

Scales distinct.

Colours. Covered with dull spots over the body and head. Dorsal and caudal fins spotted and banded.

A specimen, 3 inches long, is in the museum; received from Major Berdmore, Pegu.

NEMACHEILUS ZONALTERNANS.

Cobitis zonalternans, Blyth, J. A. S. of Bengal, 1860, p. 172.

B. iii. D. 2/9. A. 2/5.

Eyes of moderate size, rather more than one diameter from the end of snout.

Fins. Dorsal arises anterior to the ventral, and rather nearer the snout than the base of the caudal, which latter is entire.

Scales distinct.

Colours. Ten to eleven bars descend down the lower two-thirds of the body to the abdomen, with intermediate half bands superiorly between them. The dorsal and caudal fins spotted in bands.

Two specimens exist in the collection, of $1\frac{4}{10}$ and $1\frac{6}{10}$ inch respectively; they were presented by Major Berdmore, who obtained them in the Tenasserim Provinces.

NEMACHEILUS PHOXOCHEILA.

Cobitis phoxocheila, M'Clelland, Ind. Cyp. pp. 305, 449, pl. 52. f. 4.

Two specimens, respectively $1\frac{6}{10}$ and $2\frac{3}{10}$ inches in length, from Derra Pungi, are in the collection, to which they were presented by Mr. Skipwith, and are labelled *Cobitis phoxocheila*, M'Clelland. Their tails are damaged and their colours bleached.

B. iii. D. 2/9. A. 2/5.

Length of head more than the height of the body.

Eyes 2 diameters from end of snout, and situated before the middle of the length of the head.

Lower surface of the head moderately horizontal; snout rather depressed. No bony ridge between the eyes. Four rostral barbels nearly as long as the diameter of the orbit; two short maxillary ones.

Fins. Dorsal commences midway between the anterior margin of the orbit and the base of the anal fin, and slightly in advance of the ventral. The pectoral does not extend to the ventral, nor the latter to the anal.

Scales minute.

NEMACHEILUS SERPENTARIUS, sp. n.

B. iii. D. 2/8. P. 17. V. 9. A. 2/5. C. 19. L. l. 64. L. tr. 12/17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{7}$, of caudal $\frac{1}{5}$ of the total length. Height of body nearly equals the length of the head.

Eyes small, behind the middle of the length of the head, about 4 diameters from end of snout, and 3 diameters apart.

Body subcylindrical; snout pointed. Barbels very short, the maxillary pair the longest. Mouth small. Lips thick, the upper one fimbriated. Nostrils nearer to the eyes than to the snout.

Scales conspicuous, with a raised keel along their centre. Their form, posteriorly, angular.

Lateral line distinct.

Fins. Dorsal arises slightly in advance of the ventral, and midway between the snout and the base of the caudal fin; its upper margin is straight. Pectoral reaches two-thirds of the distance to the ventral, and the latter more than halfway to the anal. Caudal deeply emarginate; lobes pointed.

Colours. Brownish, with a wide serpentine band of a dark chestnut-colour running from the snout, through the orbit, to the base of the dorsal fin, which last has a black centre. Caudal deep brown, with white margins. A black bar across the base of the ventral.

Three specimens, $2\frac{1}{2}$ inches long, are in the museum.

NEMACHEILUS BLYTHII, sp. n.

B. iii. D. 2/7. V. 9. A. 2/5. C. 19.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of caudal $\frac{1}{8}$ of the total length. Height of head $\frac{1}{5}$, breadth of head $\frac{2}{13}$, height of body $\frac{2}{13}$ of the total length.

Eyes. Diameter $\frac{2}{9}$ of length of head, $1\frac{3}{4}$ diameter apart, 1 diameter from end of snout.

Body subcylindrical.

The three pairs of barbels all longer than the diameter of the orbit.

Fins. Dorsal arises midway between the snout and the base of the caudal fin, and opposite to the ventral. Caudal deeply forked, its lobes sharp.

Scales minute.

Colours. Rather bleached; brownish, darkest above, with a dark band at the base of the caudal fin.

Two specimens, 3 inches long, exist in the collection.

NEMACHEILUS CINCTICAUDA.

Cobitis cincticauda, Blyth, J. A. S. of B. 1860, p. 172.

B. iii. D. 2/7. P. 11. V. 8. A. 2/5. C. 19.

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

Eyes. Small, situated in the middle of the length of the head, nearly 3 diameters from the end of the snout, $1\frac{1}{2}$ diameter apart.

Rostral and maxillary barbels well developed, being nearly as long as the orbit. Free portion of tail longer than high. No projection on the præorbital.

Fins. Dorsal commences opposite to the ventral, and midway between the posterior margin of the orbit and the base of the caudal

fin, which last is slightly emarginate. Pectoral extends three-quarters of the distance to the ventral, and the latter halfway to the anal. Upper margin of dorsal fin straight.

Scales minute.

One specimen, 2 inches long, is in the collection, received from Major Berdmore, who obtained it at Pegu.

Two specimens of the *Homaloptera maculata* are in the collection; they were obtained by Dr. Wallich at Darjeeling, and are labelled *Balitora anisura*.

The following new genus is named after H.E. Lord Mayo, Governor-General of India, as a slight acknowledgment of the assistance I have received in my icthyological investigations:—

Genus Mayoa, g. n.

Body anteriorly depressed, posteriorly compressed. Snout smooth and rounded. Eyes lateral. Mouth small, transverse, situated on the inferior surface of the head, *and entirely surrounded by a large sucker formed by both lips*, which are thick, and have a free posterior edge. Pharyngeal teeth in three rows, *uncinate*, 5, 3, 1/1, 3, 5. Pectoral and ventral fins horizontal. Dorsal, without an osseous ray, commences somewhat in advance of the ventrals. Scales of moderate size, those near the anal fin not enlarged. Lateral line continuous, and passes to the centre of the base of the caudal fin.

Mayoa modesta, sp. n.

B. iii. D. 1/7. P. 15. V. 9. A. 1/5. C. 19. L. l. 35. L. tr. 8.

Length of head nearly $\frac{1}{5}$, of pectoral $\frac{2}{5}$, of base of dorsal $\frac{1}{7}$, of base of anal $\frac{1}{12}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{10}$, of body $\frac{2}{11}$, of dorsal fin $\frac{2}{11}$, of ventral $\frac{2}{11}$, of anal $\frac{1}{7}$ of the total length.

Eyes with free margins; they are very nearly on the superior surface of the head, but directed laterally; diameter $\frac{1}{4}$ of length of head, $1\frac{3}{4}$ diameter from the end of snout, 2 diameters apart.

Head broad, depressed, and rounded; snout also rounded. No pores on the head. Lower surface of head and chest flat. The snout overhangs the mouth, which is small, transverse, and nearly semilunar in its shape. Mouth with an adhesive sucker formed by both lips; it is extended some distance posterior to the lower jaw, as in the genus *Gonorrhynchus*, from which it essentially differs in that the sucker is completed by the upper lip, so it completely surrounds the opening of the mouth. The lower lip close to the edge of the mouth, the upper lip, and the posterior margin of the sucker are all roughened, the last being fimbriated. Four barbels, one rostral and one maxillary pair, all being rather thick; but their length is only equal to one-half of the width of the orbit. Gill-opening narrow, extending to the base of the pectoral fin; nostrils approximating, divided from one another by a valve.

Teeth pharyngeal, uncinate, 5, 3, 1/1, 3, 5.

Fins. Pectoral and ventrals horizontal, the former arising under the opercles and extending to the latter, its first ray only is undivided and reaches the anal; the anterior portion of the pectoral and ventral fins are enveloped in thick skin. Dorsal arises in advance of the ventral. Caudal slightly forked.

Scales on body, none on the chest, nor so far as the posterior margin of the base of the pectorals.

Lateral line consists of a single tube in each scale; it passes direct to the centre of the base of the caudal fin. There are $2\frac{1}{2}$ rows of scales between it and the base of the ventral fin.

Colours. Greenish brown, no markings visible except a dark blotch behind the opercle.

Two specimens exist in the Calcutta Museum, $3\frac{1}{2}$ inches long, from Northern India.

DISCOGNATHUS LAMTA, Ham. Buch.

Dr. Günther, in his 'Catalogue of Fishes,' vol. vii. p. 69, observed that "this species extends from Syria to Assam," and, "having fortunately examples from the most distant localities, I have convinced myself that they ought to be referred to a single species only."

If all the different species referred to by Dr. Günther are one, then the *Platycara notata*, Blyth, is only a synonym; it differs only in having a black spot at the base of each dorsal ray.

Specimens apparently of this species are also in the collection, which were obtained in the Abyssinian expedition—six from the Sooroo Pass, 2000 feet above the level of the sea, and six more from the Amba Pass. None are above 2 inches in length.

CROSSOCHEILUS MOSARIO.

Cyprinus mosario, Ham. Buch.

B. iii. D. 2/9. P. 17. V. 9. A. 2/5. C. 17. L. l. 37. L. tr. $\frac{7\frac{1}{2}}{10\frac{1}{2}}$.

Length of head $\frac{2}{9}$, of caudal $\frac{2}{9}$ of the total length. Height of head $\frac{2}{9}$, of body $\frac{2}{7}$ of the total length.

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

No barbels; the lower lip is fringed, the upper lip entire.

Fins. Dorsal arises midway between the snout and the base of the caudal, which last is deeply forked. Ventral situated under the middle of the dorsal.

Scales. Five and a half rows in the adult, between the lateral line and the base of the ventral fin.

Colours. Silvery, back grey.

Ten specimens, up to 10 inches in length, exist in the collection.

DANGILA BERDMOREI, Blyth, J. A. S. of Bengal, 1860, p. 162.

B. iii. D. 3/23. V. 9. A. 2/5. L. l. 31. L. tr. 6/?.

Length of head $\frac{1}{5}$, of caudal $\frac{1}{4}$ of the total length. Height of head $\frac{2}{13}$, of body $\frac{1}{4}$, of dorsal fin $\frac{2}{13}$ of the total length.

Eyes. Diameter $\frac{1}{5}$ of length of head, $\frac{3}{4}$ of a diameter from end of snout.

Large open pores on front of the snout. Rostral barbels the longest, and equal in length to the diameter of the eye.

Fins. Dorsal commences in the anterior third of the total length. The pectoral does not quite reach the ventral, nor the latter the anal. Caudal deeply forked.

Scales. Three and a half rows exist between the lateral line and base of the ventral fin.

Colours, in spirit, uniform.

The single specimen in the collection is 4 inches long, and was received from Major Berdmore, who obtained it in the Sitang river. It is now in rather a bad state.

BARBUS (BARBODES) BLYTHII, sp. n.

B. iii. D. 3/9. P. 15. V. 9. A. 3/5. C. 17. L. l. 22. L. tr. 4/5.

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

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

Præorbital covered with pores; opercles two-thirds as long as high. Barbels well developed, the nasal reaching the eye, and the maxillary to below the centre of the orbit.

Fins. Dorsal arises midway between snout and base of caudal; its third ray articulated. It is slightly in advance of the ventral. Caudal deeply forked.

Lateral line complete.

Scales. Two and a half rows between lateral line and base of ventral fin.

Colours uniform.

One specimen, 2 inches long, from the Tenasserim provinces, presented by Major Berdmore, and marked *Capoeta macrolepidota*, C. & V.

BARBUS (BARBODES) COMPRESSUS, sp. n.

B. iii. D. 3/9. P. 15. V. 9. A. 3/5. C. 17. L. l. 22. L. tr. 4/5.

Length of head $\frac{1}{6}$, of pectoral $\frac{1}{6}$, of base of dorsal $\frac{1}{6}$, of base of anal $\frac{1}{18}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{2}{15}$, of dorsal fin $\frac{1}{3}$, of ventral $\frac{1}{8}$, of anal $\frac{1}{8}$ of the total length.

Eyes. Diameter $\frac{2}{9}$ of length of head, $1\frac{1}{2}$ diameter from end of snout, $1\frac{1}{2}$ diameter apart.

Head much compressed; the whole of the cheeks covered with pores. The posterior extremity of the maxilla extends to below the anterior margin of the orbit. Rostral barbel extends to below the middle of the orbit, the maxillary to the angle of præopercle. Mouth inferior; upper jaw the longest.

Fins. Dorsal arises midway between the snout and the base of

the caudal, it is in advance of the ventral; its last undivided ray is osseous, not enlarged, and entire. Caudal deeply forked.

Lateral line, $3\frac{1}{2}$ rows of scales between it and the base of the ventral fin.

Colours. Silvery, fins stained darker.

A fine specimen exists in the Calcutta Museum; it was with an *Oreinus* from Cashmere.

BARBUS (BARBODES) INNOMINATUS, sp. n.

Leuciscus binotatus, Blyth, J. A. S. of B. 1858, p. 290, *not* C. & V. (Kuhl).

B. iii. D. 3/9. V. 9. A. 2/5. C. 17. L. l. 24. L. tr. $\frac{4\frac{1}{2}}{4\frac{1}{2}}$.

Length of head $\frac{2}{7}$, of caudal nearly $\frac{2}{7}$ of the total length. Height of body $\frac{2}{7}$ of total length.

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

Barbels four, the rostral nearly reach the orbit, the maxillary are shorter.

Fins. Third dorsal ray semiosseous, smooth; the fin commences midway between the snout and the base of the caudal fin, which latter is forked in its posterior two-thirds.

Scales. Three rows between the lateral line and the base of the ventral fin.

Colours. A black spot at the base of the caudal fin, none now apparent at the base of the dorsal fin.

Two specimens in the Calcutta Museum, to $1\frac{1}{10}$ inch in length, from Ceylon, presented by Dr. Kelaart.

BARBUS (BARBODES) MACROCEPHALUS, M'Clelland, Ind. Cyp. pp. 270, 335, t. 35. f. 2.

B. iii. D. 3/9. P. 15. V. 9. A. 2/5. C. 19. L. l. 26. L. tr. $\frac{3\frac{1}{2}}{3}$.

Length of head $\frac{1}{5}$ of the total length. Height of head $\frac{1}{7}$ of the total length.

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

Snout obtuse; mouth anterior. Rostral barbel extends to under the anterior third of the orbit; the maxillary to beyond the posterior margin of the orbit.

Fins. Dorsal arises midway between snout and base of caudal fin. Osseous ray strong, smooth, and as long as the head. Pectoral reaches the ventral, which latter does not extend to the anal. Caudal forked.

Scales. Two and a half rows between lateral line and base of ventral fin.

The above description is from an old stuffed specimen, 8 inches long, probably presented by Dr. M'Clelland. I can only account for the statement of the head being two-fifths of the length of the body, as a misprint for *one-fifth*. The drawing shows it could not

be $\frac{2}{5}$. A second specimen, 20 inches long, from Sikkim, presented by Dr. Jerdon, differs in the head being $\frac{2}{7}$ of the length of the body. I think this species may eventually prove to be only a variety of *Barbus mosal*, Ham. Buch.

BARBUS (PUNTIUS) MACULARIUS.

Systomus macularius, Blyth, J. A. S. of Bengal, 1860, p. 159.

B. iii. D. 3/8. P. 15. A. 3/5. C. 19. L. l. 33. L. tr. $\frac{6}{6}$.

Length of head $\frac{1}{4}$ of the total length. Height of body $\frac{1}{3}$, of osseous dorsal ray $\frac{1}{6}$ of the total length.

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

Fins. Dorsal arises midway between the anterior margin of the orbit and the base of the caudal fin; its third ray is osseous, and strongly serrated. Caudal emarginate in its posterior fourth.

Scales. Four rows between the lateral line and base of the ventral fin.

Colours. Silvery, each scale with a black spot at its base; the upper margin of the eye likewise black.

Two specimens, $4\frac{1}{2}$ inches long, but in rather a bad state, exist in the collection. They were presented by Major Berdmore, who collected them in the Sitang river.

BARBUS (PUNTIUS) UNIMACULATUS.

Systomus unimaculatus, Blyth, J. A. S. of Bengal, 1860, p. 159.

B. iii. D. 3/8. P. 11. V. 8. A. 2/5. C. 19. L. l. 24. L. tr. $\frac{4\frac{1}{2}}{4\frac{1}{2}}$.

Length of head $\frac{2}{7}$, height of body $\frac{1}{3}$ of the total length.

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

Mouth small, extending half the distance to below the orbit. No barbels.

Fins. Dorsal commences midway between the snout and base of caudal fin; its third ray is osseous, weak, and smooth.

Lateral line commences to become imperceptible opposite the posterior extremity of the dorsal fin.

Colours. Silvery, a black mark at the base of each dorsal ray.

A number of fry up to $1\frac{8}{10}$ inch exist in the collection; they were received from Tenasserim. Whether it is safe to found a species on such materials must be open to question, as the specimens would evidently have grown to a larger size.

CARASSIUS AURATUS.

"The home of the Gold Carp or Goldfish is China and its islands and Japan," observes Dr. Günther (Cat. of Fishes, vii. p. 32); but it has a more extended range I find from examining the collection of fishes brought by Dr. J. Anderson, who accompanied the late expedition through Burmah to China. Some specimens were taken in the Irrawaddi above Mandalay, showing it to be an inhabitant of

northern Burmah. I am told it is one of the commonest fish in the bazar in Yunan in China.

SCHIZOTHORAX LABIATUS.

Racoma labiatus, M'Clelland, C. J. H. N. ii. p. 578, t. 15. f. 1.

The following description is taken from a *stuffed specimen* 27 inches long, presented by Sir A. Burns, from Helmind, in Afghanistan, and is marked "type of *Racoma labiatus*."

D. 3/8. P. 15. V. 11. A. 3/5. C. 21.

Length of head $\frac{1}{5}$, height of body $\frac{1}{8}$ of the total length.

Body fusiform, a considerable rise from the snout to the occiput.

Upper jaw longest, lips thick; the maxillary barbels reach to below the orbit. The posterior process of the intermaxillaries extends halfway to the orbit.

Fins. Dorsal arises considerably nearer to the base of the caudal than to the end of the snout; its third ray (injured superiorly) is osseous, strong, and serrated posteriorly. Anal narrow, reaching nearly to the base of the caudal when laid backwards. Caudal forked. Pectoral first ray strong.

Scales small, deciduous.

MURIA ALBOLINEATA, Blyth, J. A. S. of Bengal, 1860, p. 163.

B. iii. D. 2/7. P. 11. V. 7. A. 2/11. C. 17. L. l. 31.

Length of head $\frac{2}{9}$, of caudal $\frac{1}{5}$ of the total length. Height of body $\frac{1}{4}$ of the total length.

Eyes. Diameter $\frac{2}{5}$ of length of head, $\frac{3}{4}$ of a diameter from end of snout, 1 diameter apart.

Body compressed, gradually tapering off towards the tail.

Mouth anterior, lower jaw the longest. The posterior extremity of the maxilla reaches to below the anterior third of the orbit. The rostral barbels reach to opposite the posterior margin of the præopercle, the maxillary to opposite the base of the ventral fin.

Fins. Dorsal arises opposite the anal, and midway between the posterior margin of the præopercle and base of the caudal, which is forked in its posterior fourth.

Scales. Half a row between the lateral line and base of the ventral fin.

Lateral line ceases opposite the base of the ventral fin.

Colours. In spirit silvery, with a silver stripe along the side.

Six specimens, to 2 inches in length, are in the collection; presented by Mr. Atkinson, from Moulmein.

NURIA ALTA, Blyth, J. A. S. of Bengal, 1860, p. 162.

Two specimens exist in the collection, the description of which I do not find to agree with the types. In the largest the maxillary barbel extends to the base of the ventral fin, in the smallest to that of the anal. The formula is

B. iii. D. 2/6. P. 15. V. 6. A. 2/5. C. 19. L. l. 32. L. tr. 6/3.

Height of body $\frac{1}{4}$, length of head $\frac{1}{5}$ of the total length.

The pectoral fins are not so long as the head in either specimen.

The species appears identical with *Nuria danrica*, Ham. Buch.

NURIA MALABARICA.

Esomus malabaricus, Day, Proc. Zool. Soc. 1867, p. 299.

Dr. Günther, Cat. Fishes, vii. p. 201, demurs to this species without a lateral line being considered to differ from *N. danrica* (in which a lateral line is present), because he has only received young examples. Seven specimens, up to 2 inches in length, exist in the Calcutta collection, and I have taken many others in the Irrawaddi. I have no doubt as to the distinctness of the two species.

BARILIUS INTERRUPTA, sp. nov.

B. iii. D. 2/7. P. 10. V. 7. A. 2/12. C. 19. L. l. 34. L. tr. $\frac{6\frac{1}{2}}{4\frac{1}{2}}$.

Length of head $\frac{2}{9}$, of pectoral $\frac{1}{6}$, of base of dorsal $\frac{1}{8}$, of base of anal nearly $\frac{1}{5}$, of caudal $\frac{1}{5}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{2}{7}$, of dorsal fin $\frac{2}{11}$, of ventral $\frac{1}{11}$, of anal $\frac{1}{6}$ of the total length.

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

Lower jaw slightly the longest; no barbels. Third suborbital bone about twice as wide as the soft naked portion of the cheek below it. The posterior extremity of the maxilla extends to below the anterior third of the orbit. Humeral process of shoulder-bone *very slightly* developed.

Teeth pharyngeal, uncinate, 5, 4, 2/2, 4, 5.

Fins. Dorsal arises in advance of the anal, and midway between the posterior margin of the opercle and the base of the caudal fin. Pectoral scarcely reaches so far as the ventral, whilst the latter only extends two-thirds of the distance to the base of the anal. Caudal forked in its posterior fourth.

Scales with numerous striæ.

Lateral line descends gently for five scales, then more abruptly for two more, and having continued along five more scales, to opposite the base of the ventral fin, it ceases.

Colours. Silvery, with short vertical bars along the middle of the side. All the upper scales with large black dots.

Numerous specimens, to 2 inches in length, from Hotha, collected by Dr. J. Anderson.

PERILAMPUS FULVESCENS, Blyth, J. A. S. of Bengal, 1860, p. 163.

B. iii. D. 2/8. P. 15. V. 7. A. 2/20. C. 17. L. l. 33. L. tr. 7/3.

Length of head $\frac{1}{5}$, of pectoral above $\frac{1}{7}$, of base of anal $\frac{1}{4}$ of the total length. Height of body $\frac{1}{3}$ of the total length.

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

Body compressed, abdomen not trenchant.

Fins. Dorsal commences midway between the posterior margin of

the orbit and the posterior extremity of the caudal fin, and opposite to the commencement of the anal. Ventral has an elongated ray.

Scales largest above the lateral line.

Two specimens, up to $2\frac{1}{2}$ inches in length, are in the collection.

PERILAMPUS OSTEOGRAPHUS, M'Clelland, Ind. Cypr. pp. 289, 392, t. 45. f. 3.

This species is identical with the *Danio micronema*, Bleeker, as described by Dr. Günther (Bleeker's paper not being available).

Four specimens are in the collection. Besides these, three others have been received from one locality, and agree with the *P. osteographus* in every respect, excepting that the maxillary barbels are deficient.

4. Notes on the Localities of two Species of Land-Shells and three Species of Volutes. By JOHN BRAZIER, C.M.Z.S.

1. DIPLOMMATINA MARTENSI.

Diplommatina (*Diancta*) *martensi*, H. Adams, Proc. Zool. Soc. 1866, p. 446, pl. 38. fig. 11.

Diplommatina paradoxa, Crosse, Journ. de Conchyl. 1867, p. 449.

Diplommatina (*Diancta*) *martensi*, H. Adams, Journ. de Conchyl. 1868, p. 100.

Found on the mountains under decayed leaves in very wet places in the Island of Avolau, Fiji Islands.

Coll. Brazier, Adams, and Crosse.

2. PALAINA COXI.

Palaina coxi, H. Adams, Proc. Zool. Soc. 1868, p. 16, pl. 4. fig. 14.

Diplommatina wisemanni, Brazier's MS.

Found under leaves on damp ground in the pine-forests of Norfolk Island. This and the preceding species I collected in 1865.

Coll. Brazier, Adams, and Angas.

3. AULICA RUECKERI.

Voluta rueckeri, Crosse, Journ. de Conchyl. 1867, p. 444, et 1868, p. 97, pl. 1. fig. 1.

The correct locality of this species is New Georgia, Solomon Islands, and not Nichol Bay, West Australia, as given by M. Crosse. I have seen as many as two hundred specimens brought to Sydney in one of the Solomon-Islands traders. The Volutes obtained at Nichol Bay are well known to us, viz. *Scaphellæ ellioti*, *volva*, and *reticulata*, and *Aulica norrisii*. Having received large quantities of all the above named, I am certain that *Aulica rueckeri* was never found on the Australian continent. I have a specimen, quite a giant in size,

5 inches long, 7 inches in diameter. This species is in all the Australian collections and quite common.

4. VOLUTELLA TISSOTIANA.

Voluta tissotiana, Crosse, Journ. de Conchyl. 1867, p. 195, pl. 6. fig. 1.

This new species was brought to Sydney twelve months ago by some person in Captain Cadell's expedition, which was sent out by the South-Australian Government to select a site for a settlement in the far north of Australia near to Liverpool River, Arnhem Land, North Australia.

Coll. Tissot, Cox, and Brazier.

5. ALCITHOË THATCHERI.

Voluta thatcheri, M'Coy, Ann. & Mag. Nat. Hist. January 1868, p. 54, pl. 2. fig. 1.

Voluta brazieri, Angas, MS. Museum Brazier.

This fine species was described by Professor M'Coy of Melbourne, Victoria, from two very bad beach-worn specimens; but he gave no locality. It was described a month before my specimen arrived in London for Mr. Angas to have it described and figured in these Proceedings; therefore *Voluta thatcheri* has priority. I have received a few very fine specimens these last four months which at present remain unique in my cabinet. The length of the largest specimen is 5 inches, diameter 4½ inches. This Volute comes from a rather rough part of the South Pacific Ocean—the Bampton Reef, in latitude 19° 51′ south, longitude 158° 20′ east, near to the north-west coast of New Caledonia. My first specimen, at present in London, was got by my father Captain John Brazier, in one of his whaling-voyages many years ago. It is from deep water, and is found on the reef after heavy southerly gales.

5. List of Species of Cones found in Port Jackson, New South Wales, with Notes on their Habitats and Distribution. By JOHN BRAZIER, C.M.Z.S.

1. CONUS MACULATUS.

Conus maculatus, Sow. Thes. *Conus*, pl. 13. fig. 296.

This species must not be confused with *C. anemone* of South Australia. *C. maculatus* is a nearly smooth, thin, peculiarly inflated shell, richly mottled with purplish brown, and attains a larger size than *C. anemone*, which is of a true conical form, more solid and transversely striated, with an elevated spire and splashed with rose-brown. *C. maculatus* is found under stones, low water, spring tides. I got in one day, at the Bottle-and-Glass Rocks, fifty specimens, from one inch up to 2½ inches in length. I have one specimen from Cape

Banks, North Head of Botany Bay; length 2½ inches. This Cone is also found at Lord Howe's Island.

2. CONUS JUKESI.

Conus jukesi, Reeve; Sow. Thes. *Conus*, pl. 13. fig. 297.

A very angular species, peculiarly mottled with bluish grey and olive, found, in company with *C. maculatus*, under stones at low water, spring tides. The best station for them in Port Jackson is the Bottle-and-Glass Rocks. I got in one day twenty splendid specimens; length of largest specimens 1½ inch, smallest specimens 1 inch. This Cone is also found at Broken Bay, Lake Macquarie, Newcastle, and Port Stephens, north of Port Jackson.

3. CONUS GRAYI.

Conus grayi, Reeve, P. Z. S. 1843, p. 179; Conch. Icon. pl. 46. fig. 258; Sow. Thes. *Conus*, pl. 13. fig. 275.

A somewhat elongated shell, smooth above, ridged below, and handsomely painted with two rows of large waved blackish spots. Mr. G. F. Angas found one some years ago in Middle Harbour. It must be a species of rare occurrence, for I have never met with it. On the authority of Mr. G. B. Sowerby, jun., this Cone is found on the coast of West Africa.

4. CONUS APLUSTRE.

Conus aplustre, Reeve, Conch. Icon. pl. 30. fig. 170; Sow. Thes. *Conus*, pl. 19. fig. 448.

The specimen figured by Reeve is beach-worn, and his figure does not represent the species. This Cone is very often found thrown up with the animal after heavy gales that sweep along our coast in the winter; it is of an angulated form, spotted with black in lines, but sometimes of an orange tint and spotted with light red in lines. Length of specimens found at Newcastle, Broken Bay, and Lake Macquarie, north of Port Jackson, 1 inch. I have three specimens from Middle Harbour, ½ inch in length. I got at Cape Solander, South Head of Botany Bay, two specimens; length ½ inch. I have another specimen from Port Fairy, Victoria, on the south-east coast of Australia; length 1 inch (Mr. R. C. Rossiter). On the authority of Mr. G. B. Sowerby, this Cone is also found at the Cape of Good Hope.

5. CONUS RUTILUS.

Conus rutilus, Menke, Moll. Nov. Holl. p. 57. no. 133; Reeve, Conch. Icon. pl. 47. fig. 264; Sow. Thes. *Conus*, pl. 14. fig. 328.

This interesting little species is described by some authors as of a fiery red. I have five specimens, got at Cape Solander, South Head of Botany Bay, of a light brown, very thin and slightly coronated; length 5 lines. It is very rare on our east coast. I have three specimens from Cape Riche, King George's Sound, Western Australia, of a fiery red, coronated and dotted with brown in lines; length 6 lines.

It is also rare on the west coast. St. Vincent's Gulf, South Anstralia (*Mr. G. F. Angas*), rare.

6. On the Birds of Angola.—Part I. By R. B. Sharpe. With Notes by the Collector, J. J. Monteiro.

(Plate XLIII.)

It will be, I am sure, welcome news to every ornithologist to hear that that most energetic and enterprising traveller, Mr. Joachim J. Monteiro, is once more on the soil of Angola, and that he has already commenced the formation of a collection of the natural productions of this country. It is to be hoped that Mr. Monteiro's efforts will be crowned with as great success as were his former exertions on behalf of ornithology (*cf.* P. Z. S. 1865, p. 86, and Ibis, 1862, p. 333); and, though we cannot expect to find so many striking novelties as those obtained by him during his last expedition, we may reasonably look forward to the discovery of many interesting facts connected with the geographical distribution of birds throughout the Æthiopian region. Our knowledge of the avifauna of Angola is still very meagre, so that every collection, however small, is sure to contribute something before unknown; and certainly the present consignment of Mr. Monteiro is not behind-hand in this respect. Especial interest attaches to the migrations of European birds, a subject we really know nothing about; and it is for this reason that the study of African ornithology presents attractions to the student of European birds. Many European species migrate to Africa, the *Sylviidæ* especially; and although the Sahara presents a barrier which stays the southward progress of many, there are several species which proceed the whole length of the continent as far as the Cape. Of these birds it is interesting to know the exact time and place of their occurrence; and for the development of our knowledge of migration and geographical distribution careful collections like those made by Mr. Monteiro are a real assistance, and we can only wish that he may proceed with the same zeal and energy which have characterized his former efforts on behalf of science.

While on the subject of Angolan ornithology, it may be as well to mention that the Royal Zoological Museum of Lisbon has recently received several large collections from Angola and Benguela from Signor Anchieta; and many interesting novelties have thus been brought to light, all of which have been described by Professor Barboza du Bocage in the 'Jornal' of the Lisbon Academy and in the 'Proceedings' of this Society. These papers of the learned Professor are amongst the most interesting of recent contributions to Ethiopian ornithology.

Mr. Monteiro left England in November last, with the intention of procuring, if possible, a few birds in Prince's Island and St. Thomas, if the steamer stopped at these places long enough to enable

him to do so. No birds from Prince's Island appearing in the collection, it is evident that his intentions were frustrated in this quarter; but the following birds are sent from St. Thomas:—

(*a*) SPEIROPS LUGUBRIS.

Zosterops lugubris, Hartl. Orn. Westafr. p. 72.

"Male. St. Thomas, October 1868."—J. J. M.

(*b*) HYPHANTORNIS GRANDIS.

Ploceus collaris, Fraser, P. Z. S. 1842, p. 142.
Ploceus grandis, Gray, Gen. of Birds, ii. p. 351 (1849).
Hyphantornis grandis, Hartl. Orn. Westafr. p. 125 (1857).

"Male and female. St. Thomas, October 1868. Stomachs contained remains of beetles, hard seeds, and the fibrous oily envelope of the Oil-Palm nut (*Elais guineæ*)."—J. J. M.

Mr. Fraser's name posesses undoubted priority over that of Mr. G. R. Gray, but must nevertheless give way, inasmuch as there is a *H. collaris* (Vieillot) of an earlier date.

I do not believe that any English description of the female of this fine Weaverbird has as yet been published, and I therefore subjoin that of the bird sent by Mr. Monteiro.

Head greyish brown, with longitudinal stripes of dark brown; back and scapularies olive-green, the centre of each feather very dark brown, giving the appearance of dark shaft-stripes; lower part of the back greyish, tinged with olive-green; least wing-coverts greyish washed with olive-green; second and cubital coverts blackish brown, tipped with white and edged with olive-green; primary coverts black; quills blackish, the inner web light olive at the base, the outer web narrowly edged with olive-green, a little broader on the secondaries; tail dark brown above, paler beneath, the middle feathers distinctly washed with olive-green, the exterior ones margined with the same colour; cheeks and ear-coverts yellowish brown, marked with greyish brown; throat and breast yellowish white, a little darker on the breast, the sides of which are dark brown; centre of the abdomen and under tail-coverts white; flanks light brown; under wing-coverts white, tinged with olive-green; bill black; feet light brown.

(*c*) COTURNIX HISTRIONICA.

Coturnix histrionica, Hartl. Orn. Westafr. p. 204.

"Male. October 1868. Stomach full of seeds."—J. J. M.

I have also seen this very handsome Quail from Damara Land, whence it was sent by the late Mr. Anderson. It seems to be widely spread over western Africa; and in St. Thomas it is very common, as the following note, which Mr. Keulemans has kindly forwarded to me, will show.

"During a sojourn of a few weeks on the Island of St. Thomas I had the opportunity of observing this bird, which, although very common on the island, is, by reason of its habits, little known even to

the inhabitants. The Harlequin Quail is found in the large swamps and prairies which surround the miserable town of St. Anna da Chaves. On one occasion I heard it a little higher up in the mountainous part of the island; but I think it is a rare visitor to the mountains, which are rich in vegetation and everywhere covered with trees and bushes. The only place where the Quails are numerous is in the neighbourhood of the town. I used to hear them every morning from about 7 to 11 o'clock, and afterwards from 3 to 6 in the evening. Their cry, which is continually heard, has a great similarity to that of our European Quail, but is not quite so powerful, more like *hoog-hoo-hoo, hoog-hoo-hoo*, &c.

"The bird is most difficult to observe in the act of calling, as the grass and herbage grow exceedingly high in these countries, and the Quail, directly it hears any thing suspicious approaching, immediately conceals itself by lying squatted on the ground; nor does it stir till the danger appears to have passed. I sometimes managed to approach within a few paces of where the bird was lying, making sure that in a moment I should see the bird fly up and have a flying shot; but after walking round about for some time I was obliged to give up the chase, being both unable to flush the bird and to find it hiding in the grass. At last, after many days spent in endeavouring to procure a specimen, I called in the assistance of a little negro boy, who showed me by signs (for I could not understand his language) that he was able to catch it. We therefore together silently approached the spot where the bird was calling, creeping along the ground and parting the herbage as we went. All at once I saw the little nigger give a start forward, and at the same moment a bird got up and flew away. He very nearly caught it with his hands, and as for myself I was so much surprised that I quite forgot to fire. Some days after this, a man brought me one alive, which he had found and caught hiding its head in a hole of a land-crab. The inhabitants assured me that only the negroes know how to find the bird, which sometimes lies so close as actually to be trodden upon by the person in search of it. After a little time I was able to find them myself, and shot them as they flew up. The inhabitants, who are little acquainted with the bird, know it by the name of *Codorniz*."

The following is a list of Mr. Monteiro's Angola collection. It has been formed chiefly at Ambriz and on the river Quanza, both well-known localities. Those believed to be recorded from Angola for the first time have a dagger (†) prefixed to their names. References are also made to Dr. Hartlaub's standard work on the Ornithology of Western Africa, to Mr. Monteiro's papers (Ibis, 1862, p. 333, and P.Z.S. 1865, p. 86), and to Professor Barboza du Bocage's recent papers in the Lisbon 'Jornal.'

†1. PHYLLOPNEUSTE TROCHILUS.

"No. 11. Obtained at Columbo on the river Quanza, November 1868. Very active, hanging on to and going round branches of trees. Stomach full of ants and other small insects."—J. J. M.

I have compared this specimen and find it identical with English ones in my collection. I have our common Willow Wren also from the Knysna, from Damara Land, and from the Ovampo country, collected by the late Mr. C. J. Andersson.

2. NECTARINIA GUTTURALIS.

Nectarinia gutturalis (Linn.).

Nectarinia natalensis, Jard.; Mont. P. Z. S. 1865, p. 96; Bocage, Jorn. Acad. Lisb. 1867, pp. 135, 332, 1868, p. 4.

"No. 10. Male. Obtained at Columbo on the river Quanza." —J. J. M.

There seem to be three species of red-breasted Sun-bird very closely allied to one another, but which may be separated as follows:—

a. gula nigra		1. *cruentata* (Rupp.).
b. gula metallice chrysea.		
	a'. macula ad flexuram alæ amethystina	2. *gutturalis* (L.).
	b'. macula ad flexuram alæ nulla	3. *senegalensis* (L.).

There are other differences; but the above seem to me to be the most striking. The beautiful amethystine spot at the bend of the wing is a distinct characteristic of *N. gutturalis*.

3. NECTARINIA JARDINII.

Nectarinia jardinii, Verr.; Hartl. Orn. Westafr. p. 47; Bocage, Jorn. Lisb. 1867, p. 135.

"No. 7. Male. Columbo, river Quanza, November 1868. No. 32. Female. Ambriz, March 1869."—J. J. M.

Mr. Monteiro has sent a pair of this pretty little Sun-bird, which would appear to be not uncommon in Angola. Professor Barboza du Bocage records it from Angola, Loanda, and Benguela.

4. UROBRACHYA AXILLARIS.

Urobrachya axillaris (Smith); Bocage, Jorn. Lisb. 1867, p. 140, *et* 1868, p. 11.

"Obtained at Columbo on the river Quanza, November 1868." —J. J. M.

One specimen, not quite adult. On comparing it with a bird in my collection from Mossamedas, I find a striking difference in the size of bill, that of the Angola bird being very much larger. The orange patch on the wing also seems to be much brighter; but we must wait for additional specimens before we can finally determine whether there is any specific difference between them.

†5 TEXTOR ALECTO.

Textor alecto, Temm.; Hartl. Orn. Westafr. p. 131.

"No. 44. Male. River Quanza, May 1869."—J. J. M.

†6. PLATYSTEIRA MELANOPTERA.

Platysteira melanoptera (Gm.); Hartl. Orn. Westafr. p. 93.

"No. 21. Male. River Loge."—J. J. M.

This specimen scarcely agrees with Fantee specimens in my collection. There is a greater amount of white edging on the tail, for instance, and there are other minor differences.

7. HIRUNDO ANGOLENSIS. (Plate XLIII.)

Hirundo angolensis, Bocage, Jorn. Acad. Lisb. 1868, p. 10.

"Ambriz, March 1869. Female.

"Ambriz, April 1869."—J. J. M.

This species has been recently described by Professor Barboza du Bocage (*l. c.*), and is a very interesting novelty. The two specimens sent by Mr. Monteiro agree with the description of the learned Professor; and I herewith subjoin a detailed account of one of them for the benefit of ornithologists, as the bird was hitherto only known from the original specimen in the Lisbon Museum.

Forehead, throat, and upper part of the breast deep brick-red; entire upper surface dark steel-blue; tail gradually forked, the whole of the inner webs, except a black border at the tip, pure white, the two middle feathers steel-blue; a band across the breast below the red throat steel-blue; the rest of the breast and under tail-coverts ash-coloured, a little paler in the centre of the breast; the under tail-coverts washed with rufous, each feather margined with pale grey and having a little heart-shaped blue mark before the end of the feather, the black shaft being also strongly defined; under wing-coverts dark ashy-grey, washed on the edge of the wing with steel-blue; beak and legs black.

As Professor Barboza du Bocage remarks, this Swallow belongs to the same group as *H. rustica*, but is easily distinguished by the colour of the under wing-coverts. Its nearest ally is a little Swallow from the river Gambia (*Hirundo lucida*, Verr.). I have long possessed a specimen of this latter Swallow, which I had supposed must be the *Hirundo angolensis* of Barboza; but the acquisition of a second and more adult bird a short time ago, which was given me by Mr. Gould, awakened some suspicion in my mind as to its correct identification, and the receipt of the true *H. angolensis* from Mr. Monteiro proves that the Gambian bird is a totally distinct species. The latter may at once be distinguished by its altogether brighter colours, and by the white under wing- and tail-coverts.

8. MOTACILLA VIDUA.

Motacilla vidua, Sundev. Öfv. Kongl. Vet. Akad. Förh. 1850, p. 158.

Motacilla capensis, Mont. P. Z. S. 1862, p. 334.

"No. 19. River Loge at Ambriz."—J. J. M.

9. IRRISOR CYANOMELAS.

Irrisor cyanomelas (Viell.); Mont. P. Z. S. 1865, p. 94.

"No. 12. Young female. River Quanza, November 15th, 1868. Stomach contained remains of beetles."—J. J. M.

10. CORYTHORNIS CYANOSTIGMA.

Corythornis cristata, auct.; Sharpe, Monogr. *Alced.* part 6 (1869).

"Male. River Quanza, May 1869. Abundant."—J. J. M.

Notwithstanding the convictions expressed in my 'Monograph' and in the 'Ibis' (1869, p. 279), I feel obliged to own that the adoption of Linnæus's name *cristata* for the Madagascar bird, as suggested by Dr. Pucheran, must be really correct. Lord Walden has drawn my attention again to the subject, and has pointed out to me the original descriptions of Seba, Brisson, and Linnæus. His Lordship's intimate acquaintance with Linnean nomenclature has rendered him skilful in determining the origins of the descriptions given by the learned Swedish professor; and from the following facts I think there can be no doubt that in the present instance Linnæus took his diagnosis of *Alcedo cristata entirely* from Brisson.

Although Brisson and Linnæus both refer to Seba, it is very evi dent that the former had really a specimen of the bird before him when he was writing, and therefore his description is, as usual, particularly exhaustive and accurate. As Dr. Pucheran remarks, it is curious that he could have considered the *Alcedo amboinensis cristata* of Seba with its red bill to have been the same as his *Ispida philippensis cristata*. Anyhow Linnæus evidently took his short diagnosis of *Alcedo cristata* from Brisson's more elaborate one, and only copied Brisson in the reference to Seba. I cannot help feeling regret in having thus to acknowledge myself in the wrong hitherto, especially as the name *cyanostigma* (which the species must henceforth bear) is applicable only to the young bird.

11. ISPIDINA PICTA.

Ispidina picta (Bodd.); Sharpe, Monogr. *Alced.* pt. 4 (1869).

"Males. River Quanza, May 1869. Rare."—J. J. M.

Two beautiful specimens, the old male being decidedly the most brilliant I have ever seen.

12. HALCYON CYANOLEUCA.

Halcyon cyanoleuca (Vieill.); Sharpe, Monogr. *Alced.* pt. 5 (1869).

"Ambriz, April 1869.

"Male. River Quanza, May 1869."—J. J. M.

Two specimens. The male from the river Quanza is a young bird agreeing with the figure in my 'Monograph.'

13. HALCYON SENEGALENSIS.

Halcyon senegalensis, Linn.; Sharpe, Monogr. *Alced.* pt. 7.

"No. 9. Obtained at Columbo on the river Quanza, November 1868. Stomach contained remains of a small lizard.

"No. 22. Male. Ambriz. Food consisted of large grasshoppers.

"No. 37. Male. River Quanza, May 1869.

"Nos. 39, 40. Females. River Quanza, May, 1869."—J. J. M.

Mr. Monteiro procured several of these birds, at my request, in order that I might have abundant proof of the distinctness of *H. cyanoleuca* from the present species. I am happy to say that, as far as I can see, the two species are undoubtedly distinct, all the specimens mentioned above having the cinereous head, the very old birds just having a tinge of blue here and there, while the black line does not extend through the eye as in *H. cyanoleuca*.

14. HALCYON CHELICUTENSIS.

Halcyon chelicutensis (Stanl.); Sharpe, Ibis, 1869, p. 277.

"Nos. 13 and 14. Male and female, shot together. River Quanza, November 1868.

"Nos. 30 and 31. Ambriz, March 1869. Male and female."

Sir William Jardine has very kindly sent me a note concerning the propriety of my uniting *Halcyon damarensis* with the present species. Sir William has a specimen of the Damara bird which measures 7·3 inches in length, while the longest total length adduced by me (*l. c.*) was 6·8. I must state, however, that my South-African skins have the neck much drawn in and could easily be made to measure 7½ inches without stretching them perceptibly. I have also examined Strickland's type in the Cambridge Museum. I do not perceive the least difference in colour, though I admit that the Damara bird is a good deal larger. But this fact cannot be taken as a character for specific separation, as so many analogous cases are to be found amongst African birds.

15. EURYSTOMUS AFER.

Eurystomus afer (Lath.); Hartl. Orn. Westafr. p. 29 (1857).

"Captured at sea within sight of land, off Mangue Grande. The stomach contained the remains of a large moth."—J. J. M.

Dr. Hartlaub (*l. c.*) states that the local race of this bird from Gaboon differs in its less-bright colours and also in its larger dimensions. The specimen sent by Mr. Monteiro measures as follows:—Total length 10 inches; of bill from front 0·8, from gape 1·3; wing 6·6; tail 3·7; tarsus 0·4; middle toe 0·3, lateral toe 0·6, hind toe 0·5.

16. CORACIAS PILOSA.

Coracias pilosa, Lath.; Hartl. Orn. Westafr. p. 30.

"Male. Legs light yellowish green; iris brown; pupil dark purple. Stomach contained remains of insects. Ambriz, February 1869."—J. J. M.

17. CORACIAS CAUDATA.

Coracias caudata, Linn.; Hartl. Orn. Westafr. p. 30; Bocage, Jorn. Lisb. i. p. 134.

"Ambriz, April."—J. J. M.

†18. DENDROPICUS HARTLAUBI.

Dendropicus hartlaubi, Malh.; Gray, Cat. Pic. Brit. Mus. p. 65.

"No. 45. Loanda, May 1869."—J. J. M.

A male, identical with specimens in the British Museum, from Shupanga.

†19. CAMPETHERA CHRYSURA.

Campethera chrysura (Swains.); Gray, Cat. Pic. Brit. Mus. p. 81. *Dendromus chrysurus*, Hartl. Orn. Westafr. p. 181.

"No. 18. River Loge at Ambriz."—J. J. M.

20. CHRYSOCOCCYX CLAASII.

Chrysococcyx claasii (Cuv.); Hartl. Orn. Westafr. p. 190; Bocage, Jorn. Lisb. 1868, p. 9.

"Nos. 26 and 27. Very abundant in January. Disappears about April and May."—J. J. M.

21. TINNUNCULUS RUPICOLA.

Tinnunculus rupicolus, Bocage, Jorn. Acad. Lisb. p. 132.

"River Loge at Ambriz. Common."—J. J. M.

One specimen, apparently an old female.

22. ELANUS MELANOPTERUS.

Elanus melanopterus (Daud.); Hartl. Orn. Westafr. p. 11 (1857), Bocage, Jorn. Lisb. 1868, p. 2.

"River Quanza, May 1869."—J. J. M.

One specimen in full plumage.

23. TRERON CALVA.

Treron calva, Temm.; Hartl. Orn. Westafr. p. 192; Bocage, Jorn. Lisb. 1868, p. 9.

"No. 24. Female. Ambriz, December 1868."—J. J. M.

†24. EUPODOTIS MELANOGASTRA.

Eupodotis melanogastra (Rupp.); Hartl. Orn. Westafr. p. 207 (1857).

"Ambriz."—J. J. M.

A single specimen, apparently a young male just gaining the adult dress.

25. BUTORIDES ATRICAPILLA.

Ardea atricapilla, Afzel.; Hartl. Orn. Westafr. p. 223.

"Female. River Quanza, May 1869."—J. J. M.

A single example of this widely distributed Heron. It is in beautiful plumage; and the head, instead of being black as the name would imply, is dark cinereous with a bronzy-green lustre.

26. CURSORIUS SENEGALENSIS.

Cursorius senegalensis, Licht.; Hartl. Orn. Westafr. p. 209; *id.* P. Z. S. 1866, p. 62; Mont. Ibis, 1862, p. 335.

"No. 46. Loanda, May 1869. Abundant."—J. J. M.

†27. GLAREOLA PRATINCOLA.

Glareola pratincola (Linn.); Hartl. Orn. Westafr. p. 210.

"No. 15. Ambriz, November 26, 1868, Large numbers flying high in the air, with a flight between that of a Swallow and a Sandpiper. Gizzard and stomach full of flies and other winged insects. Only seen for one day. Eyes dark slate-colour."—J. J. M.

The specimen sent is a young bird, apparently *G. pratincola* and not *G. nordmanni*. Most of the under wing-coverts are rufous, but some of them, especially near the edge of the wing, are quite black, while others are decidedly getting black. In case, however, I may be mistaken, I think it best to give a description of the specimen in detail.

Above dark brown, deepest on the head and scapularies, the whole upper plumage mottled with pale brown edgings to the feathers; eyebrow pale brown; primary coverts and quills dark brown, the secondaries tipped with rufous-white; rump and upper tail-coverts pure white; tail deeply forked, white at the base and for the greater part of the feathers, the outer feathers brown towards the tip; chin and throat pale yellowish brown, the latter longitudinally striped with dark brown; cheeks and ear-coverts greyish brown, the latter paler, the former broadly striped with dark brown; breast pale ochreous brown, the upper portion and the sides of the neck mottled with dark brown; abdomen and under tail-coverts pure white; under wing-coverts rufous, the feathers along the bend of the wing black, mottled with reddish brown, the edge of the wing white, and all the feathers along the radius partly black; bill and feet black, or nearly so.

†28. NUMENIUS MADAGASCARIENSIS.

Numenius madagascariensis, Briss.; Hartl. Faun. Madag. p. 77; Schl. & Poll. Faun. Mad. Ois. p. 133.

"Ambriz, December 1868."—J. J. M.

This Curlew seems to me to be a very good species, totally distinct from *N. arquatus* or its southern form *N. major*, Schl. Its occurrence in West Africa is here recorded for the first time.

29. ACTITIS HYPOLEUCOS.

"River Loge at Ambriz."—J. J. M.

7. A Monograph of the Genus *Pelecanus*.

By D. G. ELLIOT, F.L.S., F.Z.S., &c.

(Plate XLIV.)

This paper was written chiefly in Philadelphia, where my opportunities for investigating the species were most favourable; for in the magnificent collection of the Academy of Natural Sciences,

all the species, excepting *P. javanicus*, are represented by a large number of individuals of various ages. I have also examined the specimens in the collections of the British and Paris Museums, as well as the living birds in the Gardens of this Society and in those of the Jardin des Plantes and Jardin d'Acclimatation of Paris.

My conclusions are the result of patient investigation; yet I am fully aware that in some instances they may appear less satisfactory than might be desired; this, however, in some degree, arises from the lack of necessary specimens of the different ages of one or two species to enable me to clear up some still uncertain points.

If I shall succeed in drawing the attention of those whose opportunities are better than my own to study the changes of plumage of those species still involved in some obscurity, and thus extend our knowledge of these interesting birds, my paper will not have been written in vain.

Review of the Literature of the Genus.

As far within the dim past as history gives to us any record, the birds of this genus have been observed and mentioned; for we have good reason to suppose that the *P. onocrotalus*, the species most widely distributed and best known in the Old World to-day, was the "Pelican of the wilderness" of Biblical times.

All of the older authors mention the "Pelican," meaning to imply, probably, the common species just named above, although in many instances their descriptions could not be referred to that bird.

Commencing with Linnæus, the author of the binominal system now generally adopted, in the review of the literature of the genus, his great work claims first our attention.

The tenth edition of the 'Systema Naturæ,' being generally conceded to be the most complete, I have not deemed it advisable to refer to works prior to its date, notwithstanding that some excellent although, unfortunately, polynominalist authors flourished before the great Swede.

(1758.) Linnæus, 'Systema Naturæ.' The genus *Pelecanus*, established by Linnæus in 1735, here contains only one species, the *P. onocrotalus*, according to our author's ideas, although he adopts as synonymous the *O. fuscus* of Sloane, and the *O. americanus* of Edwards, both of which are distinct species of the New World. But thus far Linnæus's genus has but one species.

(1760.) Brisson, 'Ornithologie.' This author here establishes the genus *Onocrotalus*, with *P. onocrotalus* as his type, and cites the following as his species:—*O. albus* (*P. onocrotalus*); *O. mexicanus dentatus*, which is the *P. molinæ* of Gray as it now stands; *O. fuscus*; and *O. philippensis*, which is *P. rufescens* as now determined,—four species in all, being quite a step in advance of Linnæus's list of two years previous. The descriptions given by Brisson are good, and the various species easily recognizable; but so much cannot be said of the plates.

(1785.) Pennant, 'Arctic Zoology.' This author gives no new

species, but makes a new synonym for the *P. fuscus*, in his "Charlestown Pelican," which is the "Brown Pelican" from that locality.

(1788.) Gmelin, 'Systema Naturæ.' In this work we find quite an extended list of species of this genus, without, however, rendering it necessary for us to accord our author any merit for original investigation, as it is simply Latham's list of a few years previous Latinized. The species are, *P. onocrotalus, roseus, fuscus, manillensis, philippensis, rufescens, carolinensis, erythrorhynchus*, and *thagus*. Of these, *P. rufescens* is a good species, *roseus, manillensis*, and *philippensis* being synonyms: *P. fuscus* is also good, with *carolinensis* as a synonym, this being the Charlestown Pelican of Pennant; while the American White Pelican is here first named *erythrorhynchus*, a misnomer. The *P. thagus* is *P. molinæ* of Gray. Species now five.

(1790.) Latham, 'Index Ornithologicus.' The list given by this author is the same as the preceding, except that the White Pelican of America is renamed *trachyrhynchus*, which is not admissible; for, although it may be more appropriate than Gmelin's appellation, yet the reason is not sufficient to justify the action, and should not be upheld by subsequent writers.

(1790.) Bonnaterre, 'Encyclopédie Méthodique, Ornithologie.' The species already given are included in this author's list, but no novelty afforded.

(1794.) Donndorf (Johann August), 'Zoologische Beiträge.' No new facts are recorded by the great synonymatist, while the errors previously made are repeated.

Between this date and the next, a period of nearly thirty years, nothing especial transpired in the literature of this genus.

(1822.) 'Transactions of the Linnean Society.' Dr. Horsfield describes *P. javanicus* from Java. Species six.

(1824.) Temminck, 'Planches Coloriées.' The *Pelicanus conspicillatus* is here described for the first time. Species seven.

(1826.) Stephens, in 'Shaw's General Zoology.' A list of eight species is given, more correct than those usually met with at this period. These are *P. onocrotalus, fuscus, rufescens, carolinensis, australis, javanicus, thagus*, and *trachyrhynchus*: *australis* is a synonym of *conspicillatus, carolinensis* of *fuscus*, and *thagus* of *molinæ*; the other four stand as at present good species, so considered.

(1826.) Rüppell, 'Reise im nördl. Africa, Zoologie.' Dr. Rüppell figures *P. rufescens*, up to the present time the only tolerable representation of the adult existing.

(1831.) Lesson, 'Traité d'Ornithologie.' A list by this author, only requiring notice here from his giving a new synonym to the *P. rufescens*, in his *P. cristatus*.

(1832.) Bruch, 'Isis,' p. 1109. *P. crispus* is here first described. Species eight.

(1832.) Wagler, 'Isis,' p. 1233. Our author institutes the genus *Onocrotalus* (oblivious of Brisson's genus of the same name) with

the *O. hernandezii* as the type—this, however, being a synonym of *P. thagus* of Molina, now accepted as *P. molinæ* of Gray. *P. rufescens* in this article is also renamed *phæospilus*. Species eight.

(1836.) Brandt, Joannes Fredericus, 'Descriptiones et Icones Animalium Rossicorum novorum.' The author gives in this pamphlet descriptions and copious synonymy of two species, *P. onocrotalus* and *P. crispus*, while *fuscus* is attributed to the West Indies, and *conspicillatus* to New Holland, and *onocrotalus, vel species valde affinis* to North America. A good description of the bony structure and internal anatomy of *onocrotalus* is added. A very valuable contribution.

(1837.) Rüppell, 'Museum Senckenbergianum,' p. 185. A new species is here described as *P. minor*. Species nine.

(1838.) Lichtenstein, 'Abhandlungen der Königl. Akademie der Wissenschaften zu Berlin.' In this valuable paper is contained the best monograph of this genus that had thus far been attempted. Seven species are given, namely, *onocrotalus, mitratus, crispus, rufescens, trachyrhynchus, fuscus*, and *conspicillatus*: *P. mitratus* is described as new, but is the *minor* of Rüppell given in the previous year, as above noted, while *philippensis* of Brisson and *manillensis* and *roseus* of Gmelin are considered the same as *rufescens*. A plate with representations of the heads, both in profile and front view, of six of the species is given, *conspicillatus* having been omitted. Altogether it is the most valuable paper on this genus thus far published.

(1849.) Gray and Mitchell, 'Genera of Birds.' The genus *Pelecanus* is here introduced as belonging to the second subfamily of the great family *Pelecanidæ*, which arrangement the present writer accepts only in part. The four generally considered families, *Pelecanidæ, Plotidæ, Tachypetidæ*, and *Phalacrocoracidæ*, would seem to be far more naturally arranged if brought together under the first named, and these divisions considered as subfamilies of the one family *Pelecanidæ*. The differences exhibited among the members of each group from those of the others are more of the kind properly considered generic than of those which constitute separate family divisions. All the species as now known are included in this excellent list, except the *P. javanicus* of Horsfield.

(1850.) Reichenbach, "Novitiæ ad 'Synopsis Avium.'" Eight species are here enumerated, *javanicus* and *molinæ* being omitted. Reduced figures are also given.

(1851.) Reichenbach, MS., as quoted by Bonaparte. Four genera are here instituted—*Catoptropelicanus*, type *P. conspicillatus*; *Onocrotalus*, type *P. crispus*; *Cyrtopelicanus*, type *P. erythrorhynchus*; and *Leptopelicanus*, type *P. fuscus*.

(1857.) Bonaparte, 'Conspectus Generum Avium.' In this monograph the various species are grouped in three genera. *Pelecanus*, Linn., comprises *conspicillatus, crispus, rufescens, philippensis*, and *onocrotalus*. *Catoptropelicanus*, Reich., is placed as a subgenus for *conspicillatus*, and *Onocrotalus* of the same author as a

subgenus for the remaining species; while *P. minor* of Rüppell is deemed a variety of *onocrotalus*, and *mitratus* of Lichtenstein a synonym of *rufescens*—this last a serious error, as the two may not even be included in the same group. This error, however, is repeated again by *javanicus* of Horsfield being given as a synonym of *philippensis*. The two species *mitratus* (or *minor*, as it should be called) and *javanicus* belong to that group which have the feathers of the forehead terminating in a long point at the base of the upper mandible, while in *rufescens* these form a concave line at the base of the culmen. This author appears to have arranged his synonymy without having examined the specimens, which is generally considered rather necessary when one is defining species.

The second genus is *Cyrtopelicanus*, Reich., including the single species *erythrorhynchus*—although Latham's name is here employed, and the synonymy is very much mixed up with that properly belonging to *molinæ* of Gray; for although we may not exactly be able to determine what *thagus* of Molina is referable to, it is very certain that it does not belong to the White Pelican of North America. The remaining species, *fuscus* and *thagus* (Molina), are included in Wagler's genus *Onocrotalus*, Brisson's genus of the same name, established nearly one hundred years previous, being ignored. These genera are made to comprise the subfamily *Pelecaninæ*, which, with *Sulinæ*, constitutes his family *Pelecanidæ*, tribe Totipalmi, of the order Gaviæ.

(1864.) Jerdon, 'Birds of India.' In this valuable work the species of Pelicans inhabiting India are given:—*P. onocrotalus*; *P. mitratus*, which is *minor*, Rüppell; *P. javanicus*, which, being described as possessing an occipital crest, which true *javanicus* never has, and also having the frontal feathers truncated and not pointed, would appear to be referable to *P. rufescens*; and, finally, *P. philippensis*, which is young *rufescens*.

(1867.) Blyth, in the 'Ibis.' In his commentary on Dr. Jerdon's 'Birds of India,' this author here reviews the Pelicans enumerated in that work. He refers *mitratus* to *onocrotalus* as identical, or only a race. The *P. onocrotalus* of Jerdon is mentioned as never having any occipital crest, nor any tumidity upon the forehead, which does not agree with *onocrotalus* of Europe, which, during the breeding-season, has both of these. *P. javanicus* is considered a race of *onocrotalus*; and a fourth race, a "similar diminutive of *P. mitratus*," is deemed to be the *Onocrotalus minor* of Rüppell. Of the *P. crispus* type, *P. rufescens* is acknowledged, and *philippensis* doubtfully separated from it.

(1868.) Sclater, 'Proceedings of the Zoological Society.' A list of the known species is here given, with plates of two, *fuscus* and *rufescens*, juv.: *javanicus*, Jerdon, is referred to *mitratus*, Lichtenstein; and *onocrotalus*, Jerdon, to *javanicus*, Horsfield. An analytical table is appended at the end of the article. No synonymy is given, the article being intended more as a list of the species living in the gardens of the Society than as a monograph of the genus.

Characters of the Subfamily.

The Pelicans form a very strongly defined and well-marked group or division of the great family *Pelecanidæ*, which is distinguished from all others by its members possessing gular sacs, less extensive in the Cormorants and Gannets, but having their greatest development in the birds forming the genus now under consideration. Another peculiar characteristic of this family is, that its members have the four toes connected by a thin semitransparent skin; the hind toe, articulated to the inner side of the tarsus, pointing inwards, sometimes directed slightly forwards. Although so well provided for a life in the watery element, they nevertheless perch well upon the branches of trees, in many instances build their nests upon the limbs raised high above the water. The young are incapable of providing for themselves, and do not leave the nest for a long period after escaping from the shell.

The family *Pelecanidæ* is composed of six subfamilies, *Phætoninæ*, *Attageninæ*, *Plotinæ*, *Pelecaninæ*, *Sulinæ*, and *Graculinæ*, as it appears to the present writer. Gray comprises them in three, making *Pelecaninæ* to include *Sulinæ*, *Graculinæ*, and *Attageninæ*, while many writers make them all distinct families. These six subfamilies constitute the order Steganopodes. The members of this order occupy a very humble rank in the classification of birds, being only the second remove from the lowest, which comprises the Auks and their allies, some of which, in their wingless forms, or rather being incapable of flight, are but one step from the inhabitants of the deep. As a general rule the Pelecans are dwellers in warm countries, and are found mostly in those lying towards the equator; but there are exceptions to this, the *P. erythrorhynchus* of North America having been met with in great numbers in the fur-countries as high as 61° N. latitude, and the *P. onocrotalus* of Europe has penetrated into the colder regions of that continent. Pelicans are altrices, and do not generally lay more than two eggs, although three are sometimes found in the same nest. They are naturally arranged into two groups, according to the shape of the frontal feathers. One, of which we may consider *P. onocrotalus* as the type, has the feathers prolonged to a point, which divides the bare skin, and comes down nearly to the culmen; the other, of which *P. crispus* may be taken as the type, has the feathers coming down upon the forehead and forming a concave line upon the culmen. The first of these embraces, beside the typical species, *minor* and *javanicus*; the second contains *crispus*, *rufescens*, *conspicillatus*, *erythrorhynchus*, *fuscus*, and *molinæ*. All the species fly and walk well; one only dives or plunges.

Pelicans are the largest of the water-birds, some species exceeding the Swan in size, and when upon the wing have an alar extent nearly as great as any bird that flies. Their bodies are heavy; but they seem to be no impediment to the bird when desirous of ascending into the air, where they frequently amuse themselves sailing in wide circles for hours.

The general form is stout, heavy, and cumbersome, the apparently disproportioned bill and deep pendent gular sac giving to the bird an awkward, rather stupid appearance. The body is long, flattened beneath; the neck long and thick. Head rather small, oblong, rather flat on the top. The plumage is soft and downy upon the head and neck, excepting the feathers of the crest when this appendage is present; that of the upper parts is usually lanceolate, rather loose; of the breast and under parts thick and elastic, impervious to water.

The bill of the Pelican is of peculiar form, fitted to sustain the pouch which is suspended from it. It is long, rather slender, generally straight, and flattened. The upper mandible is convex at the base, more so in some species than in others, becoming flattened, spreads gradually, and reaches its widest part near the end, when it narrows rapidly and terminates in a nail, or hooked point. The ridge is convex at first and then follows the shape of the mandible, narrowing towards the tip. The nail is curved sharply, concave beneath, with the point acute. The crura of the lower mandible are separated, and only meet at the tip; to these, filling up the interspace which thus occupies the whole length of the bill, is appended the huge gular pouch, being a huge exaggeration of the membrane usually observed at the base of the under mandible in other species of birds. At the base, and extending for about one-half of the length of the bill, the lower mandible is wider than the upper, but contracts and fits into the upper mandible for the remainder of its length. Upon the ridge of the upper mandible, in one species, a bony crest is present in the males during the breeding-season, but does not remain after that period. The pouch is formed of skin, which is thin, filled with small blood-vessels, semitransparent, and capable of great distention. It extends in a greater or less degree down the throat, reaching its greatest development in *P. molinæ*.

The nostrils, although visible and open in the young, are hidden in the adults, in a groove which runs along the side of the ridge on the upper mandible. The bill is covered with an irregular, rough, somewhat scaly skin.

The wings are long, when folded reaching to about half the length of the tail; the second and third primaries usually the longest; the secondaries are incurved, long—sometimes, when the wing is closed, extending beyond the primaries. The feathers of the coverts are long and narrow, in some species lanceolate.

The tail is rather short, broad, and rounded, composed, in the different species, of various numbers of feathers, which are pointed. The coverts are long, both upper and under covering two-thirds of the length of the tail.

Thighs usually within the body; the tarsus rather short, in some species being two-thirds the length of the middle toe without the claw, in others about equal to it. It is covered with hexagonally shaped scutellæ, largest anteriorly. Feet rather small; toes on an equal plane, all connected by a web. Claws short, stout, curved, acute, concave beneath.

Family Pelecanidæ.

Char.—Feet small. The four toes on a level, connected together by a more or less indented web.

Subfamily Pelecaninæ.

Size large; body heavy; head with or without occipital crest.

Genus Pelecanus.

Bill very long; sac extending the entire length; under mandible wider than the upper at the base. Upper mandible terminating in a sharp curved nail.

Analytical Table.

A. Bare loral space extending to the mandibles.
- *a'*. Feathers on the forehead extending to a point on the culmen ..... 1. *P. onocrotalus.* 2. *P. minor.* 3. *P. javanicus.*
- *b'*. Lower mandible feathered at base ..... 4. *P. erythrorhynchus.*
- *c'*. Feathers of the forehead forming a concave line at the base of the culmen. Mandibles free of feathers ..... 5. *P. crispus.* 6. *P. rufescens.* 7. *P. fuscus.* 8. *P. molinæ.*

B. Bare loral space separated from the bill by a row of feathers..... 9. *P. australis.*

Description of the Genera and Species.

Subfamily Pelecaninæ.

Pelecanus, Linnæus.

Pelecanus, Linn. Syst. Nat. p. 132 (1758) (auct.).

Onocrotalus, Briss. Ornithologie (1760), tom. vi. p. 519, type *P. onocrotalus*; Wagler nec Briss. Isis (1832), p. 1233, type *P. molinæ*.

Catoptropelicanus, Reich., type *P. conspicillatus*.

Onocrotalus, Reich., nec Briss. nec Wagl., type *P. crispus*.

Cyrtopelicanus, Reich. MS., type *P. erythrorhynchus*.

Leptopelicanus, Reich. MS., type *P. fuscus*.

Largest in size of all the birds of this family. Head long, oval, flattened. Neck long and thick. Wings long, secondaries exceeding the primaries when the wing is folded. Tail moderate, rounded. Tarsi short; toes long, webs broad, not indented. Bill very long; gular sac attached to the crura of the lower mandible for its entire length. Nostrils in adults hidden.

This genus, instituted by Linnæus at a much earlier date even than the one selected as a starting-point for this monograph, comprises various species of birds which cannot be confounded with any others known, and which, according to the views of the present writer, do not present any characters not common to all, which can be considered of sufficient importance to separate any of the number from the remainder into a different genus, as has been of late years

attempted. But one species of Pelican seems to have been known to Linnæus (the common *P. onocrotalus* of Europe) at the date of the tenth edition of his 'Systema Avium,' although two years later Brisson enumerates four. The various genera instituted by Reichenbach, as above quoted, do not seem to be founded upon sufficient reasons, the characters selected appertaining more to specific than generic distinctions.

PELECANUS ONOCROTALUS.

Pelecanus onocrotalus, Linn. Syst. Nat. vol. i. p. 132 (1758); Naum. Vög. Deutschl. t. 282. 1 (ad.), 2 (juv.); Bonnat. Encycl. Méthod. Ornith. (1790) p. 42; Lath. Syn. vol. iii. p. 578. sp. 1; *id.* Ind. Orn. ii. p. 882. sp. 1; Steph. Gen. Zool. xiii. p. 109, t. 12; Brehm, Vög. Deutsch. p. 824, t. 40. fig. 1; Roux, Orn. Prov. t. 342 (juv.); Reich. Syst. Av. pl. 36. figs. 376, 377; Gray, Gen. of Birds, iii. p. 668. sp. 1; Gmel. Syst. Nat. i. pt. 2 (1788), p. 569; Bree, Birds of Eur. vol. iv. p. 174; Temm. Man. d'Ornith. ii. p. 891; Jerd. B. of India, vol. iii. p. 854; Brandt, Icon. Animal. Rossic. Nov. (1836) p. 44. sp. 1; Schleg. Mus. Pays-Bas, 4me livr. p. 30; Sclat. P. Z. S. (1868) p. 264; Licht. Abhandl. Akad. Wiss. Berl. (1838) p. 436, t. 3. fig. 1; Donnd. Zool. Beitr. vol. ii. pt. 1, 844; Gould, B. of Eur. vol. v. pl. 405?

Le Pélican, Buff. Plan. Enlum. 87, p. 169, tom. ix.

Pelecanus roseus, Eversm. in Script. Liter. Imp. Universit. Casanien. (1835) fascic. ii. p. 369.

Onocrotalus albus, Brisson, Ornith. (1760) p. 519, tom. vi.

Pelecanus javanicus, Blyth, Cat. B. Mus. Asiat. Soc. Beng. p. 297. n. 1740.

Occiput with a rather elongated crest during the breeding-season. Bare space around the eye diamond-shape behind, and reaching to the base of the upper mandible. Gular pouch extending for about six inches down the throat. Feathers of head form a distinct point upon the forehead. Upper mandible reddish at the base, becoming yellowish at the tip, with a line of crimson along the culmen; under mandible pale red. Pouch and bare space about the eye flesh-colour. Primaries and spurious wing black. Occipital crest and the elongated feathers at the lower part of the neck in front light yellow. Rest of plumage white, tinged with rose-colour. Tarsi flesh-colour. Tail of eighteen feathers. Length about 5 feet, wing 26 inches, tarsus 4½ inches, upper mandible 16 inches.

Hab. Europe and northern part of Africa. Common in Hungary, Crimea, Egypt, and Ionian Islands. Accidental in France and Algeria. In West Africa, at Senegambia and Mozambique*. Also in Abyssinia.

The young during the first year are uniform greyish brown, the lanceolate feathers of the breast being entirely wanting. The perfect plumage is not acquired for some years; and the depth of the rosy tint is increased at the breeding-season.

* Ornithologie Westafrikas, p. 259 (Hartl.).

I have never seen a specimen of this bird; and the type, which is now in the collection of the East-India Company, is not at present visible, on account of the birds being packed preparatory to their removal to another location; consequently I am not able to give an opinion upon its specific value.

It is distinguished from *P. onocrotalus*, according to its describer, by having the margins of the tertiaries black, and by never having any pendent occipital feathers; instead it has a few recurved feathers upon the nape. According to Blyth, as quoted from 'The Ibis,' the forehead is never tumid, the bare skin of the cheeks is deep purplish or livid carneous, and the pouch intense bright yellow.

Length, as given by Blyth, 5 feet 6 in.; alar extent 8 feet 10 in.; wing, from carpal joint, 26 in.; tail 8 in.; bill, along culmen, 14·5; tarsus 5·5 in. Another had the bill 15·5 in., wing 27 in.; in a third the bill was 16 inches in length.

PELECANUS CRISPUS.

Pelecanus crispus, Bruch, Isis (1832), p. 1109; Licht. Abhandl. Akad. Wiss. Berl. (1838) t. 3. fig. 4, p. 437; Gould's B. of Eur. pl. 406, vol. v.; Bree, B. of Eur. vol. iv. p. 167; Naum. Vög. Deutsch. vol. ii. p. 180, pl. 283; Reichen. Syst. Av. vol. i. pl. 36. figs. 378, 379; Feldegg?; Schleg. Mus. Pays-Bas, 4me livr. p. 32; Bon. Consp. Gen. Av. vol. ii. p. 162. sp. 2; Brandt, Icon. Animal. Rossic. Nov. (1836) p. 59; Sclat. P. Z. S. (1868) p. 267.

P. onocrotalus, Pall. Ross.-Asiat. vol. ii. p. 292; Eversm. in Script. Literar. a Cæsarea Universit. Casanien. editis (1835), fascic. ii. p. 370.

P. patagiatus, Brehm, Isis (1832), p. 1109.

Head crested; feathers of the forehead advancing on each side towards the nostrils, forming a concave line upon the culmen. Gular pouch extending for about 4 inches upon the throat, in a gently curved line from the base of the lower mandible. The feathers of the head and neck are long, narrow, and filamentous. The body-feathers terminate in long points, those of the under surface being very narrow. The entire plumage, save the primaries, is silvery white; a yellow tinge upon the long feathers of the breast; those of the back wings and tail have black shafts. Primaries black, greyish at their bases and inclined to grey at their tips. The upper mandible is grey, marked with blue and red; and on each side, at the base of the under mandible, a spot of yellowish grey. Gular pouch deep orange, intermingled with bluish. Naked skin round the eye reddish, with a blue shade near the bill. Tarsi and feet light flesh-colour. Iris yellow.

Wing 26 in.; tail (twenty-two feathers) 6½ in.; bill, along culmen, 16 in.; tarsus 4½ in.; middle toe 4½ in.

The young are devoid of crest, have a greyish pouch, and the entire plumage brownish grey.

Hab. Dalmatia, Greece, Russia, Asia, and northern parts of Africa, China.

This splendid bird, the largest of the genus, may stand as the

type of one of the two groups which the Pelicans seem naturally to comprise—that one in which the feathers of the forehead form a concave line upon the culmen. It is easily distinguished in the mature state from all the other species by the thick mass of recurving feathers upon the head (which are loose and fall over on each side, producing a conspicuous crest), by the lanceolate feathers of the breast, and by its comparatively shorter tarsus. The present species being comparatively recently known, having been described by Bruch, in 'Isis,' in 1832, its synonymy is not in any way confused —quite a relief among this family of birds, so many of which have their synonyms so sadly involved that it seems to be almost a hopeless task to restore them all to their proper places.

This species, according to Baron Feldegg, arrives in Dalmatia in the spring and autumn, and prefers the river Naranta, near Fort Opers, where it is bordered with morasses. Count v. d. Mühle, 'Orn. Griech.' p. 132, as quoted in Bree's 'Birds of Europe,' says "it is very plentiful in Greece the whole year through; and on many lakes and swamps, such as Zigeri, Kopai, and Paralynni, are broad colonies of them. They are also very plentiful on the lakes of Missolonghi and Thermopylæ. In places incredibly difficult to reach, where floating islands are found, they place their nests very thickly together, supported among the reeds and rushes, and generally soaked with wet. The whole neighbourhood of these congregated nests is covered with their dull white dung and a multitude of foul fish which they have dropped about, and which make the spot horribly offensive. The yellow-grey young birds have a very unsightly appearance, and these never-satisfied screamers, with their shrill shrieking voice, and the unformed head hanging on the crop, make an unsightly picture."

PELECANUS RUFESCENS.

Red-backed Pelican, Lath. Gen. Syn. vol. iii. pt. 2, p. 584. sp. 6 (1785).

Pelecanus rufescens, Gmel. Syst. Nat. vol. i. (1788) p. 571. sp. 13; Reich. Syst. Av. pl. 38. fig. 386, & pl. 38. figs. 878 & 384, 385 (juv.); Rüpp. Atl. t. 21, p. 31; *id.* Reise im nördl. Afrika, Zool. p. 439; Licht. Abhandl. Akad. Wiss. Berl. (1838) t. 25. sp. 5, & tab. 3. fig. 3; Bon. Consp. Gen. Av. vol. ii. p. 162; Bonnat. Ency. Méth. Ornith. (1790) p. 44; Steph. Shaw's Gen. Zool. xiii. p. 114; Lath. Ind. Ornith. vol. ii. p. 884. sp. 6; Gray, Gen. of Birds, vol. iii. sp. 6; Sclat. Proc. Zool. Soc. (1868) p. 267, pl. 26 (juv.).

P. cristatus, Less. Traité d'Ornith. p. 602 (1831).

P. phœospilus, Wagl. Isis (1832) p. 1233.

P. roseus, Donnd. Zool. Beitr. vol. ii. pt. 1, p. 848. sp. 9; Bonnat. Ency. Méthod. Ornith. (1790) p. 43; Gmel. Syst. Nat. (1788) p. 570. sp. 9.

P. philippensis, Jerd. B. of Ind. iii. p. 858 (juv.); Gmel. Syst. Nat. (1788) vol. i. p. 571. sp. 11; Lath. Ind. Ornith. vol. ii. p. 883. sp. 5 (1790); Gray, Gen. of Birds, vol. iii. sp. 2 (1849);

Reich. Syst. Av. vol. i. pl. 36. fig. 877 (juv.); Donnd. Ornith. Beitr. vol. ii. pt. 1, p. 849. sp. 12; Sclat. Proc. Zool. Soc. (1868) p. 268.

Pélican des Philippines, Buff. Pl. Enl. 965; Bonnat. Ency. Méthod. Ornith. (1790) p. 43.

Rose-coloured Pelican, Lath. Gen. Syn. vol. iii. p. 579 (1785).

Pelecanus javanicus, Jerd. B. of Ind. vol. iii. p. 857.

Le Pélican rose de l'île de Luçon, Sonn. Voy. p. 91, pl. 54, vol. iii. (1776).

Le Pélican brun de l'île de Luçon, Sonn. Voy. p. 91, pl. 53, vol. iii.

Pelecanus manillensis, Gmel. Syst. Nat. (1788) vol. i. p. 571. sp. 11; Lath. Ind. Ornith. vol. ii. p. 883. sp. 4; Donnd. Ornith. Beitr. vol. ii. pt. 1, p. 849. sp. 11.

Onocrotalus philippensis, Briss. tom. vi. p. 527. sp. 3, t. 46; Bon. Consp. Gen. Av. ii. p. 162; Schleg. Mus. Pays-Bas, 4me livr. p. 33.

Pelecanus calorhynchus, Hodgs.; Gray, Zool. Misc. p. 86.

P. gangeticus, Hodgs.; Gray, Zool. Misc. p. 86.

P. philippensis, J. E. Gray, Cat. Mamm. and Birds in Brit. Mus. presented by B. H. Hodgson.

Adult.—Head with a long, full, pendent crest, some of the feathers 5 inches in length. Feathers of the neck and head short, soft, rather furry to the touch; those of the body and wing-coverts long, and narrow lanceolate in form. Feathers of the forehead coming down to the bill, forming a concave line upon the culmen. Gular sac, starting from the base of the lower mandible, descending in a gently curved line for about 6 inches upon the neck. Bare skin around the eye contracted, of small dimensions, extending no distance behind the eye, reaching to base of upper mandible in front. Head and neck soiled white; crest dark grey, tinged with rose, each feather tipped with white. Back and upper tail-coverts deep rich rose-colour. Feathers on the crop long, stiffened, yellowish. Wings yellowish white, secondaries silver-grey; primaries black, with black shafts, white at base, with white shafts, brownish at their tips. Tail silver-grey; shafts of greater and lesser coverts, secondaries, and tail-feathers black. Bill yellowish, without any spots upon the upper mandible. Bare ocular space flesh-colour, with a black conspicuous spot near the upper mandible; gular pouch yellowish, streaked with reddish lines. Tarsi flesh-colour. Length about 60 inches; wings, from carpal joint to end of primaries, 20–24 inches; tail 8 inches; bill, along culmen, 15 inches; tarsus $3\frac{3}{4}$ inches; middle toe $4\frac{1}{4}$ inches.

A second specimen is somewhat younger, probably assuming for the first time the adult livery, and not in as perfect plumage as the first. It is devoid of crest; the feathers of the head and neck are short, brown tipped with white, giving to this part a mottled appearance. The remainder of the plumage is dark grey, centre of the feathers brown, secondaries tipped with light brown; there is more of the rose-colour, however, present, this hue extending somewhat

upon the flanks, and also covering the vent and entire under tail-coverts. The measurements are:—wing 24 inches; tail 8 inches; bill, along culmen, 13½ inches; tarsus 3¾ inches; middle toe 4 inches.

A third specimen, still youuger, has the head and neck covered with a whitish down, a few short feathers standing out from the occiput. The feathers of the body rounded, none of the lanceolate shape (so conspicuous a feature in the adult) yet present. Upper parts and wings light brown, each feather with a broad margin of white; secondaries dark brown in the centre, fading out gradually to a brownish grey on the edges; primaries brownish black. Back and upper tail-coverts pure white, with none of the roseate tinge so prevalent in the more matured individuals. Tail silvery white; shafts of the feathers of the tertials, secondaries, primaries, and tail black, white at their bases. Bill clear yellow; the upper mandible with two rows of impressed black spots; bare skin around the eye yellow. (Entire under parts pure white; the feathers soft and downy.) The colours present in life having all disappeared. Wing, from carpal joint, 22 inches; tail 8 inches; bill, along culmen, 12¼ inches; tarsus 3¾ inches; middle toe 4 inches.

Hab. Nubia, Abyssinia, Senegal, Madagascar, India, Cochinchina, Malacca, Philippines, Java, &c.

The synonymy of this species appears to be in a sad state of confusion, arising chiefly from the doubts existing as to whether this bird and *P. philippensis* are distinct—a circumstance which may indeed be very seriously questioned, as the differences that are claimed as sufficient to separate them are very slight, and may only be the result of age. Latham, in his 'Synopsis,' is the first to describe this species, which is sufficiently well done to leave no doubt of the bird meant by him; besides, the name which he conferred upon it, that of the *Red-backed Pelican*, indicates the adult of this species, and no other, as it is the only one of this genus which has the rose-colour restricted to these particular portions of the body. Gmelin, three years afterwards, in his 'Systema Naturæ,' confers upon Latham's bird the name of *rufescens*, which, by the laws of priority, is the one it now possesses. The *Pelecanus cristatus* of Lesson appears to be a bird of this species. The long lanceolate feathers of the crest and back delicately tinted with yellowish, together with the square shape of the frontal feathers, would seem to point out the present bird. The pure white of the plumage ("plumage blanc pur") cannot be taken as referring to the entire bird, as, further on, the description says, "plumes du cou et du dos minces, effilées, *légèrement soufrées*," which is observed also in specimens of *rufescens*. The absence of all mention of the rose-colour on the back arises probably from the fact of Lesson's specimen not being in the dress of the fully matured bird, which we may suppose alone possesses this beautiful hue. The *Pelecanus phæospilus* of Wagler is probably the present species, although he gives no description to enable the bird he has in view to be definitely ascertained. He gives Senegal as the locality of his species, which is one of the habitats of *P. rufescens*.

The *P. philippensis* of Jerdon is undoubtedly the immature bird of *P. rufescens*; and the young, as described by him, is a bird of this species in its first stage of plumage. Rüppell's figure exhibits very fairly the adult in perfect plumage, and is the only one yet given by which the species is properly represented, although the drawing may not be so artistic as could be wished. A specimen of this bird in the British Museum, from Nepaul, Hodgson's collection, is very interesting, as it is just changing to the adult plumage, and exhibits very distinctly the reddish colour on the back and rump, while still retaining the black marks on the upper mandible, thus combining the characteristics of *rufescens* and *philippensis*, and showing that the latter supposed species is but the young of the former.

It is very difficult to decide what species Jerdon intends by his *P. javanicus*, as he seems to confound three in one, viz. *P. javanicus*, *P. minor*, and *P. rufescens*. He describes his bird as having broad black margins on each side of the tertiaries, which is truly a character of *javanicus*; but then he speaks of an occipital crest and golden-yellow breast, which, with the dimensions given, would seem to refer his specimen to "*minor*;" while, at the conclusion of the article, he says, "forehead with the frontal plumes not narrowed in front, but truncated and emaginate; bill with a double series of impressed dark spots." Now the form of the frontal feathers here described renders it impossible that the bird he had in view could belong to any species of the *onocrotalus* style, and therefore both *javanicus* and *minor* are excluded from all further consideration; while the truncate and emarginate frontal plumes, with the dark spots upon the bill, are characteristics of young *rufescens*; therefore I have referred Jerdon's birds to the present species.

PELECANUS FUSCUS.

Pelecanus fuscus, Linn. Syst. Nat. (1766) p. 215; Vieill. Gal. Ois. t. 276; Licht. Abhand. Akad. Wiss. Berl. (1838) t. 3. f. 6; Donnd. Ornith. Beitr. vol. ii. pt. 1, p. 848; Aud. B. of Am. t. 251. fig. 421; *id.* Orn. Biog. vol. iii. p. 376; Reich. Syst. Av. t. 37. figs. 382, 383; Schleg. Mus. Pays-Bas. 4me livr. p. 28; Sclat. Proc. Zool. Soc. (1858) pp. 268 & 269; Bon. Consp. Gen. Av. vol. ii. p. 163; Lawr. B. of Am. p. 870; Lath. Ind. Orn. vol. ii. p. 833. sp. 3; Bonnat, Ency. Méth. Ornith. (1790) p. 43.

Pélican brun d'Amérique, Buff. Plan. Enl. 957.

Charlestown Pelican, Penn. Arct. Zool. vol. ii. p. 308. sp. 506; Lath. Syn. vol. iii. p. 580. sp. 3.

Pelecanus carolinensis, Gmel. Syst. Nat. (1788) vol. i. pt. 2, p. 571; Bonnat. Ency. Méth. Ornith. (1790) p. 52; Lath. Ind. Ornith. vol. ii. p. 884. sp. 7.

Onocrotalus fuscus, Bon. Consp. Gen. Av. vol. ii. p. 163.

Leptopelecanus fuscus, Reich. Syst. Av. pl. 70.

Dusky Pelican, Penn. Arct. Zool. vol. ii. 308. sp. 507.

Brown Pelican, Lath. Syn. vol. iii. p. 585. sp. 7.

Head with slight occipital crest. Feathers of the forehead forming a concave line upon the culmen. Bare space between the bill and the eye. Gular patch large, extending in nearly a straight line from under mandible halfway down the neck. Feathers of the neck and throat soft and downy, becoming, however, rather stiff on the upper part of the breast. Tail 22 feathers.

Adult male in breeding-plumage.—Fore part of head bright yellow, crown to occiput and a narrow line running down the neck along the edge of the pouch white; rest of neck and a short line between the white in front, at the lower part, deep rich chestnut. The neck at other seasons of the year is yellowish white. Short crest reddish brown. Back and wings ash, with dusky edges, the latter colour becoming almost obsolete on the greater coverts. Primaries blackish brown; the shafts white for the greater part, black towards the tips. Secondaries greyish brown, margined with pale brown. Tail greyish ash; shafts of feathers blackish brown, white at their base. At the end of neck in front a small patch of light yellow. Under parts dark brown; sides marked with narrow longitudinal white lines. Bill greyish with a brown tinge, spotted irregularly with carmine. Under mandible for half its length and tip of upper mandible blackish. Bare space about the eye blue; gular pouch blackish, streaked with brownish lines. Tarsi and feet black. Length about 50 inches, wing 23 inches, tail 7 inches, bill 13 inches, tarsus $2\frac{1}{2}$ inches, middle toe $3\frac{3}{4}$ inches.

The female is rather larger than the male, and resembles him in colour of plumage.

Young.—Upper parts generally dark brown, secondaries and coverts tipped with lighter brown. Primaries and tail brownish black, with white shafts. Bill and gular pouch greyish blue. Under parts white. Tarsus and feet lead-colour.

Hab. Shores of the Gulf of Mexico, California.

The Brown Pelican is very numerous on the sea-coast of the Southern States, particularly at Key West, in Florida, where it frequents the salt-water inlets and bays that abound there. In its habits it differs somewhat from the White Pelican, especially in its mode of procuring food, which is obtained by plunging obliquely into the water, frequently immersing the whole body. The prey is scooped up and immediately swallowed, and the plunge repeated until its hunger is satisfied. Audubon states that the Black-headed Gulls follow this bird when on a fishing-excursion, and when the Pelican has obtained a quantity of fish some frequently fall out of its pouch when the water is allowed to escape. The Gulls, to obtain these, alight upon the bill or head of the Pelican, and seize them before they reach the water. I have never witnessed this curious fact. The food of this species appears to be entirely fish, small ones being usually selected. The Brown Pelican goes in flocks until the breeding-time, which is about the middle of April, when the old ones separate from the younger birds. The nest, which is constructed of sticks, roots, and plants, is placed on or near the tops of the mangroves; and the eggs, two to three in number,

are white, with a few faint blotches of pale blue. The shell is thick and rough. The young are covered with down of a creamy colour, and are fed by their parents, at first with fish well macerated, but after they acquire more strength it is given to them entire. The flight of this bird is rather heavy, but well sustained, and they proceed by regular flappings and sailings. It is fond in warm, calm weather of rising high in the air, which is accomplished by wide circles, and then sailing for a considerable length of time. Their evolutions at such times are very beautiful. The flesh of this bird is tough and fishy, unfit for food, although the negroes are accustomed to eat the young.

There is no difficulty in the synonymy of this species.

PELECANUS MOLINÆ. (Plate XLIV.)

Pelecanus thagus, Steph. Gen. Zool. vol. xiii. p. 117; Gmel. Syst. Nat. vol. i. p. 577 (1788); Molina, Chil. p. 212?; Gay, Hist. Chili, Zool. vol. i. p. 494; Bonnat. Ency. Méth. Ornith. (1790) p. 46; Donnd. Ornith. Beitr. vol. ii. pt. 1, p. 859. sp. 30.

Onocratalus thagus, Bon. Consp. Gen. Av. vol. ii. p. 164 (1851?).

O. rostro denticulato, Briss. Orn. vol. vi. p. 523 A.

Pélican à bec dentelé, Buff. Hist. Nat. des Ois. 8. p. 309.

Onocrotalus hernandezii, Wagl. Isis (1832), p. 1233. sp. 1.

O. mexicanus dentatus, Raii Syn. p. 127.

Saw-billed Pelican, Lath. Syn. vol. iii. pt. 2, p. 579 A.

Pelecanus molinæ, G. R. Gray, Gen. of Birds, vol. iii. (1849); Sclat. Proc. Zool. Soc. (1868) p. 269.

Hab. South America!

As it is exceedingly uncertain what bird Molina meant when he wrote his description of *Pelecanus thagus*, and as it will not answer for any bird known to ornithologists at the present day, his name must become a synonym (although a doubtful one) of the present species, for which I have adopted the appellation bestowed upon it by Mr. Gray.

It is evidently a very near ally of the more northern *P. fuscus*, differing chiefly in its larger size.

Beside the two specimens in the British Museum, there is one immature in the Academy of Natural Sciences of Philadelphia, and one in the Paris Museum.

PELECANUS ERYTHRORHYNCHUS.

Rough-billed Pelican, Lath. Syn. vol. ii. (1785) p. 586.

Pelecanus erythrorhynchus, Gmel. Syst. Nat. (1788) vol. i. p. 571; Bonnat. Ency. Méth. Ornith. (1791) p. 44.

P. trachyrhynchos, Lath. Ind. Ornith. p. 884. sp. 8; Gray, Gen. of Birds (1845), p. 309; Lichten. Abhandl. Akad. Wiss. Berl. (1838) t. 3. fig. 5; Steph. Shaw's Gen. Zool. vol. xiii. (1825) pt. 1, p. 117.

Cryptopelicanus trachyrhynchus, Bon. Consp. Av. vol. ii. (1865) p. 163.

Pelecanus onocrotalus, Bon. Syn. (1828) no. 351; Nutt. Man. vol. ii. (1834) p. 471; Swains. Faun. Bor.-Am. vol. ii. p. 472 (1831).

P. americanus, Aud. Orn. Biog. vol. iv. (1838) p. 88; *id.* Syn. 1839; *id.* Birds Amer. vol. vii. p. 20, pl. 422.

P. brachydactylus, Licht.? (ubi?).

P. trachyrhynchus, Reich. Syst. Av. vol. i. t. 38. figs. 881, 882.

P. onocrotalus, Penn. Arct. Zool. vol. ii. p. 306. sp. 505.

P. erythrorhynchus, Schleg. Mus. Pays-Bas, 4me livr. p. 35.

P. trachyrhynchus, Sclat. Proc. Zool. Soc. (1868) p. 269.

P. erythrorhynchus, Donnd. Ornith. Beitr. vol. ii. pt. 1, p. 850. sp. 15.

Adult male.—General colour of plumage pure white; the crest upon the nape, most elongated during the breeding-season, at other periods of the year but little of it remaining, pale yellowish, as are also the elongated feathers upon the fore part of the breast. Primaries black, with white shafts, becoming blackish towards the end. Inner secondaries white, remainder black, with their bases white. A thin crest upon the upper mandible, in the breeding-season, about halfway from the point. Bill, space about the eye, gular sac, and feet bright yellow.

Bare space between the eye and the bill not extending behind the eye. Feathers of the throat extending for about two inches upon the sides of the lower mandible, dividing the gular sac from the bare ocular space; differing in this respect from all the other species of this genus. Feathers of the forehead slightly pointed at the culmen, but not forming so well defined an angle as in *onocrotalus* and others of that group. Tail of 24 feathers. Gular sac extending in a decidedly curved line down the throat for about 8 inches.

Length 60 inches; wing, from carpal joint, 23 inches; tail 6 inches; bill, along culmen, 14 inches; tarsus 4½ inches; middle toe 4¼ inches.

Female rather less in dimensions, and destitute of the horny crest on the upper mandible.

Hab. North America.

This Pelican is only found in the New World, but has been frequently confounded by authors with the *P. onocrotalus* of Europe, to which, indeed, it bears a very close resemblance in general appearance, but presents characters to the investigator sufficient to cause its separation into a distinct species. The horny crest on the upper mandible is peculiar to the male only, and is assumed at the breeding-season, after which period it falls off, leaving no evidence of its former existence. Mr. Ridgeway, during an excursion to Pyramid Lake, in Nevada, found these birds breeding on an island in the lake; and before they left, the shores of the island were covered with the horny crests which had fallen from the mandibles of the males. They seem to cast them somewhat as deer do their horns. The present species is pretty generally distributed throughout North America, rather rare, however, on the Atlantic coast of the northern

portion of the United States, and has been met with in the fur-countries up to the 61st parallel. On the southern coast of the United States they are very abundant; and I have witnessed them in winter on the sea-beach at Florida, standing close together in long rows of many hundreds of individuals, enjoying a siesta after fishing. This species does not plunge into the water after its prey, as is the custom of its relative the *P. fuscus*, but swims along, beating the surface of the water with its wings, and scooping up great numbers of fish at once. When raising the bill from the water, the point is held downwards until all the water has been allowed to run out from the sac, and then the small fish contained in the skinny bag are devoured at leisure. Sometimes so many fish or such large ones are obtained that the sac hangs down nearly to the ground, it is so very elastic; while at other times, when empty, it is drawn up between the crura of the lower mandible. When flying, these birds proceed in single file, flapping their wings two or three times in succession, and then sailing along for some distance, when the flappings are repeated. It is a very agreeable sight to witness them proceed in this manner along the surf, just clearing the waves as they roll and toss beneath them, and at times disappearing in the trough of the sea, to rise again over the crest of some mighty breaker. When on the wing, the head is drawn in close to the shoulders, the webbed feet extended behind. I have never heard them utter any sound as they thus proceeded.

The synonymy of this species does not involve any particularly doubtful point; several of the old authors, such as Pennant, and indeed some of the latter ones, as Swainson and Nuttall, confound it with the European bird. The name *erythrorhynchus* given to it by Gmelin, although perhaps unfortunate, since the bill is not red, yet has priority over Latham's more appropriate one of *trachyrhynchus*, and, consequently, must stand as the name for the species. The efforts made by some later writers to substitute Latham's name for that of Gmelin's cannot be countenanced; for it is contrary to the laws of priority, which is professed to be accepted as influencing the nomenclature of science; and if, simply because a name may be inappropriate, it is to give way to some other, then indeed a fine field is open for some one desirous of acquiring distinction in this line, as numerous names now accepted in ornithology could very properly be superseded by others.

PELECANUS CONSPICILLATUS.

Pelecanus conspicillatus, Temm. Pl. Col. 276; Gould, B. of Austr. vol. vii. pl. 74; Bon. Consp. Gen. Av. vol. ii. (1857) p. 161; Reichen. Syst. Av. vol. i. pl. 37. figs. 380, 381, and pl. 37 *b*. figs. 2318 & 2329; Schleg. Mus. Pays-Bas, p. 36, 4me livraison; Less. Traité d'Ornith. p. 602. sp. 3.

Catoptropelicanus conspicillatus, Reichenb.

Pelecanus australis, Steph. Shaw, Gen. Zool. vol. xiii. (1825) p. 113.

Ne-rim-ba and *Boo-dee-lung*, aborigines of Australia.

A short crest on back part of head. Gular pouch extending in a direct line from the lower mandible for about 3 inches upon the throat. Around the eye a bare space separated from the bill by a narrow line of white feathers. Scapulars, lower portion of greater wing-coverts, primaries, and secondaries, some feathers of the upper tail-coverts, and tail jet-black. Rest of plumage white, with a yellowish tint upon the breast. Gular pouch white, as are also the mandibles, the latter having a bluish tinge darkest at the tip, the cutting edges yellow; nail of mandible greenish yellow. Irides dark brown; orbits pale sulphur-yellow, bounded by a narrow ring of pale bluish grey.

Total length about 5 feet; upper mandible 18 inches in length along the culmen, its greatest width $1\frac{3}{4}$ inch; wing 25 inches; tail 10 inches; tarsus 5 inches; middle toe, without nail, $4\frac{3}{4}$ inches; outer toe $4\frac{1}{2}$ inches, inner 3 inches, hind toe $1\frac{1}{2}$ inch.

Hab. Australia, Van Diemen's Land.

This fine species is an inhabitant of Van Diemen's Land and the continent of Australia, in which countries it is very abundant. So numerous, indeed, is it on the inland waters, that Capt. Sturt states, as related by Mr. Gould, "that a channel of a river from 70 to 80 yards broad was literally covered with Pelicans, and that they were in such numbers upon the Darling as to be quite dazzling to the eye."

The Australian Pelican cannot easily be confounded with any other species, its black wing-coverts and tail serving to distinguish it from its fellows.

The nest, according to Mr. Gould, is "a large structure of sticks and grassy herbage, placed just above high-water mark; the eggs are generally two in number, of a dirty yellowish white, $3\frac{3}{4}$ inches long by $2\frac{3}{4}$ inches broad."

This species appears to be generally distributed throughout Australia, although it is gradually retiring before the advances of civilization.

8. Description of a new Species of Mexican Wren. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

(Plate XLV.)

When looking through the fine series of American birds in the Royal Zoological Museum of Berlin last summer, I found an example of a species of Wren from Mexico, which was quite new to me, and which, although long since provided with a MS. name, appeared to be undescribed. Dr. Peters, with his wonted liberality, upon my pointing this out to him, immediately offered me the loan of the specimen for examination and description, if new; and as, after carefully comparing it with other species known to me, I find my anticipations verified, I propose to characterize the species under the specific name already bestowed upon it in the Berlin Museum.

THRYOTHORUS NISORIUS, sp. nov. (Plate XLV.)

Troglodytes nisorius, Licht. in Mus. Berol.; *ej.* Nomencl. p. 34.

Supra læte rufus, alis caudaque nigro regulariter transfasciatis: superciliis elongatis albis: lateribus capitis albis nigricante variegatis: subtus albus, nigro omnino transvittatus, fere sicut in Sylvia nisorio: *tectricibus subalaribus albo nigroque variegatis: rostro et pedibus corneis: long. tota* 5·5, *alæ* 2·7, *caudæ* 2·2, *tarsi* 0·85 *poll. Angl.*

Hab. In Mexico, Real Arriba (*Deppe*).

Mus. Berolinensi.

Obs. Proximus *T. pleurosticto*, mihi, sed corpore subtus omnino transfasciato diversus.

This little Wren was one of the many novelties discovered by Herrn Deppe and Schiede during their travels in Mexico. In 1830 a sale-list of the duplicate specimens of these travellers was printed at Berlin by W. Deppe, which contained very short descriptions of some of the new species by the late Prof. Lichtenstein *. At the close of the list is announced the approaching publication of a 'Prodromus Faunæ Mexicanæ' by the latter zoologist, which promise, however, was never redeemed.

This tract is now very scarce, and I have never seen the original, although I have made repeated inquiries after it at Berlin and elsewhere. It has, however, been lately reprinted by Dr. Cabanis in his 'Journal für Ornithologie' †. Dr. Cabanis has likewise promised us a critique on the new species described in it according to the typical specimens of the Berlin Museum, which I hope will shortly appear, as it will be of great advantage to the students of Mexican Ornithology. The characters given by Prof. Lichtenstein are, in many cases, so short that without some such assistance it is impossible to to recognize the "new species" with certainty.

9. Remarks on two Species of Mammals described from specimens recently living in the Society's Gardens. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

(Plate XLVI.)

1. MICO SERICEUS, Gray, P. Z. S. 1868, p. 256.

On March 21, 1868, Mr. Bartlett purchased for the Society, from a dealer in Liverpool, a living male specimen of a small Marmoset Monkey which was quite new to me. It was stated to have been obtained out of a vessel coming from Pará, and to be the only

* Preis-Verzeichniss der Säugethiere, Vögel, Amphibien, Fische und Krebse, welche von den Herren Deppe und Schiede in Mexico gesammelt worden, und bei dem unterzeichneten Bevollmächtigten in Berlin gegen baare Zahlung in Preuss. Courant zu erhalten sind. Berlin, 1830.

† Journ. f. Orn. 1863, p. 54.

survivor of several others of the same species. Mr. Bates, being in the Gardens shortly afterwards, recognized this Monkey as one that he had met with on the Tocantins River, and had spoken of in his interesting travels as *Midas argentatus* *. Following his identification, I referred the species to the *Simia argentata* of Linnæus, and in one of my notices of the additions to the Menagerie, published in the Society's 'Proceedings' for the past year (P. Z. S. 1868, p. 262), spoke of the animal as *Hapale argentata*. About the same time Dr. Gray, having made a cursory inspection of this Monkey at the British Museum, whither I had sent it, in order to be compared with the specimens in the National Collection, named it *Mico*† *sericeus*, and published under that name a very short description of it in the Society's 'Proceedings' (1868, p. 256), which is accompanied with an accurate figure by Mr. Wolf (plate xxiv.).

When inspecting the fine collection of American Quadrumana in the Berlin Museum last summer, under the guidance of my friend Dr. Peters, I first became aware that I had made a sad error in referring our *Hapale* to *H. argentata*. The Berlin Museum is fortunate in possessing authentic specimens of *H. argentata*, as well as of the *Hapale chrysoleucos* of Wagner. On examining these (which are both deficient in the British Museum, and had never come under my notice previously), I perceived at once that our animal was referable to the latter, and not to the former species. The *Hapale argentata*, although somewhat resembling *H. chrysoleucos* in colour, has the ear-conch naked, as in its close ally *H. melanura*, while in *H. chrysoleucos* this organ is densely fringed with hair. In order, however, to set the question definitely at rest, I applied to my friend Herr August von Pelzeln of Vienna, who most kindly supplied me in exchange, from the treasures of the Imperial Zoological Cabinet, with one of the duplicate specimens of

* "The little *Midas argentatus* is one of the rarest of the American Monkeys. I have not heard of its being found anywhere except near Cametá. I once saw three individuals together running along a branch in a Cacao-grove near Cametá; they looked like white kittens: in their motions they resembled precisely the *Midas ursulus* already described. I saw afterwards a pet animal of this species, and heard that there were many so kept, and that they were esteemed as choice treasures. The one I saw was full-grown, but it measured only 7 inches in length of body. It was covered with long, white, silky hairs, the tail was blackish, and the face nearly naked and flesh-coloured. It was a most timid and sensitive little thing. The woman who owned it carried it constantly in her bosom, and no money would induce her to part with her pet. She called it Mico. It fed from her mouth, and allowed her to fondle it freely; but the nervous little creature would not permit strangers to touch it. If any one attempted to do so, it shrank back, the whole body trembling with fear, and its teeth chattered, whilst it uttered its tremulous frightened tones. The expression of its features was like that of its more robust brother, *Midas ursulus*; the eyes, which were black, were full of curiosity and mistrust, and it always kept them fixed on the person who attempted to advance towards it."—*Bates's 'Naturalist on the River Amazons,'* vol. i. p. 162.

† The value of this *genus* (!) may be estimated by the fact that it is characterized (P. Z. S. 1865, p. 734) as having the "*ears naked, exposed*," whereas the so-called *Mico sericeus* has the ear-conch thickly fringed with outstanding white hairs.

Natterer's *Hapale chrysoleucos*. This skin, which I now exhibit, agrees, it will be observed, in every respect very closely with the original of Dr. Gray's *Mico sericeus*, also now before us, which died in the Gardens on the 21st of July last; so that there can be no doubt of their identity.

The synonymy of this species will therefore stand as follows:—

HAPALE CHRYSOLEUCOS.

Hapale chrysoleucos, Wagner, Wiegm. Arch. 1842, i. p. 357; Säugeth. Suppl. v. p. 125.

Midas argentatus, Bates, Nat. on the Amazons, i. p. 162 (?).

Mico sericeus, Gray, P. Z. S. 1868, p. 256, t. xxiv.

Hapale argentata, Sclater, P. Z. S. 1868, p. 262.

Hab. Vicinity of Borba, Rio Madeira (*Natterer*).

This species of *Hapale* is very well marked, from its peculiar pale uniform colour, in which it resembles *H. argentata* and *H. melanura*. From these, however, as already remarked, it may be distinguished by its hairy ears.

Herr v. Pelzeln has most kindly informed me that Natterer collected seven examples of this species of *Hapale* at Borba, on the Rio Madeira, and in its vicinity, 1829 and 1830. Four of these are still in the Vienna Museum, and one in that of Berlin.

Unless Mr. Bates is in error in his identification of the *Hapale* observed near Cametá with the animal lately living in our Gardens, the range of this species must extend from the Rio Madeira along the southern bank of the Amazons to the Rio Tocantins, which is by no means unlikely, other species being common to these two localities.

2. CEPHALOPHUS BREVICEPS, Gray, P. Z. S. 1866, p. 202.

On the 13th of February, 1866, we purchased of a dealer at Liverpool a very young female Antelope, of the genus *Cephalophus*, stated to have been received in a vessel coming from Western Africa. Shortly afterwards, Dr. Gray, having had his attention called to this animal by the Superintendent whilst visiting the Gardens, described and figured it in our 'Proceedings' (1866, p. 202, plate xx.) as a new species, under the name *Cephalophus breviceps*. Upon the animal attaining maturity about a year afterwards the colour of the fur became darker and more intense, and it was evident that the supposed new species was nothing more than the young of the Bay Antelope (*Cephalophus dorsalis* sive *badius*), which had been previously living in the Society's Gardens, as well as in the former Surrey Zoological Gardens, and in the Menagerie of the late Earl of Derby, at Knowsley.

The history of this species, as far as I can make it out, appears to be as follows:—

In 1846 Dr. Gray first established *Cephalophus dorsalis* as a new species of the genus *, basing his description on a specimen in the

* Ann. Nat. Hist. xviii. p. 164.

British Museum, which had been brought to this country living by Mr. Whitfield, and had died in the Surrey Zoological Gardens.

In one of the plates of the 'Knowsley Menagerie' (plate vii. fig. 1) an Antelope is figured under the same name, and is described in the letterpress by Dr. Gray in very nearly the same terms as in the original description in the 'Annals.' This description is repeated, word for word, in Dr. Gray's "Synopsis of Antelopes" published in the Society's 'Proceedings' for 1850 (p. 123).

In 1852, Dr. Gray seems to have come to the conclusion that the animal figured in the 'Knowsley Menagerie' was not the same as the true *Cephalophus dorsalis* originally described from Mr. Whitfield's specimen, and, accordingly, in his list of Ungulata Furcipeda in the British Museum, named the former *Cephalophus badius*, retaining the name *Cephalophus dorsalis* for the latter. Dr. Gray, however, does not state exactly how the two species are to be distinguished, and, after examining the two typical specimens in the British Museum, I am unable to regard them as more than slight varieties of the same animal. The typical specimen of *C. breviceps* is likewise now in the National Collection, and appears to me quite undistinguishable from either of the two above mentioned, though most nearly resembling that called by Dr. Gray *C. badius*.

The only other original author who appears to have mentioned this Antelope is Temminck, who, in his 'Esquisses Zoologiques sur la Côte de Guiné' (Leiden, 1853), tells us that *Cephalophus dorsalis* inhabits the forests of Ashantee and Sierra Leone, but is rare in the forests of the sea-coast.

We have had three examples of this Antelope living in the Society's Menagerie.

The first of these (*a*) was purchased of a dealer in Liverpool on the 27th of August, 1861, and lived more than two years in the Gardens, having died on the 6th of November, 1863.

The second specimen (*b*) is that already mentioned, which was received, when quite immature, on the 13th of February, 1866, and described by Dr. Gray as *Cephalophus breviceps*. This animal was a female, and was kept in the same division of the Gazelle-sheds with a male of the allied species, *Cephalophus rufilatus*, with which it bred when adult. It produced a young one on the 25th of January last, and died on the following day.

A third specimen (*c*) of the same Antelope was brought from the Gold Coast, and presented to the Society by Mr. C. B. Mosse, Staff-Surgeon, R.N., on the 16th of October last, but unfortunately died three days afterwards. Mr. Smit's drawing of the present species (Plate XLVI.) is taken from this last-named individual, which, however, as already stated, agrees closely with what *Cephalophus breviceps* became when adult.

Dr. Murie has kindly communicated to me the following notes taken on a comparison of our specimen *b* of *Cephalophus dorsalis* and an example of a female of *Cephalophus maxwellii* which died about the same period.

"As the table shows, there is little difference as to the dimen-

sions of the bodies of the two; but the *Cephalophus dorsalis*, nevertheless, has much the stronger build. The head and ear of the latter are relatively and absolutely the largest, whilst the length of the tail preponderates in *C. maxwellii*.

	C. dorsalis.	*C. maxwellii.*
	in.	in.
" Length from snout to root of tail (taken laterally)	27½	26
Height at shoulder (with straightened limb) ..	16	16
——— at hip (with straightened limb)	17	17
Depth at chest.....	7	7
Length of tail to tips of hairs.....	4	5½
——— of tail to the end of the vertebræ	3	4½
Head: length, muzzle to occiput	7	6½
Ear, in greatest length.....	3	2¾

"In the Bay Antelope the nasal and zygomaxillary regions are half an inch broader than in the other species, and they are likewise more prominent and arched both across and lengthwise.

"The inside of the ear of *C. maxwellii* is covered with long hairs; in *C. dorsalis* the ears are bare, or have but a trace of short hairs near the margin.

"Both species possess interdigital pits on all the feet, and both have shallow, rudimental suborbital glands; but the Bay Antelope differs markedly from the other in its possessing two deep inguinal sacs: there is neither an external nor internal trace of these in *C. maxwellii*.

"As regards the internal organs, these are formed on the same ruminant model, there being four cavities in the stomach and a capacious cæcum. There is a trenchant difference, however, in the comparative lengths of the intestinal tract, the stronger animal having the shorter gut. Thus in

	C. dorsalis.		*C. maxwellii.*	
	ft.	in.	ft.	in.
" The small intestine measures	22	0	25	3
The great intestine, minus cæcum	7	7	10	3
The cæcum.....	0	5½	0	8

"From the animals being both adult, of the same sex, and, broadly speaking, similar in size, it may reasonably be inferred that this striking variation arises from specific difference. Our want of knowledge of the precise food and habits of each in their native haunts debars a physiological reason being guessed at."

10. On Peruvian Birds collected by Mr. Whitely. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.—Part V.*

Since our last communication to the Society upon this subject two small collections have been received from Mr. Whitely. The

* For Part IV. see P. Z. S. 1869, p. 151.

first of these was formed in the Cosnipata valley, the second in his former collecting-grounds round Tinta.

The valley of Cosnipata, which is well shown in the map attached to Mr. Markham's 'Travels in Peru and India,' is situated on the eastern slope of the Andes of Caravaya, and is drained by the river of the same name, which is an affluent of the Madre di Dios, until recently supposed to flow into the Purus, but now believed to pour its waters into the Beni†.

Mr. Whitely has written a letter to General Lefroy concerning his expedition into this valley, from which, by the kindness of that gentleman, we have been enabled to extract the following particulars.

Mr. Whitely left Tinta on the 12th of August, 1868, and arrived at Cusco on the 17th. From Cusco he proceeded, after a short stay, to Paucartambo on the river of that name (elevation 9400 feet). Leaving Paucartambo on the 31st with an *arriero* and one Indian he ascended the bare ridge of the Andes, and after various adventures reached Tres Cruces, at the summit of the pass (elevation 11,900 feet), on the 2nd September. Next day he commenced the descent into the valley of Cosnipata, finding the road so bad and stony that he was compelled to walk the whole eighteen miles down to San Pedro, a recent settlement consisting of two new wooden huts. On the 4th he descended the valley five leagues further, to the hacienda of Cosnipata.

This is described as a clearing about a mile long by a mile broad, and consisting of some twelve wooden huts, with about thirty work-people, more than two-thirds women. The principal products are coca, coffee, and cocoa. The houses are in a wretched condition of decay, and, if not better looked after, must in the course of a few years inevitably fall into the hands of the Chunchos. Mr. Whitely computes the height of Cosnipata as 2350 feet above the sea-level, but descended the valley to some huts of Chuncho Indians which are only 1650 feet above the sea-level.

After remaining in the valley three months, as the rainy season had set in, Mr. Whitely set out to return to Paucartambo. The journey back was frightful, as the rain was pouring down in torrents, and he had to ascend the mountain for eighteen miles on foot. He accomplished the ascent in two days, and reached Paucartambo on the 30th of November, 1868, in safety.

The Cosnipata collection contains about 80 skins, amongst which are examples of the following species, namely :—

I. PASSERES.

1. *Hirundo erythrogastra.*
2. —— *leucorrhoa.*
*3. *Neochelidon tibialis.*
4. *Procnias occidentalis.*
5. *Calliste cyaneicollis.*
6. *Tanagra cœlestis.*
7. —— *striata.*
8. *Ramphocælus jacapa.*
9. *Saltator azaræ.*
10. *Orchesticus ater.*
11. *Spermophila luctuosa.*
12. —— *castaneiventris.*
13. *Volatinia jacarina.*
14. *Coturniculus peruanus.*
15. *Chrysomitris capitalis*, Cab.

† *Cf.* Chandless, J. R. G. S. xxxvi. p. 114.

16. *Ostinops atrovirens.*
17. *Cyanocorax violaceus.*
18. *Synallaxis albigularis.*
*19. *Muscisaxicola fluviatilis,* Scl. et Salv.
20. *Elainea pagana.*
21. *Myiozetetes cayennensis.*
22. —— *granadensis.*
23. *Tyrannus melancholicus.*
*24. *Pipra chloromeros,* Tsch.
25. *Rupicola peruviana.*

II. PICARIÆ.

26. *Trogon heliothrix,* Tsch.†
27. —— *melanurus.*
28. *Nyctidromus albicollis.*
*29. *Cypseloides fumigatus.*
30. *Crotophaga ani.*
31. *Ramphastos cuvieri.*
32. *Dryocopus trachelopyrus.*
33. *Psittacula sclateri,* G. R. Gray.

III. ACCIPITRES.

34. *Asturina nattereri,* Scl. et Salv.

IV. COLUMBÆ.

35. *Columba vinacea,* Temm.
36. *Leptoptila rufaxilla,* Rich. et Bern.

V. GALLINÆ.

37. *Ortalida guttata,* Spix.
38. *Penelope cumanensis,* Jacq.

VI. GRALLÆ.

39. *Charadrius virginicus,* Bork.
40. *Actiturus bartramius,* Wils.
41. *Tringa maculata* (Vieill.).
42. *Rhyacophilus solitarius* (Wils.).

We have been much disappointed with the poverty of the avifauna of this district, as evidenced by Mr. Whitely's collection, which was the result of nearly three months' assiduous labour, and a journey of 300 miles altogether. Not one species is new, and most of them are well known and of wide range. The groups of Trochilidæ, Dendrocolaptidæ and Formicariidæ are entirely unrepresented. Almost the only species of interest are the following four:—

3. NEOCHELIDON TIBIALIS.

Petrochelidon tibialis, Cassin, Pr. Acad. Sc. Phil. 1853, p. 370.
Neochelidon tibialis, Scl. et Salv. P. Z. S. 1864, p. 347.
Atticora tibialis, Baird, Rev. A. B. p. 307.

The only trustworthy localities for this peculiar species hitherto recorded are Panama and New Granada.

19. MUSCISAXICOLA FLUVIATILIS, Scl. P. Z. S. 1866, p. 187.

Mr. Whitely's specimens of this species agree with the types collected by Mr. Bartlett on the Ucayali.

24. PIPRA CHLOROMEROS, Tsch. F. P. p. 144.

Discovered by Tschudi in the wood-region of eastern Peru: in Sclater's collection from Bolivia.

29. CYPSELOIDES FUMIGATUS, Streubel; Sclater, P. Z. S. 1865, p. 615.

Natterer obtained the original specimens of this species in S.E. Brazil.

† Faun. Per. p. 257.

The last collection from Tinta and its vicinity contains examples of about 57 species. Most of them have already been recorded from this locality; but we subjoin notes upon such of them as call for remark or have not been noticed in our former articles. The additional species to the district are 13 in number, amongst which three are new to science. One of these, a fine new Humming-bird, has been already described by Mr. Gould.

1. CINCLUS LEUCOCEPHALUS, Tsch. F. P. p. 180, t. 15. fig. 2.

Two skins of this fine Dipper from Pitumarca are in the collection. The species is unmistakable; but in Tschudi's figure the feet are coloured yellow, whereas in these skins they are of a dark plumbeous. For a general account of the group, see Salvin's article, 'Ibis,' 1867, p. 109. The nearest ally of the present species is *C. leuconotus* of New Granada, which has the centre of the back and the whole of the lower surface white.

2. ATTICORA CINEREA (Gm.).

Petrochelidon cinerea, Sclater, Cat. A. B. p. 39.
Atticora murina, Baird, Rev. A. B. p. 312.

One example of this Swallow from Tinta. Fraser obtained it at Quito (see P. Z. S. 1860, p. 74).

3. CATAMENIA ANALIS (Lafr. et d'Orb.); Sclater, Cat. A. B. p. 105.

One female of this little Finch from Tinta.

4. SYCALIS LUTEIVENTRIS (Meyen); Sclater, P. Z. S. 1867, p. 342.

A single skin, apparently of this species, but in somewhat abraded plumage.

5. PHACELLODOMUS STRIATICEPS.

Anumbius striaticeps, Lafr. et D'Orb. Syn. Av. in Mag. de Zool.; d'Orb. Voy. Ois. p. 255.

Two skins of this bird were collected near Tinta in January 1869. The species is allied to *P. frontalis* (Scl. Cat. A. B. p. 154), but easily distinguishable by the rufous colour of the wings and lateral rectrices.

6. OCHTHOECA POLIONOTA, sp. nov.

Supra cinerea, superciliis latis et elongatis albis: secondariorum marginibus angustis rufescentibus: cauda fusco-nigra, rectricis utrinque extimæ pogonio externo albo late marginato: subtus gutture cinereo, albicante mixto, abdomine toto late rufo: crisso cinnamomeo: subalaribus albis rufo vix tinctis: rostro et pedibus nigris: long. tota 6·3, *alæ* 3·5, *caudæ* 3·0, *tarsi* 0·9, *rostri a rictu* 0·8 *poll. Angl.*

Hab. in Peruvia alta, Pitumarca (*Whitely*).

Obs. Similis *O. œnanthoidi*, sed tectricibus alarum non rufo marginatis, dorso cinereo, et rectricis utrinque externæ margine albo differt.

Mr. Whitely obtained his examples of this *Ochthoeca*, which we at first took for *O. œnanthoides*, at Pitumarca, in April and June last. Another nearly allied species is *O. fumicolor*, Sclater, of New Granada and Ecuador. Sclater has skins of the true *O. œnanthoides* collected by Mr. David Forbes in Bolivia.

In the present bird the fourth primary is slightly longer than the third and fifth, and largest. The tail is nearly square, the external rectrices being only slightly shorter than the middle pair.

7. OREONYMPHA NOBILIS, Gould, P. Z. S. 1869, p. 295.

Mr. Whitely obtained his specimens of this fine Humming-bird on the Cordillera above Tinta, at an elevation of about 14,500 feet above the sea-level.

8. BUTEO BRACHYURUS, Vieill.

Asturina albifrons, Bp.
Buteo albifrons, Schlegel, Mus. d. P.-B. *Buteones*, p. 10.

A single skin of what we believe to be the young of this species.

9. COLUMBA MACULOSA.

Paloma cobijas manchadas, Azara, Apunt. iii. p. 10.
C. maculosa, Temm. Pig. et Gall. i. p. 113 (1813).
C. pœciloptera, Vieill. N. D. xxvi. p. 344, et E. M. p. 375.
C. maculipennis, Licht. in Mus. Berol.
Patagiœnas maculosa, Burm. La-Plata Reise, ii. p. 496.

Two examples of this Pigeon from Pitumarca. It must be carefully distinguished from its naked-eyed allies, *C. picazuro* and *C. gymnophthalma*, with which Bonaparte and other writers have confounded it. There are specimens of it in the Paris Museum, obtained in Sicasica, Bolivia, by d'Orbigny.

10. FULICA GIGANTEA, Eyd. et Soul.; Sclat. et Salv. Ex. Orn. p. 120; P. Z. S. 1868, p. 463.

A single skin of this magnificent species from the Laguna of Lanqui, south of Tinta, obtained in February 1869.

11. IBIS MELANOPIS, Gm.; Bp. Consp. ii. p. 155; Tsch. F. P. p. 298.

Two skins of this Ibis from Pitumarca. Tschudi has already recorded its occurrence in the highlands of Peru.

12. MERGANETTA TURNERI, sp. nov.

Merganetta leucogenys, Scl. et Salv. P. Z. S. 1869, p. 157.

Supra nigra, interscapulio et scapularibus rufo marginatis: capite colloque toto albis, linea rostrum cingente, pileo medio in strigam nuchalem producto et linea utrinque collum descendente niger-

rimis: alis extus cærulescenti-cinereis: speculo alari æneo-viridi; tectricibus alarum et secundariis albo auguste terminatis: abdomine nigro, ventre medio fusco variegato: crisso et uropygio nigris, albo minute vermiculatis: cauda fuscescenti-cinerea unicolori; tectricibus subalaribus cinereis: rostro et pedibus obscure rubris: long. tota 16·0, *alæ* 7·5, *caudæ* 5·0, *rostri a rictu* 1·5, *tarsi* 1·8, *digiti medii cum ungue* 2·3.

Fem. *Supra cinerea, lateribus cervicis et uropygio albo nigroque minute vermiculatis; dorso nigro flammulato; alis albo bifasciatis: speculo alari obscure æneo-viridi; subtus fulvo-rufa unicolor: long. tota* 16·0, *alæ* 6·4, *caudæ* 4·0, *rostri a rictu* 1·35.

Hab. in Andibus Peruviæ meridionalis.

In our paper on Mr. Whitely's birds read before this Society on the 11th of March last, we have referred this bird to the species described by Tschudi as *Merganetta leucogenys*. Having, however, more recently made a re-investigation of the group, we have convinced ourselves that Tschudi's bird is, so far as can be decided by his figure and description, inseparable from the *Merganetta columbiana* of New Granada, and that the present species must be regarded as undescribed, being equally distinct from the New-Granadan form, and from the Chilian *Merganetta armata*. From the former it differs in its larger size, and black breast and flanks, which are only relieved by some brownish marks in the middle of the belly. In the New-Granadan bird, which is well represented in Des Murs's 'Iconographie' (tab. vi.), the whole abdomen is white, sparingly striped with narrow blackish markings, and the bill is narrower and much less elevated than in this species. *Merganetta armata*, of which an excellent figure will be found in Gray and Mitchell's 'Genera of Birds,' resembles the present bird in having a black breast; but the edges of the scapularies are white instead of rufous, and the throat and fore neck are black, instead of being pure white as in its two northern allies. It would seem, therefore, that our new species occupies an intermediate position as regards the differential characters of the male, just as it does in geographical range, between the two known species. As regards the female, our specimen does not appear to differ in colour from the corresponding sex of *Merganetta armata* (Des Murs, Icon. t. xlviii.). We are not yet acquainted with the female of *M. leucogenys*; but in all probability it would also bear a similar dress.

The male bird now described was shot and skinned by Mr. Turner, a friend of Mr. Whitely's, near Tinta. We have therefore acceded to Mr. Whitely's request to call it, if new, after his friend's name. The female was obtained by Mr. Whitely himself in the same neighbourhood.

13. PHALACROCORAX BRASILIANUS (Gm.).

Graculus brasilianus, Bp. Consp. ii. p. 170.

A single skin, apparently referable to this widely distributed species of Cormorant.

11. Description of a New Species of *Dacelo* from North-western Australia. By JOHN GOULD, F.R.S., V.P.Z.S., &c.

I have long had in my collection a pair of a species of *Dacelo* which I could not satisfactorily determine; but not having a sufficient series of *Dacelo cervina* for comparison, I have hesitated to describe it as new. Having, however, recently obtained several examples of the last-named bird, I find that the species from North-western Australia is quite distinct, and I therefore propose for it the name of

DACELO OCCIDENTALIS, sp. nov.

D. *affinis* D. cervinæ *sed diversa, rostro multo robustiore, coloribus pallidioribus, et præcipue pogonio externo rectricis extimæ conspicue albo fasciato distinguenda.*

Long. tot. 16·0, rostri 3·2, al. 7·5, caud. 4·5 poll. Angl.

December 9, 1869.

Dr. E. Hamilton, V.P., in the Chair.

Mr. Sclater made some remarks on recent additions to the Society's Menagerie, amongst which were particularly noticed:—

1. A Two-toed Sloth, obtained at Panama by Mr. C. Gilman of the R.M.S. 'Neva,' and purchased of him for the Society's Menagerie on the 29th of September. Mr. Sclater believed that this Sloth, which was obviously distinct from the common *Cholœpus didactylus* associated with it in the collection, might ultimately be found to be referable to the newly described *Cholœpus hoffmanni* of Peters*, but was unable to decide this question positively from an examination of the living specimen.

2. Two Persian Gazelles (*Gazella subgutturosa*), presented by Thomas Kerr Lynch, Esq., on the 1st of October, being the first examples of this rare Gazelle that had been received by the Society since those received in 1852, and figured in Wolf and Sclater's 'Zoological Sketches' (vol. i. pl. 22).

3. A female of the Cape Ant-bear (*Orycteropus capensis*), from the same locality as the male of this animal, purchased October 6th. This example has been placed along with the male purchased on the 18th of June last; and the pair seemed thriving and likely to do well together.

4. A Say's Snake (*Coronella sayi*) from North America, purchased 15th of October, being the first example of this species exhibited alive.

5. A second example of the Collared Fruit-bat (*Cynonycteris collaris*) from Natal, purchased November 1st.

* Monatsb. Berl. Acad. 1858, p. 128, and 1864, p. 678.

6. A South-American Rat-snake (*Spilotes variabilis*) from Demerara, presented to the Society by Thomas Hounslow, Esq., of Georgetown, Demerara, and received on the 5th of November.

7. Two Gibbons, deposited in the Society's Gardens by Mr. G. S. Rodon of the 1st Royals, Cannanore, India. These Gibbons, according to a letter received from Mr. Rodon, had been obtained on the Malayan peninsula. The larger one (a male), supposed to be about three years old, had been caught in one of the islands of the Mergui archipelago, where the species is said to abound. The smaller (female), believed by Mr. Rodon to be about eighteen months old, had been obtained in the province of Tenasserim. Both were probably referable to the White-handed Gibbon (*Hylobates lar*). These Gibbons were in very feeble health when received, but had slightly improved since their arrival, which gave some hope of their ultimate recovery.

The following extract was read from a letter addressed to the Secretary by Capt. G. E. Bulger, C.M.Z.S.:—

"I suppose it is right to tell you that I committed a great error by including *Corvus splendens* in my list of birds observed at Wellington, in the Neilgherry Hills, which was published in the P. Z. S. 1866, p. 568. I cannot account for the mistake, nor can I even guess how it occurred. My attention was first drawn to the matter by my friend Lieut.-Col. M'Master, who assured me *Corvus splendens* was not found in the hills. I was difficult to convince; for, though I could not actually remember having seen the bird, I had perfect reliance on my notes, which were made on the spot. I found, however, on examination, that I had nothing whatever about *Corvus splendens* in my notes about the Neilgherries, and that which appeared in the P. Z. S. referred not to Wellington but to Burmah. I regret I should in any way have been instrumental in propagating error. *Corvus splendens*, I feel convinced, has not yet, at all events, been found in the Neilgherry range of mountains."

Prof. Flower exhibited for Mr. Blanford the skull of a Hyrax (*Hyrax brucei*) collected by that gentleman in Abyssinia, which, in addition to the normal dentition, had a supernumerary tooth at the posterior end of the molar series on each side of the upper jaw.

The skull is evidently that of an old animal (a female), and the teeth are much worn. The crown of this supernumerary tooth is simple, slender, tapering, broad in front, and sharp-edged behind, and placed in close apposition to the last normal molar. It has a slight curve forwards and a sharp apex, which, having nothing to oppose it in the lower jaw, projects beyond the worn surface of the tooth in front of it. The crown of the right tooth, which is rather larger than the left, shows a slight tendency to develope a second cusp on its posterior edge. The root of the left tooth is simple, cylindrical, and tapering slightly to its rounded closed apex. The root of the right is thicker, and partially bifurcated at the apex.

The dimensions of this tooth are:—Entire length ·4″; length of portion above the alveolar margin ·25″; diameter at the base of the crown, in either direction, ·14″.

The specimen is deposited in the British Museum, along with a large series of skins and skeletons of the same species collected by Mr. Blanford.

The following papers were read:—

1. Notes on four Specimens of the Common Fin-whale (*Physalus antiquorum*, Gray; *Balænoptera musculus*, auct.) stranded on the South Coast of England. By William Henry Flower, F.R.S. &c.

(Plate XLVII.)

On the 20th of November last the crew of a fishing-boat belonging to Langston in Hampshire brought in the dead body of a large Whale, which they had found floating in the sea about fifteen miles from Havre. They succeeded in beaching the carcase near Fort Cumberland, at the entrance to Langston Harbour, about two miles east of Portsmouth. Hearing that it was being exhibited at this place, I went to see it on the morning of the 25th of November, and put down a few notes upon its external characters, which may be worth the notice of the Society, as it is only by recording all information which can be derived from every available example that an accurate history of these great Cetaceans can be obtained.

Unfortunately the present specimen, in some respects, afforded even less information than usual, in consequence of the very advanced state of decomposition it was in. The cuticle had almost entirely peeled off the surface; moreover fish and sea-birds (with which the part of the carcase floating above the surface of the water was covered when first discovered) had committed ravages upon many parts of the superficial tissues; consequently the natural colour was completely destroyed, and the whole animal appeared of a uniform dirty yellowish white. It was therefore in much the same condition as the large Fin-whale stranded at Pevensey in November 1865, and described in the 'Proceedings' of this Society for that year, at page 699*. As far as could be judged by the external characters, it belonged to the same species.

The animal was lying on the right side, which position enabled me to obtain a view of the blow-holes and also of the dorsal fin, which were not seen in the Pevensey Whale, and to obtain a pretty exact general outline of its form (see Plate XLVII. fig. 1).

All zoological figures of large Whales must be looked upon in the light of compilations from various data, or as restorations from mea-

* The skeleton of this animal is now in the Anatomical Museum of the University of Cambridge, having been, fortunately, secured in a perfect condition by Mr. J. W. Clark, the zealous curator of that excellent collection.

surements and drawings of various parts put together, as the animal when lying dead on the beach, flattened and distorted by its own weight, or inflated by the liberation of gases within its cavities, can give but little idea of its appearance when swimming in its native element. Hence there are considerable discrepancies between the most reliable of the figures we possess even of the most common species*.

The exact length in a straight line, from the front of the lower jaw (which projected about 18 inches beyond the muzzle) to the middle of the tail, was 61 feet, or 6 feet less than the Pevensey Whale, and 1 foot more than a Whale of the same species and sex (male) taken in the Thames in 1859, and which, as shown by the condition of the bones, now in the Rosherville Gardens, was fully adult. From the end of the muzzle to the axilla was 19 feet 10 inches; from the same part to the middle of the eye 12 feet, to the hinder border of the dorsal fin 45 feet 6 inches. The dorsal fin rose gradually in front, with a convex border, to a vertical height of 1 foot 3 inches, the apex was short and recurved, the posterior border hollowed; the base was rather more than 2 feet in length. The flukes of the tail (Plate XLVII. fig. 3) measured 11 feet across, and 2 feet 10 inches from before backwards near the middle line. As in the Pevensey Whale, the right was markedly convex, and the left concave, on the upper surface, giving the characteristic screw-like form to the main organ of propulsion.

The terminal portion of the trunk, between the dorsal fin and the flukes of the tail, was, as usual in the species, strongly compressed, of great and nearly uniform vertical depth (4 feet), and sharply ridged above and below.

The pectoral fins, measured from the axilla to the tip, were 5 feet 4 inches long, and 1 foot 7 inches in greatest breadth, which was about midway between those points. Towards the tip the upper or ulnar border was somewhat excavated. The tip was rather sharply pointed.

The upper surface of the head was on the whole remarkably flat; but immediately in front of the blow-holes a strong median ridge rose rather abruptly, then gradually subsided to about midway be-

* The most authentic representations of the external characters of the Whale under consideration with which I am acquainted are:—

1. From a specimen, 45 feet long, stranded in 1825 on the west coast of Rügen. Figured in 'Einige Naturhistor. Bemerk. über die Walle,' by F. Rosenthal. Griefswald, 1827. (Called *Balæna rostrata*, var. *major*.)

2. From an animal, 51 feet long, stranded on the coast of Holland. Schlegel, Abhand. a. d. Gebiete der Zoologie, Heft i. pl. 6, 1841. (Called *Balæna sulcata arctica*.)

3. From an animal, 40 feet long, stranded near Katwijk, in Holland, in 1841. Ibid. Heft ii. pl. 9, 1843. (Called *Balænoptera arctica*.)

4. From an animal, 50 feet long, stranded in the Orkney Isles, 1856. R. Heddle, Proc. Zool. Soc. 1856, pls. XLIV. and XLV. (Called *Physalus duguidii*.)

5. From an animal, 40½ feet long, stranded on the Lofoden Islands. (Called *Balænoptera musculus*.) G. O. Sars, Vid-Selskab. Forhand. Christiania, 1865.

The various names assigned to these specimens by their respective describers illustrate the difficulties of the nomenclature of this group.

tween the blow-holes and the end of the snout; in front of this the surface was quite flat. The snout was pointed, flat above and below, and rounded at the extreme end, which projected 6½ inches beyond the anterior limits of the baleen. On this part, instead of the rayed indentation observed in the Pevensey Whale, there was a roundish depression about the size of a halfpenny piece on each side of the middle line (see Plate XLVII. fig. 2).

The blow-holes were situated in a deep hollow (wide behind and narrow in front) behind the before-mentioned median ridge, rather anterior to the eye, their front end being 10 feet 4 inches from the tip of the muzzle. Between them was a longitudinal median depression; each aperture was 13 inches long, curved, with the concavity outwards; and they were 2 inches apart in front, and 10 inches behind.

The lower jaw terminated anteriorly in a sharp median ridge, like the prow of a fast-going vessel. On each side of this ridge, about 1 inch from the middle line above and rather nearer below, was a vertical row of short white bristles, about a dozen on each side, placed rather irregularly, but averaging ¾ of an inch between each. Each bristle was ½ inch in length, but not more than ⅝ inch projected above the surface. They were set in distinct fossæ, which were very evident, although most of the bristles had fallen out. I could detect no traces of hairs on any part of the surface of the upper lip.

The baleen of the two sides was continuous around the front of the palate. The anterior narrow blades were 7 inches long, and placed in a very reclined position (see Plate XLVII. fig. 2, *c*). The longest blades were 1 foot 9 inches in length, including the hairy ends. There were about 350 blades on each side; and in the middle of the series 24 blades exactly occupied the space of 1 foot. As in the Pevensey Whale, the baleen was slate-coloured externally, and white at the inner edge; so that the hairy surface, forming the greater part of the roof of the mouth, was all of a yellowish-white colour, except quite at the outer edge. Each blade was mainly of the dark colour, but near its inner border longitudinally striated with pale horn-colour.

The position in which the animal was lying, with the lower jaw thrown much to one side, so as to expose the baleen-plates of the left side from end to end, enabled me to observe a structure which I did not see in the Pevensey Whale, and have not found noted in any description. Outside the main series of baleen-plates, growing from the "coronary band" ("Horn-Kranzband" of Rosenthal*), which encircles their base, was a fringe of stout coarse fibres, like those of the inner surface of the whalebone, but strongly curled. Each of these fibres, or hairs, when straightened was about 3 inches in length; and the whole series extended from the angle of the mouth for 18 inches forwards. No trace of them was to be seen more anteriorly.

The characteristic longitudinal furrows of the throat extended forwards on the side of the lower lip to midway between the angle of the mouth and the end of the chin; but in the median line they

* Ueber die Barten des Schnabel-Wallfisches (Akad. d. Wissenschaft. Berlin, 1829).

reached almost to the symphysis menti, and laterally they extended as far as the insertion of the pectoral fins. Counting from the pectoral fin to the middle line on the exposed side, there were about twenty-six furrows; they were all widely distended. But all this part of the surface, as well as the abdomen, had been so much damaged by the birds (as it was the part which floated uppermost) that it was impossible to make any satisfactory observations upon it.

The penis was completely protruded, as it always appears to be in Whales that have been long dead, being probably forced from the sheath in which it naturally lies concealed by the pressure of the gases arising from decomposition accumulating within the abdominal cavity. The hinder edge of its base was 21 feet in front of the end of the tail, or 5 feet 6 inches in front of the hinder border of the dorsal fin. Its length was 6 feet 6 inches. Its diameter at the base 1 foot, from which it gradually tapered to 1 inch at the apex. The orifice of the urethra was terminal, and surrounded by four distinct rounded lobes. The nipples were placed about 6 inches behind the root of the penis, and 2 inches apart; each was lodged in a groove, much compressed, ridged or keeled on the free edge, with the anterior border sloping gradually to the apex, and the posterior edge almost vertical, about 1 inch from before backwards at the base, and $\frac{3}{4}$ inch in height at the apex, and with a soft nodulated surface.

I have not had any opportunity of examining any of the bones of this specimen; but I will add to this notice some observations upon the skeletons of three other Whales presumably of the same species which have been stranded on various parts of the south coast of England.

1. This skeleton, the smallest of the three, was prepared from an animal taken at Margate in 1850, and was kept at that place until December 1864, when it was brought to London and exhibited in a waxwork show at Shoreditch as an additional Christmas attraction. After it had ceased to "draw," I purchased it from the proprietor; and as it was too imperfect to mount for any museum, the bones have been divided between the Royal College of Surgeons and the Cambridge University.

The animal was very nearly adult; the epiphyses were united to both ends of the humerus and the upper end of the radius and ulna, though still loose on the bodies of the dorsal vertebræ. The skeleton wanted the malar bones, the tympanics, the stylo-hyals, the pelvic bones, almost all the carpals and phalanges, many of the chevron bones, and the three or four last caudal vertebræ. The spines and transverse processes of the vertebræ were much broken.

The entire length, the vertebræ being placed close together and the end of the tail missing, was 55 feet. Fifty-seven vertebræ were present. The second, third, fourth, and fifth cervical vertebræ have their upper and lower transverse processes united so as to form complete rings. The sixth has very short lower processes, very unequal in size on the two sides. In the seventh they are entirely absent.

There are fifteen pairs of ribs; the first 46″ long in a straight line from the tubercle to the inferior extremity, with a long capitular

process; the second and third have also moderately long capitular processes; the fourth has none; the fifteenth rib is slender and twisted, but nearly as long as the penultimate. The sternum consists of a broader anterior portion, 21″ from side to side, and a narrow posterior prolongation, turned somewhat to the right side, 8½″ long; the whole length from before backwards is 17″. The anterior border is very thin, notched, and evidently incompletely ossified; about 1″ behind it is an oval foramen, 1″ in length, situated in the mesial line. The hyoid (basihyal and thyro-hyal ankylosed) is 33″ across. The scapula is 25½″ in height, and 46″ in breadth. The humerus 17½″ long; the radius 28½″; the ulna 32½″, or without the olecranon 27½″. The length of the cranium is 14′ 6″, the greatest breadth 6′ 4″. The length of the rostrum 10′. The breadth of the middle of the rostrum 30″; the breadth of the maxillary at this point 8½″, of the premaxillary 5¾″; the premaxillary projects 9″ beyond the maxillary. The length of the lower jaw is 13′ 6″.

2. The next animal (a male) was stranded near Falmouth in August 1863. The skeleton was prepared by Mr. Gerrard, jun., at whose establishment I examined it in April 1864. It is now in the Alexandra Park. It is (or was when I last saw it) quite perfect, with the exception of one or two of the terminal phalanges. All the epiphyses of the vertebræ are completely united, so that the animal must have been fully adult. The skeleton as articulated measures in a straight line 66′, of which the skull occupies 15′ 6″. The various dimensions of the cranium and mandible are given in P. Z. S. 1864, p. 411*.

There are sixty-one vertebræ; but the last is elongated and constricted in the middle, as if it really consisted of two united. Of these, seven are cervical, fifteen thoracic, fourteen lumbar, and twenty-five or twenty-six (according as the last is reckoned as one or two) caudal. The second cervical has immense, expanded, backward-directed transverse processes, with a large perforation at the proximal end. The second, third, fourth, and fifth have the upper and lower processes united so as to form rings. The sixth has a long upper process; but the lower one is a mere tubercle, larger on one side than the other. In the seventh the lower process is entirely absent. The extreme width between the ends of the transverse processes of the different cervical vertebræ is as follows:—First 26″, second 43″, third 34″, fourth 35½″, fifth 35¾″, sixth 34″, seventh 33½″. The foramen in the transverse process of the second cervical vertebra is 6¼″ broad, and 4″ high; the corresponding foramen in the third vertebra is 8″ broad, and 6½″ high; in the fourth 8½″ broad, and 6″ high.

The chevron bones appear to be all present. There are eighteen; the first and the last three have not united in the middle line. The first is placed at the hinder end of the body of the thirty-seventh vertebra. The vertical perforations through the base of the transverse processes commence in the eighth caudal vertebra.

* The atlas, axis, and fifth cervical vertebræ of this specimen are figured by Dr. Gray in 'Cat. of Seals and Whales in Brit. Mus.' 1866, p. 145.

There are fifteen pairs of ribs. The first, second, and third have a capitular process extending about halfway from the ends of the transverse processes to the bodies of the vertebræ. The first is 50″ in its greatest length in a straight line, and 12″ broad at the lower end. It is simple, showing no trace of the coalition of a cervical rib with it. The last pair were quite rudimentary and unconnected with the spinal column, corresponding in position with the middle third of the fourteenth pair. They are pointed at the upper end, but shaped like the other ribs below. The length of that on the right side is 19½″, of the left 27″.

A figure of the sternum is given in P. Z. S. 1864, p. 393. Its anterior part is expanded laterally into two broad wings; and it has a long narrow posterior process. Its extreme breadth is 24″, and its length 21¾″. The ankylosed basihyal and thyro-hyals measure 34″ across, and 11½″ in greatest length from before backwards. The stylo-hyals are 16½″ long, and 4″ in greatest thickness. The scapula is 51″ in breadth, and 29″ in height; from the posterior superior angle to the end of the acromium process is 46½″, from the hinder edge of the glenoid fossa to the tip of the coracoid 21″. The humerus is 20″ in extreme length, and 11″ in greatest diameter near the lower end. The radius is 31½″ long, 7″ in greatest diameter (at the upper end), 5½″ at the middle, and 7¾″ at the lower end. The ulna is 36″ in extreme length, 29½″ from the middle of its articulation with the humerus, 9½″ in width at the olecranon, 4″ at the middle, and 6½″ at the lower end. The lower epiphyses of the ulna and radius are quite separate from the shafts. There are five principal ossifications in each carpus, three in the proximal and two (smaller) in the distal row, besides a minute (pisiform?) nodule situated on the ulnar side of the wrist. There are four metacarpal bones, which measure respectively, beginning on the radial side, 4¾″, 6″, 5″, and 3¾″. The pelvic bones are each 18½″ long, gently curved, with one end flattened and rather spatulate, and the other tapering and more conical, and with a prominent angular projection from near the middle of the convex border.

3. The third skeleton was prepared from the animal which was washed ashore on the south coast of the Isle of Wight in April 1842.

A short notice of it has been given by Dr. Gray*; and it once received a visit from the distinguished Danish cetologist Eschricht, as mentioned in his valuable 'Untersuchungen über die nördlichen Wallthiere;' but no further description of it has ever been published. My notes are brief, but they are sufficient to determine the species. They were taken on the 11th of last August. The skeleton belongs to the proprietor or exhibitor of the well-known gully in the cliff called "Black Gang Chine," about six miles west of Ventnor, and is at present in a stable attached to the house which forms the entrance for visitors to the "Chine."

This must have been a considerably larger animal than the last,

* Zoology of Erebus and Terror, p. 50; Cat. Seals and Whales Brit. Mus. (1866) p. 148.

judging by the size of individual bones; for as the skeleton was very imperfectly articulated I could form no accurate estimate of its actual length. It was therefore above the average size of Whales of this species, and, when compared with the one at the Rosherville Gardens, shows that there may be a considerable amount of variation in this respect. I have, unfortunately, not been able to learn the sex to which it belonged. It was perfectly adult, all the epiphyses of the vertebræ having united.

The skeleton is far from complete. One of the lachrymals and jugals are missing from the skull; and one of the stylo-hyals, many of the chevron bones, and nearly all the bones of both hands are wanting. The bones that remain are, however, at present in excellent condition, free from grease, and the processes of vertebræ are generally unbroken. The terminal caudal vertebræ are contained within the dried tail-fin, so that their number cannot be ascertained, but they are probably all present. Besides these there are fifty-four vertebræ. The axis has very large transverse processes, containing a small oval foramen near its base. The transverse processes of the third, fourth, fifth, *and sixth* form complete rings on both sides; the seventh has only an upper transverse process. There are fourteen pairs of ribs present, the last well developed and articulating with the transverse process of the corresponding vertebra. There may have been a rudimentary fifteenth, as in the Alexandra-Park skeleton; but the transverse process does not show any enlargement at the end. The upper end of the first rib has a mere rudiment of a capitular process; the second and third have moderately long necks; in the fourth this process is almost obsolete.

The sternum resembles in general form that of the Alexandra-Park Whale, but the posterior process is longer, thicker at the base, and more gradually tapering. The whole length is, therefore, exactly equal to the breadth (24″); in all other Whales of this species that I have examined, the sternum has been somewhat broader than long. The scapula is 59″ in breadth, and 37″ in height; the radius 37″ in length. I find by my notes that I estimated the length of the cranium at 16′; but it was in a position which rendered exact measurement impossible; Dr. Gray gives it as 16′ 7″, and 5′ wide at the notch.

It will be seen that the main differences between these three skeletons, besides size, are in the extent of the development of the lower transverse process of the sixth cervical vertebra, in the presence or absence of capitular process to the first rib, and in the development of the fifteenth rib. These, with other minor differences, will show (especially when compared with the descriptions already published of other specimens from the same locality*) how large an amount of variation, quite independently of age, may exist in different individuals which may with all reasonable probability be assumed to have belonged to a single species.

* For that in the Antwerp Zoological Gardens, see P. Z. S. 1864, p. 414. The skeleton of the specimen taken in the Thames in 1859, and now in the Rosherville Gardens, is described by Dr. Murie, P. Z. S. 1865, p. 206.

DESCRIPTION OF PLATE XLVII.

Fig. 1. Male Fin-whale (*Physalus antiquorum*), 61 feet in length, stranded near Portsmouth, November 20th, 1869.
2. Anterior portion of the roof of the mouth, showing the baleen *in situ*.
a. Smooth median ridge of the palate.
b. Filamentous inner surface of the baleen.
c. Small, anterior, reclined baleen-plates.
3. Outline of the tail.

2. On some of the Fishes in the Calcutta Museum. By Francis Day, F.Z.S., F.L.S.—Part III.*

At the commencement of these papers on the Fishes in the Calcutta Museum, I proposed offering some remarks on Hamilton Buchanan's MS. ichthyological drawings, which I have had the opportunity of fully examining whilst in Calcutta. I find, however, objections exist to this course, as it is advanced that my observations should be addressed to the Society to whom those drawings belong; consequently, should I give my views publicity, I must reserve them for the consideration of the Asiatic Society of Bengal.

I have, however, a few more remarks to make upon the Fishes of the Calcutta Museum. Amongst the specimens I have been unable to find some of Mr. Blyth's types; but having fortunately recognized several of the species in Burma, I shall be able, when adverting to the fishes of that country, to remark upon them.

A crest on the head. Dorsal fin notched.

Salarias andamensis, sp. nov.

D. 12/22. P. 15. V. 4. A. 22–24. C. 11.

Length of head $\frac{1}{6}$, of pectoral $\frac{1}{7}$, of caudal $\frac{2}{11}$ of the total length. Height of body $\frac{1}{5}$ of the total length.

Eyes. Diameter $\frac{1}{3}$ of length of head.

Mouth very oblique, directed downwards and forwards; snout obtuse, vertical; the maxilla extends to beneath the posterior margin of the orbit. Tentacle above orbit two-thirds as long as the eye. Occipital crest rather high. A small fringed tentacle at the nostril.

Teeth in a single row, with a large canine internally on either side of the lower jaw.

Fins. A rather deep notch between the two divisions of the dorsal fin; the posterior extremity of the dorsal is not connected by membrane to the caudal; the central rays of caudal the longest.

Lateral line in upper fourth of body, commencing to curve downwards opposite the eighth dorsal spine, after which it soon becomes lost.

Colours. Brownish, with ten brown bars along the centre of the body, and a row of oblong pearl-coloured spots with dark margins along the middle of the last half of the body, and a second row

* See Part I. p. 511, and Part II. p. 548.

below. Dorsal fin with a dark margin edged with white, and the posterior portion of the second dorsal spotted. Anal edged with black. Pectoral and ventral white. Caudal barred in about six lines on either side of the fin. Head dark in its anterior portion.

Two specimens up to 4 inches were brought from the Andaman Islands and presented to the Museum by Dr. J. Anderson.

One specimen, 3 inches long, from the same locality was presented by Capt. Hodges, who also gave what appears to be the same species $1\frac{7}{10}$ inch long, but wanting both the crest and orbital tentacle.

In the Museum I find the specimens of *Saccobranchus* considered to be the *S. fossilis*, Bloch, and that to be identical with *S. singio*, Ham. Buch. Dr. Günther, however, in his elaborate 'Catalogue of Fishes' (vol. v. pp. 30, 31), holds a different view. Having taken some trouble to elucidate this question, I will here offer a few reasons for dissenting from this division (as it appears to me) of the species. Dr. Günther's diagnosis may be summed up as follows:—

Saccobranchus singio. A. 68 to 70 rays. Height of body $\frac{1}{7\frac{1}{2}}$, length of head $\frac{1}{6\frac{2}{3}}$ of the length of the body. Eye 2 diameters from end of snout. Maxillary cirri extend to or beyond the pectoral fin; pectoral spine $\frac{2}{4}$ of length of head. Ventral fin reaches to third or fourth anal ray. A notch between anal and caudal fin.

Saccobranchus fossilis. A. 70. Height of body $\frac{1}{7}$, length of head $\frac{1}{8}$ of the length of body. Eye 3 diameters from end of snout. Maxillary cirri extend to middle or end of the pectoral fin; pectoral spine $\frac{2}{3}$ as long as head. Ventral fin reaches the origin of the anal. Anal and caudal fins scarcely separated by a notch.

First, as regards coloration, it is no criterion in this species. In Burmese specimens, as a rule, there are two longitudinal yellowish-white bands; this I have never seen in India.

Next, as regards fin-rays. Out of thirty specimens I found as wide a variety as from A. 60–79, yet the species was evidently the same in all.

The height of the body depends on the time of year, whether they are captured from sluggish streams or tanks, or from localities well or badly supplied with food. Thus, out of several from one tank at Pegu, where food was plentiful, the height of the body was from $\frac{1}{4\frac{1}{2}}$ to $\frac{1}{7}$ of the length of the body; in Malabar $\frac{1}{7}$ of the same; in Mysore $\frac{1}{6\frac{1}{2}}$ of the body. Were the depth alone of much specific value, some of the Burmese species would differ from the Malabar, and those again from the Mysore ones.

As to the length of the head, out of thirty specimens it differed from $\frac{1}{5\frac{1}{2}}$ to $\frac{1}{7}$ of the length of the body.

The size of the eye differs with age, as does also the pectoral spine.

As regards the notch between the anal and caudal fins, its comparative size varies considerably.

There is one subject, however, to be kept in mind respecting this

species of fish, that both it and the *Clarias magur*, H. B., are extensively bred in India and the East for stocking tanks. There is hardly any thing which pays better, whilst the trouble is but slight. Domestication causes a wide difference in a few generations even in fishes; and an overstocked tank will give a larger proportion of the lanky *S. fossilis*, Bl., than the stouter-looking *S. singio*, H. B.

In the 'Journal of the Asiatic Society of Bengal' (1860, p. 156), Mr. Blyth gives a short description of *Pseudosilurus macrophthalmus*, sp. nov., from Burma, specimens of which I was unable to find in the collection, but I recognize it in the following, which I procured in the Irrawaddi.

CALLICHROUS MACROPHTHALMUS, Blyth.

D. 4. P. $\frac{1}{12}$. V. 6. A. 74–76. C 17.

Length of head $\frac{2}{11}$, of pectoral $\frac{2}{13}$, height of body $\frac{2}{9}$ of the total length.

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

Lower jaw prominent; maxillary cirri reach to the middle of the length of the fish, their extremities being very fine; mandibular ones to the gill-opening.

Teeth in cardiform bands in both jaws; in a single or double series across the vomer, interrupted in the middle.

Fins. Pectoral spine as long as the head without the snout, strongly serrated internally in its last half. A deep notch between the posterior extremity of the anal and the commencement of the caudal, which latter is deeply lobed, the lower one being the longest.

Colours. A well-developed round black blotch exists above the posterior third of the pectoral fin. Body greenish along the back, sides silvery, abdomen shot with purple. Opercles covered with fine spots and glossed with a golden colour.

Differs from *C. bimaculatus* in the larger size of the eye, the greater length of the pectoral spine and maxillary cirri, as well as in the extent of the anal fin, &c.

Hab. The Irrawaddi and its branches.

POLOTUS NITIDUS, Blyth (J. A. S. of Bengal, 1858, p. 282), is doubtless the *Coius gudgutia*, H. Buch. (pp. 94, 370), as subsequently observed by Mr. Blyth (*l. c.* 1860, p. 111); but it is not a *Mesoprion* as he suggested, but the *Pristipoma hasta*, Bl.

CHÆTODON LAYARDI, Blyth, in Kelaart's 'Prod. Faun. Zeylan. Appendix' (p. 50), is *Chætodon vittatus*, Bl. Schn.

PHRACTOCEPHALUS ITCHKEEA, Sykes (Trans. Zool. Soc. ii. p. 373, t. 67. f. 1), is not a *Macrones* as suggested by Dr. Günther (Catal. v. p. 84), but is identical with *Pimelodus cenia*, H. Buch. (pp. 174, 376, pl. 31. f. 57), a *Hemipimelodus* of Bleeker. It is fully described in my paper "On the Fishes of Orissa." (See *antea*, p. 308.)

HARA FILAMENTOSA, Blyth (J. A. S. of Bengal, 1860, p. 152), and which I described when remarking on that genus in the "Fishes of Orissa," is doubtless the *Pimelodus conta*, Ham. Buch. (pp. 191, 379). It is abundant in Burma.

PERILAMPUS FULVESCENS, Blyth (J. A. S. of Bengal, 1860, p. 163), is, I find, merely a variety of the *Perilampus laubuca* of Ham. Buch. (pp. 260, 384). I have procured all the intervening grades in Burma.

3. On the Freshwater Fishes of Burma.
By FRANCIS DAY, F.Z.S., F.L.S.—Part I.

In the course of the following papers I propose describing the Freshwater Fishes of Burma, or rather those which I have obtained during my tour whilst inspecting the fisheries of Pegu, and in the course of a hurried visit I paid to the capital of Upper Burma. In doing this I shall first detail (without arrangement) some species which appear to me to be undescribed or doubtful, next give a short general notice of the fishes, with observations upon any thing peculiar which I may have observed respecting them, and lastly a retrospect of the geographical distribution of the fishes of this portion of the east.

The period of the year during which my investigations extended being the monsoon months, was against collecting; but my duties were to investigate the fisheries and how the young were being looked after, consequently my own scientific collection was obliged to be a secondary consideration.

I am unaware of any one having written much respecting the ichthyology of this region. Mason, in his account of Burma, observes that it is probably the same as that of Bengal, but his list is very incorrect in many respects. Cuvier and Val. received a few specimens from the Irrawaddi; and Major Berdmore transmitted others to the Asiatic Society of Bengal.

My tour extended from Rangoon by boat to Bassein through the various creeks, then up the Dugga river to the Een-gay-gyee Lake fishery, returning to Rangoon by Bassein, being unable to pass into the Irrawaddi. From Rangoon by steamer about 650 miles up the Irrawaddi to Mandalay, returning by the same route to Prome; then by boat down the river. Next to Moulmein; then, having returned to Rangoon up the Pegu river, to Pegu, across country to Sittoung, down that river to Billing, then across country to Salwein, and so down again to Moulmein—these last two rivers being in Tenasserim.

No adipose eyelids.

MUGIL HAMILTONII, sp. nov.

? *Mugil cascasia*, Ham. Buch.

D. $4\frac{1}{8}$. P. 13. V. $\frac{1}{5}$. A. 3/9. C. 15. L. l. 44. L. tr. 18.

Length of head $\frac{2}{9}$, of pectorals $\frac{1}{7}$, of caudal $\frac{1}{8}$, height of body $\frac{1}{3}$ of the total length.

Eyes without adipose lids, diameter $\frac{2}{7}$ of length of head, 1 diameter from end of snout, $1\frac{1}{3}$ diameter apart.

Body compressed, tapering to both ends; snout somewhat pointed. Least depth of free portion of tail equal to half the length of head. Maxilla almost entirely hidden by the præorbital, which latter, although not emarginate, is strongly spinate, with eleven or twelve spines, the five posterior being the coarsest, and the last one the strongest. Lips thin. Cleft of mouth equal to half its gape. Mandibular angle somewhat obtuse. Lower jaw with a knob on symphysis. Uncovered space on chin lanceolate.

Teeth absent.

Fins. Dorsal arises midway between the snout and the base of the caudal; its spines are moderately strong, and the length of the longest equal to that of the head from the middle of the orbit. Pectoral short; its length equals that of the head without the snout. Second dorsal arises over the middle of the anal; its height equals that of the first dorsal. Anal spines well developed, the third the longest, lower surface of the fin concave. Caudal lunate.

Scales strongly ctenoid, with a raised line, more or less apparent, along each. Few scales on the vertical fins; thirty-eight rows between the base of the first dorsal and the snout. No elongated scale in the axil.

Colours. Silvery shot with gold; of a leaden colour along the upper half of the body.

This is a small species found in the Irrawaddi, Pegu, and other rivers of Burma, but it rarely grows to $4\frac{1}{2}$ inches in length.

It may be the *M. cascasia*, H. B.; but that is said to have D. $4\,|\,\frac{1}{7}$, A. 2/8, and to be found in the rivers of Northern Bengal.

CATOPRA NANDIOIDES?, Bleeker.

B. vi. D. $\frac{13}{15\text{-}6}$. P. 15. V. $\frac{1}{5}$. A. 3/8. C. 13. L. l. 27. L. tr. $5\frac{1}{2}/14\frac{1}{2}$. Cæc. pyl. 2.

Length of head from $\frac{2}{7}$ to $\frac{1}{4}$, of pectoral $\frac{1}{8}$, of caudal $\frac{1}{4}$, of height of body $\frac{2}{5}$, of dorsal spines $\frac{1}{5}$, of dorsal rays $\frac{2}{7}$ of the total length.

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

Snout convex in the adult. Body oblong, compressed, and rising from the snout to the base of the dorsal fin.

Præorbital and præopercle rather strongly serrated, fine serrations in the contiguous portions of the sub- and interopercles. Two flat spines on the opercle, the lower being double in the adult. Posterior extremity of maxilla extends to beneath the anterior margin of the orbit.

Teeth villiform in both jaws, the external row being the largest, more especially in the upper jaw. Blunted teeth on the vomer and palate. Tongue osseous, toothed.

Fins. Dorsal spines strong, interspinous membrane deeply cleft;

rays much longer than the spines, and central ones the longest. Pectoral rounded. Second anal spine strongest, third the longest. Caudal rounded.

Scales ctenoid.

Lateral line interrupted opposite the posterior extremity of the dorsal fin, being continued three scales lower down to opposite the base of the caudal, on reaching which it curves slightly downwards and is continued to the end of the fin.

Colours. Dull greenish, having a jet-black mark in the axil and on the base of the pectoral fin, which otherwise is yellow. The remainder of the fins slate-coloured.

Air-bladder large. Two cæcal appendages rather long. Pseudobranchiæ absent.

One specimen, 8 inches long, from Een-gay-gyee Lake; another, $4\frac{3}{10}$ inches long, from Hengada; two from Sittoung, the longest being $6\frac{3}{4}$ inches.

This species does not quite agree with Bleeker's description, and a comparison of specimens is desirable.

Vomerine band of teeth interrupted.

CALLICHROUS NOTATUS, sp. nov.

D. 4. P. $\frac{1}{14}$. V. 8. A. $\frac{3}{62-70}$. C. 17.

Length of head $\frac{1}{5}$, of caudal $\frac{1}{5}$, height of body $\frac{1}{6}$ of the total length.

Eyes nearly lateral, situated opposite the angle of the mouth. Diameter $\frac{2}{9}$ of length of head, $1\frac{1}{4}$ diameter from end of snout, $2\frac{1}{4}$ diameters apart.

Nape not elevated. Width of head nearly equals its length, and is more than its height.

Cleft of mouth equals half its gape. Lower jaw moderately prominent. Maxillary cirri reach to the centre of the total length of the fish; the mandibular arise opposite the angle of the mouth, and are slightly longer than one diameter of the orbit.

Teeth villiform in the jaws; those on the vomer in two distinct patches.

Fins. Dorsal fin small, arising a little in advance of the ventrals. Pectoral spine slightly denticulated towards its extremity; it is as long as the postorbital portion of the head. A notch exists between the end of the anal and the caudal; the latter with deep sharp lobes, the upper being the longest.

Colours. Silvery, with a deep black round spot on the lateral line some distance above the middle of the pectoral fin.

Hab. Rivers of Burma. Many specimens, up to 4 inches in length.

CALLICHROUS NIGRESCENS, sp. nov.

B. xvi. D. 5. P. 1/13. V. 9. A. $\frac{3}{63-68}$. C. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{6}$, of caudal $\frac{1}{6}$, height of body $\frac{1}{5}$ of the total length.

Eyes situated opposite the angle of the mouth, a portion being on the lower surface of the head. Diameter $\frac{1}{4}$ of length of head, $1\frac{1}{2}$ diameter from end of snout, 2 diameters apart.

Nape of neck elevated. The width of the head equals its length without the snout, and is the same as its height.

Gape of mouth wide, cleft equals half its gape; lower jaw strongly prominent. Maxillary cirri reach as far as the posterior margin of the orbit; mandibular pair opposite the angle of the mouth and minute.

Teeth villiform in both jaws, and in an interrupted band on the vomer.

Fins. Dorsal arises above the ventrals. Pectoral spine weak, entire, as long as the head without the snout. Anal reaches the base of the caudal, but is separated from it by a notch. Caudal deeply forked.

Colours. Silvery, spotted all over with fine black dots, giving it a dark cloudy appearance. A black finger-mark on the side above the base of the pectoral fin. Caudal lobes with black tips.

Hab. Throughout the branches of the Irrawaddi, in the Pegu and Sittoung rivers.

Out of many specimens, the largest was $6\frac{1}{2}$ inches long. In one the mandibular cirri were absent, but it was evidently the same species.

The *Pseudeutropius taakree*, Sykes, or the *P. longimanus*, Günther, is tolerably abundant in the Irrawaddi and its branches—as is also the *P. goongwaree*, Sykes, or *Eutropias macrophthalmus*, Blyth. The former has been fully described by Dr. Günther (Catalogue of Fishes, vol. v. p. 60); the latter has still some points which require investigation, although it is doubtless *Bagrus exodon*, C. & V.

PSEUDEUTROPIUS GOONGWAREE, Sykes.

D. $\frac{1}{6}$ | 0. P. 1/8. V. 8. A. 46–54. C. 17.

Length of head nearly $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of caudal $\frac{1}{5}$, height of body nearly $\frac{1}{5}$ of the total length.

Eyes behind the cleft of the mouth, and partly on the lower surface of the head. Diameter $\frac{1}{4}$ of length of head, $1\frac{1}{2}$ diameter from end of snout, $2\frac{1}{2}$ diameters apart.

Rostral cirri as long as the head; maxillary reaching the anal fin; external mandibular pair slightly the longest, and extending to the base of the pectoral fin. The longitudinal furrow on the head extends to the base of the occipital process, which is narrow, and of nearly equal width throughout. The cleft of the mouth extends halfway to the orbit; upper jaw slightly the longest, anteriorly rounded.

Teeth villiform in the lower jaw and over the lower surface of the snout, so as to be entirely beyond the lower jaw. Palatine teeth in a narrow uninterrupted curved band.

Fins. Dorsal spine somewhat slender, as long as the head without the snout, finely serrated posteriorly. Pectoral spine about the same length, stronger, and coarsely denticulated along its whole internal

margin. Ventral small, inserted behind the posterior dorsal ray. Caudal forked.

Colours. Silvery, darkest above; a small black spot at base of the dorsal fin.

Hab. The Irrawaddi and its branches, growing to 8 or 10 inches in length. It is very common.

PSEUDEUTROPIUS ACUTIROSTRIS, sp. nov.

D. $\frac{1}{6}|0$. P. 1/7. V. 6. A. 2/44. C. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{7}$, of caudal $\frac{1}{5}$, height of body $\frac{1}{5}$ of the total length.

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

A considerable rise occurs from the snout to the base of the dorsal fin. The upper jaw elongated and pointed, extending some distance beyond the lower jaw.

Upper surface of head slightly rugose; superior longitudinal furrow extends to the base of the occipital process, which is narrow, $\frac{2}{3}$ as wide at base as it is long; the triangular bone in front of the dorsal fin descends some distance down to meet the occipital process, which is emarginate to receive it. Cleft of mouth equals half its gape. Maxillary cirri reach the base of the anal fin; the rostral are longer than the head; the two pairs of mandibular, which arise on a transverse line, are longer than the head.

Teeth villiform in both jaws, that in the upper widest and entirely in advance of the lower jaw; in two minute patches on the vomer, and of the same character in the palatines, not continuous with those on the vomer.

Fins. Dorsal spine sharp, pointed, entire, as long as the head to the angle of the mouth. Ventral arises somewhat behind the dorsal fin. Pectoral spine very strong, coarsely denticulated, with about ten teeth, as long as the head without the snout. Caudal deeply forked.

Colours. Silvery, a black spot on occiput; a black base to the dorsal fin.

Hab. Throughout Burma. Rarely exceeds 4 inches in length.

ARIUS BURMANICUS, sp. nov.

B. vi. D. $\frac{1}{7}|0$. P. $\frac{1}{10}$. V. 6. A. $\frac{4-6}{16}$. C. 15.

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

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

Head depressed; body elongated and compressed.

Snout spatulate; upper jaw longest. Maxillary cirri reach the base (or middle in the immature) of the pectoral fin; the external mandibular are nearly as long, the internal slightly shorter. The longitudinal furrow on the summit of the head does not extend so

far as the base of the occipital process, which is keeled, its length being equal to the breadth of its base. There is no interneural shield in the occipital region.

Teeth villiform in the jaws and palate; on the latter in a narrow band.

Fins. Dorsal spine strong, serrated on both sides, and equal to half the head in length. Pectoral spine of equal length, but stronger; it is likewise serrated on both sides. Base of adipose dorsal short; it commences slightly posterior to the origin of the anal. Caudal deeply forked.

Lateral line at first descends; opposite the centre of the base of the caudal it divides into two branches—one going to the upper, the other to the lower lobe.

Colours. Purplish along the back, silvery white on the abdomen. Dorsal fin stained posteriorly with black.

This fish has a general resemblance to *Macrones aor*.

Hab. Irrawaddi, Bassein district, and Salwein in the Tenasserim provinces.

Barbus malabaricus, Jerdon, Madras Journ. Lit. & Sc. 1849, p. 312?

B. iii. D. 2/9. P. 17. V. 9. A. 2/5. C. 17. L. l. 23. L. tr. 3½/4.

Length of head from $\frac{1}{5}$ to $\frac{2}{9}$, of caudal $\frac{1}{6}$, height of body $\frac{2}{7}$ of the total length.

Eyes. Diameter $\frac{1}{5}$ of length of head, 1½ diameter from end of snout, 2½ diameters apart.

Mouth antero-inferior, without enlarged lips.

Barbels four and long, the rostral extending to beneath the middle of the eye, the maxillary to opposite its posterior margin. Upper surface of head flat.

Fins. Dorsal spine strong, smooth, and as long as the head without the snout; it arises midway between the snout and the base of the caudal fin.

Scales. Two and a half rows between the lateral line and the base of the ventral fin.

Hab. One specimen from Akyab, another from Moulmein, to 11 inches long.

This appears to be probably Dr. Jerdon's fish, which did not find a place in my 'Fishes of Malabar,' because it was stated to be found "only in mountain-streams in Malabar," whilst my descriptions extended to those captured inland as far only as the western ghawts, or to the foot of the Malabar hills.

Barbus m'clellandi, sp. nov.

B. iii. D. 2/8. P. 14. V. 9. A. 2/5. C. 19. L. l. 25. L. tr. 5/6.

Length of head $\frac{1}{4}$, of caudal $\frac{1}{5}$, height of body $\frac{1}{3}$ of the total length.

Eyes. Diameter nearly $\frac{1}{4}$ of length of head, 1 diameter from end of snout, 1½ diameter apart.

Barbels absent. Mouth small.

Teeth pharyngeal, crooked, 5, 3, 2/2, 3, 5.

Fins. Dorsal fin commences midway between snout and base of caudal, which latter is lunate. Dorsal spine not so strongly serrated as in *B. tieto*, H. B., whilst the teeth are somewhat irregular in their direction.

Lateral line complete to the base of the caudal. Three and a half rows of scales between it and the base of the ventral fin.

Scales scarcely striated, usually smooth.

Colours. Silvery; a black mark on the lateral line about the third scale, and a deep-black mark above and also a little behind the posterior extremity of the anal fin; it extends superiorly almost to the back, and is yellow anteriorly. Fins orange, with no black marks.

This species bears a strong resemblance to the *B. tieto*, H. B., which it appears to supersede in Eastern Burma. But it is distinguished by a complete instead of incomplete lateral line, and its body is not so compressed; its dorsal spine and colouring also differ.

Hab. Six specimens from Pegu, and fifteen from Moulmein, up to 4 inches in length.

BARILIUS NIGROFASCIATUS, sp. nov.

B. iii. D. 2/7. P. 15. V. 7. A. 2/11. C. 19. L. l. 30. L. tr. 7.

Length of head $\frac{2}{11}$, of caudal nearly $\frac{1}{5}$, height of body $\frac{2}{7}$ of the total length.

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

Only the maxillary barbels are perceptible; they are very fine, and reach as far as the middle of the orbit. Lower jaw prominent.

Fins. Dorsal is situated over the first portion of the anal, and midway between the posterior extremity of the orbit and the base of the caudal fin. Caudal lunated.

Lateral line absent.

Colours. Very similar to *B. rerio*, H. B. A dark band passes along the side of the body, and a second dotted black line below it. Dorsal and anal spotted with black in lines. In some specimens the body is intensely blue.

Hab. Pegu and Moulmein. It seems to be only a minute species; out of twenty specimens none exceeded $\frac{7}{10}$ of an inch in length.

OPSARIUS GUTTATUS, sp. nov.

B. iii. D. 2/7. P. 15. V. 9. A. 3/11. C. 17. L. l. 44. L. tr. 9/5.

Length of head $\frac{2}{9}$, of caudal $\frac{2}{9}$, height of body $\frac{2}{11}$, of dorsal fin $\frac{2}{13}$ of the total length.

Eyes. Diameter nearly $\frac{1}{5}$ of length of head, $1\frac{1}{4}$ diameter from end of snout and apart.

Cleft of mouth very deep, extending nearly one diameter behind the orbit. A strong knob on the inner side of the symphysis of the lower jaw. Suborbitals very broad, more especially the last, which is nearly behind the vertical from the posterior margin of the orbit.

Fins. Dorsal arises midway between the posterior extremity of

the orbit and the base of the caudal, being opposite the interspace between the ventral and anal fins. Pectoral nearly reaches ventral. Caudal forked, lower lobe slightly the longest.

Scales strongly lineated. Two and a half rows between the lateral line and the base of the anal fin.

Colours. Silvery, shot with purple; two rows of blue spots along the side. Lower caudal lobe orange, with a dark margin along its upper half.

Hab. Irrawaddi, from Prome to Mandalay; very common. Specimens obtained up to 7 inches in length.

DANIO STOLICZKÆ, sp. nov.

B. iii. D. 2/7. P. 13. V. 7. A. 2/13. C. 19. L. l. 33. L. tr. $5\frac{1}{2}/3$.

Length of head nearly $\frac{1}{5}$, of caudal $\frac{2}{9}$, height of body from $\frac{1}{4}$ to $\frac{2}{9}$ of the total length.

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

Body moderately compressed.

Maxillary barbels reach beyond the base of the pectoral fin; rostral barbels as far as the posterior margin of the orbit. Lower jaw anterior. Cleft of mouth very oblique, extending halfway to below the orbit.

Fins. Dorsal commences midway between the end of the head and the base of the caudal, and slightly in advance of the anal. Caudal lunate.

Scales. A single row along the base of the anal fin. One and a half row between the lateral line and the base of the ventral.

Colours. Greenish superiorly; a scarlet band commences from below the base of the dorsal fin, it gradually widens and is continued to the centre of the base of the caudal, it has a black lower edging. Dorsal edged with red. Anal with a yellow stripe along its centre.

Hab. Moulmein, in tanks and streams. Upwards of 100 taken, up to 2 inches in length.

I have named this species after Dr. Stoliczka, who personally captured the first three which were obtained.

DANIO SPINOSUS, sp. nov.

B. iii. D. $\frac{2-3}{13}$. P. 13. V. 7. A. 3/17. C. 19. L. l. 52. L. tr. 15/4.

Length of head $\frac{1}{5}$, of caudal $\frac{1}{5}$, height of body $\frac{1}{3}$ of the total length.

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

Body strongly compressed; a slight concavity in dorsal profile over the occiput.

Barbels absent. Lower jaw prominent, having a strong hook, whilst there is an emargination to receive it in the upper jaw. In the adult there is rather a sharp spine pointing forwards above the anterior superior margin of the orbit, and a second, broader and not so sharp, before the centre of the anterior orbital margin. In the immature both these spines are equally sharp.

Fins. The dorsal arises midway between the posterior extremity of the orbit and the base of the caudal. The anal commences under the anterior third of the dorsal. Caudal lunate.

Scales. Three and a half rows between the lateral line and the base of the ventral fin.

Colours. Silvery, with a badly defined lateral band, and some vertical yellow lines in the anterior half of the body. Dorsal and anal greyish, with reddish margins anteriorly. In the immature there is a dark humeral spot, and a steel-blue lateral band goes to the centre of the caudal fin; in its last half it has a scarlet stripe along its centre.

Hab. A tank near Pegu. Four specimens captured, from $2\frac{3}{10}$ to 4 inches in length.

CHELA SLADONI, sp. nov.

B. iii. D. 2/8. P. 11. V. 8. A. 2/19. C. 21. L. l. 68. L. tr. 10/8.

Length of head $\frac{1}{6}$, of caudal $\frac{1}{5}$, height of body $\frac{1}{4}$ of the total length.

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

Posterior extremity of the maxilla reaches to beneath the anterior third of the orbit. The suborbital ring of bones is half as deep as the diameter of the orbit.

Teeth pharyngeal, crooked, 5, 4, 2/2, 4, 5.

Fins. Dorsal commences opposite the anal; lower lobe of caudal the longest. Edge of thorax rounded; the serrated abdominal margin commences opposite the base of the pectoral fin.

Colours. Silvery; caudal black-edged.

Hab. Irrawaddi, as high as Mandalay. Very common.

CHATOËSSUS MODESTUS, sp. nov.

D. 3/13. P. 16. V. 8. A. 3/25. C. 21. L. l. 47. L. tr. 17.

Length of head $\frac{1}{5}$, of pectoral $\frac{1}{5}$, of caudal nearly $\frac{1}{4}$ of the total length. Height of head $\frac{1}{6}$, of body $\frac{3}{11}$, of dorsal fin $\frac{1}{5}$ of the total length.

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

Body strongly compressed; profile above the head slightly concave, then a great rise to the base of the dorsal fin. Abdominal profile equally convex.

Mouth transverse; snout moderately projecting over the lower jaw. The posterior extremity of the upper jaw is opposite the centre of the anterior margin of the orbit.

Fins. Dorsal fin arises slightly nearer to the snout than to the base of the caudal fin; its last ray is not prolonged.

Scales regularly arranged; eighteen serrations anterior to the ventral fin, and eleven posterior to it.

Coloration uniform.

Hab. Along the Bassein River as high as the Een-gay-gyee Lake. Many specimens were taken, up to $5\frac{1}{2}$ inches in length.

CLUPEA VARIEGATA, sp. nov.

D. 2/13. P. 17. V. 8. A. 3/26. C. 17. L. l. 90.

Length of head $\frac{2}{9}$, of pectoral $\frac{1}{6}$, of caudal $\frac{1}{4}$ of the total length. Height of body $\frac{1}{3}$ of the total length.

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

Abdominal profile more convex than the dorsal.

Jaws of about equal length; the posterior extremity of the maxilla extends to beneath the centre of the orbit. Opercles smooth.

Teeth on tongue; none on jaws, vomer, or palatines.

Fins. Dorsal commences rather nearer to the snout than to the base of the caudal. Ventrals situated opposite the commencement of the dorsal fin. Anal in the posterior third of the distance between the posterior margin of the orbit and the base of the caudal fin.

Scales regularly arranged behind a line from the opercles to the base of the anal fin, anterior to which they are very irregular. Along the back to the base of the dorsal fin the scales of the two sides meet, so as to form a sort of line somewhat resembling a lateral line in appearance. Serrated scales commence under the middle of the pectoral; ten are posterior to the ventral fin, and ten anterior to it.

Colours. Silvery glossed with gold. A dark humeral spot. A row of about eighteen bars passes across the back and descends a short way over the sides. Dorsal fin with a black band in the lower portion of its posterior half. End of tail tipped with black.

Hab. Irrawaddi and its branches. Many specimens procured, up to 7 inches in length.

PELLONA SLADENI, sp. nov.

D. $\frac{3}{10}$. P. 11. V. 7. A. $\frac{3}{41}$. C. 21. L. l. 48. L. tr. 10.

Length of head $\frac{1}{4}$ of length of body, and equal to its height.

Eyes with wide adipose lids. Diameter $\frac{1}{4}$ of length of head, 1 diameter from end of snout.

Ridges on the head slightly diverge posteriorly. Lower jaw very prominent.

Fins. First two dorsal rays in advance of anal, the remainder of the fin over it; it arises midway between the base of the caudal and the posterior extremity of the opercle. Pectoral reaches to nearly the end of the ventral, which is small. Caudal forked. Twenty spinate scales exist on the abdominal profile anterior to the ventral fins, and eleven posterior to them.

Colours. Silvery; opercles golden. Caudal edged with black.

Specimens up to 7 inches from the Irrawaddi, at Mandalay.

I have named the species after Major Sladen, Political Resident at the court of the King of Burma, who greatly assisted me in collecting specimens, as well as in acquiring information on the fishes of that mismanaged but magnificent country.

4. Descriptions of Eight New Species of *Helicidæ* from the Western Pacific Islands. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., F.R.G.S., &c.

(Plate XLVIII.)

HELIX (CORASIA) PSYCHE, n. sp. (Plate XLVIII. fig. 1.)

Shell imperforate, depressed, thin, obliquely irregularly plicately striated, pellucid, white, covered with a yellowish-brown shining epidermis; spire scarcely elevated, obtuse at the apex; whorls 3, flatly convex, margined at the sutures, the last not descending, prominently keeled at the periphery, flattened above and ventricose below; columellar margin arcuately descending, narrowly excavated, sharp within; aperture large, oblique, subovate; peristome not continuous, white, slightly reflected, the upper margin nearly straight, not flexuous.

Diam. maj. 13, min. 9, alt. 7 lines.

Hab. New Georgia, Solomon group.

This species, which I have received from Dr. James Cox of Sydney, New South Wales, is somewhat intermediate between *H. aphrodite*, Pfr., and *H. purchasi*, Pfr. It differs from the former in being much flattened above and very ventricose below, and especially in the form and amplitude of the aperture, and from the latter in texture, form of spire, colour, and size. Dr. Pfeiffer erroneously gives New Caledonia as the habitat of *H. aphrodite*; its correct locality is San Christoval, Solomon Islands. *H. purchasi* comes from the Admiralty Islands.

HELIX (GEOTROCHUS) ADONIS, n. sp. (Plate XLVIII. fig. 4.)

Shell narrowly perforate, ovately conical, thin, obliquely sculptured with very fine irregular raised striæ, rich orange-yellow colour throughout; spire conoidal; whorls 6½, slightly convex, narrowly margined at the suture, the last angled at the periphery and flattened at the base; aperture rhomboidally oval, margins united by a thin callus, the right expanded and subreflected, the basal slightly reflexed, forming an obtuse angle with the columella, which descends vertically and is callously reflected over the perforation.

Diam. maj. 10, min. 8½, alt. 13 lines.

Hab. Bougainville Island, Solomon group (*Brazier*).

This delicately orange-coloured species is intermediate in form between *H. meta*, Pfr., and *H. gaertneriana*, Pfr.

HELIX (GEOTROCHUS) CÆRULESCENS, n. sp. (Plate XLVIII. fig. 6.)

Shell subperforate, conoidal, thin, obliquely striated and the lower whorls decussated by irregular undulating striæ, bluish grey, with darker bands of the same colour, changing into pale yellowish olive above and at the base, the apical whorls being dark chestnut, and with a flesh-coloured band immediately below the suture, and a

similar one at the periphery with a narrow dark chestnut line in the middle; spire conical, rather obtuse at the apex; whorls 4½, slightly convex, the last descending in front, angled at the periphery; aperture diagonal, sublunar; peristome white, margins converging, the right scarcely flexuous, expanded, the basal one arcuate, reflexed.

Diam. maj. 9, min. 8, alt. 8½ lines.

Hab. Guadalcanar Island, Solomon group.

HELIX (GEOTROCHUS) DEIDAMIA, n. sp. (Plate XLVIII. fig. 3.)

Shell perforate, turbinate, rather solid, shining, obscurely obliquely striated, yellowish olive, gradually becoming purple towards the apex, with an opaque white band joining the suture below; spire convexly conical; whorls 6½, convex, attenuated at the upper part, the last non-descending, slightly angled at the periphery and a little flattened at the base; aperture diagonal, subovate; peristome purplish black, reflexed, right margin flexuous, excavated behind, columellar margin curved, sloping, and broadly covering the perforation.

Diam. maj. 11, min. 10, alt. 14 lines.

Hab. Ysabel Island, Solomon Group.

In form this species nearly approaches *H. acmella*, Pfr.; but the spire is more turbinate and peculiarly contracted towards the apex, the last whorl is less convex, and the outer lip more flexuous. The painting, moreover, is entirely different, and uniform in all the specimens that have come under my notice.

HELIX (GEOTROCHUS) HARGREAVESI, n. sp. (Plate XLVIII. fig. 2.)

Shell imperforate, turbinate, rather solid, obliquely faintly striated, creamy white sprinkled here and there with small purplish semipellucid spots, and ornamented with a narrow suffused chestnut band above and below the suture and a broader one at the periphery; spire turbinate, apex very slightly obtuse; whorls 6, a little convex, the last abruptly descending, convex below, with a broad suffused chestnut band in the middle; aperture very oblique, truncately oval; peristome black, thickened, the right margin very slightly expanded and sinuous, the columellar margin a little reflexed, obliquely descending, spread over the body-whorl, and furnished within with a long straight callus.

Diam. maj. 12, min. 10, alt. 10¼ lines.

Hab. Bougainville and Shortland's Islands, Solomon group (*Brazier*).

Varieties of this species occur in which the chestnut bands are wanting.

HELIX (GEOTROCHUS) HERMIONE, n. sp. (Plate XLVIII. fig. 5.)

Shell perforate, ovately conical, rather thin, very finely obliquely striated, purplish black, with a pale straw-coloured band below the periphery of the last whorl, and sometimes with a second band between the periphery and the suture; spire conical, apex rather obtuse; whorls 6½, a little convex, the last angled at the periphery,

and slightly convex at the base; aperture diagonal, rhomboidal-ovate; peristome white, right margin expanded, basal margin reflexed; columella subvertical, and triangularly expanded over the perforation.

Diam. maj. 9, min. 8, alt. 11 lines.

Hab. Bougainville Island, Solomon group (*Brazier*).

A very pretty species, distinguishable from the black variety of *H. meta*, Pfr., by its invariably smaller size, by the presence of the straw-coloured band below the keel instead of next the suture, and by the last whorl being more distinctly keeled and less convex beneath.

HELIX (RHYTIDA) BOYDI, n. sp. (Plate XLVIII. fig. 8.)

Shell widely and perspectively umbilicated, discoidal, moderately solid, shining, closely plicately striated, olive-brown, ornamented with numerous dark brown, irregular, more or less interrupted stripes; spire almost flat; whorls 6, slightly convex, regularly increasing, the last rounded and a little descending; aperture diagonal, roundly lunate; peristome simple, not expanded, margins approximating.

Diam. maj. 14, min. 11, alt. 5 lines.

Hab. Recherche Island, San Christoval, Solomon group.

I dedicate this fine shell to the memory of the late Benjamin Boyd, Esq., who visited the Solomon Islands in his yacht 'The Wanderer,' and was murdered by the natives whilst pigeon-shooting at Guadalcanar.

HELIX (TROCHOMORPHA) FESSONIA, n. sp. (Plate XLVIII. fig. 7.)

Shell narrowly umbilicated, trochiform, thin, closely irregularly plicately striated, light brown, ornamented here and there with paler diaphanous irregularly interrupted stripes; spire rather convexly conical, apex somewhat obtuse, sutures with a narrow distinct pale thread-like margin; whorls 6, a little convex, the last not descending, with an acute white keel, flattened below, pale horn-colour, with a narrow rufous band next the keel; aperture diagonal, truncately oval; peristome not continuous, the right margin arcuate, simple, the columellar margin a little thickened and slightly reflexed, not covering the umbilicus.

Diam. maj. 4½, min. 4¼, alt. 3 lines.

Hab. Kantavu, Fiji Islands, on trees (*Brazier*).

5. On the Breeding of Birds in the Gardens of the Zoological Society of London during the past Twenty Years. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

On the 10th of December last I had the honour of submitting to the Meeting a list of the species of Mammals that had bred in the

Society's Gardens during the previous twenty years*. To this I now beg leave to add a list of the birds that have produced living young in the Society's Gardens during the same period, drawn up in a corresponding manner.

The first Table contains the names of the species of this class that have bred in the Gardens from the 1st of January 1848 to the 31st of December 1868, arranged according to the last edition of the List of Vertebrates, and the number of instances in which each species has produced living young during this period.

The second Table gives the total number of species that have bred in each order of Birds, and the corresponding number of species of the same order enumerated in the List of Vertebrates. A comparison of these two columns will give some approximate idea of the comparative frequency of breeding in captivity in the different orders of this class of animals.

TABLE I.

		No. of instances of breeding in each species during the years 1848–68.	No. of ditto in each order.
I. PASSERES.			
1. Song-thrush	*Turdus musicus*	1	
2. Blackbird	—— *merula*	1	
3. Pied Wagtail	*Motacilla yarrelli*	3	
4. Spot-sided Finch	*Amadina lathami*	1	
5. Rufous-necked Weaverbird	*Hyphantornis textor*	3	
6. Black-crested Cardinal	*Gubernatrix cristatella*	1	
7. Cardinal Grosbeak	*Cardinalis virginiana*	1	
			11
III. PREHENSORES.			
1. Undulated Grass-parrakeet	*Melopsittacus undulatus*	3	
2. Turquoisine Parrakeet	*Euphema pulchella*	13	
3. Elegant Parrakeet	—— *elegans*	5	
4. Crested Ground-parrakeet	*Calopsitta novæ-hollandiæ*	6	
5. Blood-rumped Parrakeet	*Psephotus hæmatonotus*	1	
			28
IV. ACCIPITRES.			
1. Black Kite	*Milvus niger*	3	
2. Great Eagle-owl	*Bubo maximus*	1	
			4
V. COLUMBÆ.			
1. Naked-eyed Pigeon	*Columba gymnophthalma*	6	
2. White-crowned Pigeon	—— *leucocephala*	4	
3. Triangular-spotted Pigeon	—— *guinea*	2	
4. Cambayan Turtledove	*Turtur senegalensis*	13	
5. Vinaceous Turtledove	—— *vinaceus*	28	
6. Barbary Turtledove	—— *risorius*	2	
7. Dwarf Turtledove	—— *humilis*	2	
8. Zenaida Dove	*Zenaida amabilis*	17	
9. Barred Dove	*Geopelia striata*	2	

* See P. Z. S. 1868, p. 623.

		No. of instances of breeding in each species during the years 1848–68.	No. of ditto in each order.
10. Red Ground-dove	*Geotrygon montana*	5	
11. Mountain-witch Ground-dove	—— *sylvatica*	1	
12. Crested Pigeon	*Ocyphaps lophotes*	23	
13. Bronze-wing Pigeon	*Phaps chalcoptera*	17	
14. Harlequin Bronze-wing	—— *histrionica*	1	
15. Wonga-wonga Pigeon	*Leucosarcia picata*	2	
16. Bartlett's Pigeon	*Phlogœnas crinigera*	6	
17. Nicobar Pigeon	*Calœnas nicobarica*	5	
18. Crowned Pigeon	*Goura coronata*	5	
19. Victoria Crowned Pigeon	—— *victoriæ*	2	
			143
VI. Gallinæ.			
1. Pintailed Sand-grouse	*Pterocles alchata*	1	
2. Capercailzie	*Tetrao urogallus*	6	
3. Cape Francolin	*Francolinus capensis*	4	
4. Red-legged Partridge	*Caccabis rufa*	1	
5. Australian Quail	*Synœcus australis*	1	
6. Californian Colin	*Callipepla californica*	10	
7. Impeyan Pheasant	*Lophophorus impeyanus*	33	
8. Pallas's Eared Pheasant	*Crossoptilon auritum*	2	
9. Ring-necked Pheasant	*Phasianus torquatus*	20	
10. Japanese Pheasant	—— *versicolor*	10	
11. Sœmmering's Pheasant	—— *sœmmerringi*	3	
12. Reeves's Pheasant	—— *reevesii*	5	
13. Cheer Pheasant	—— *wallichii*	18	
14. Gold Pheasant	*Thaumalea picta*	2	
15. Siamese Pheasant	*Euplocamus prælatus*	1	
16. Swinhoe's Pheasant	—— *swinhoii*	4	
17. Silver Pheasant	—— *nycthemerus*	7	
18. Lineated Pheasant	—— *lineatus*	7	
19. Purple Kaleege	—— *horsfieldi*	19	
20. Black-backed Kaleege	—— *melanotus*	19	
21. White-crested Kaleege	—— *albicristatus*	13	
22. Sonnerat's Jungle-fowl	*Gallus sonneratii*	9	
23. Bankiva Jungle-fowl	—— *bankiva*	2	
24. Horned Tragopan	*Ceriornis satyra*	7	
25. Black-winged Peafowl	*Pavo nigripennis*	1	
26. Javan Peafowl	—— *muticus*	3	
27. Peacock Pheasant	*Polyplectron chinquis*	2	
28. Ocellated Turkey	*Meleagris ocellata*	1	
29. Brush Turkey	*Talegalla lathami*	10	
30. Variegated Hemipode	*Turnix varius*	1	
31. Rufous Tinamou	*Rhynchotus rufescens*	8	
			220
VII. Struthiones.			
1. Common Rhea	*Rhea americana*	4	
2. Cassowary	*Casuarius galeatus*	2	
3. Bennett's Cassowary	—— *bennettii*	3	
4. Emu	*Dromœus novæ-hollandiæ*	2	
			11
VIII. Grallæ.			
1. Mantchurian Crane	*Grus montignesia*	3	
2. Common Crane	—— *cinerea*	1	
3. Sun-bittern	*Eurypyga helias*	6	
4. Crested Coot	*Fulica cristata*	1	

		No. of instances of breeding in each species during the years 1848–68.	No. of ditto in each order.
5. Scarlet Ibis	*Ibis rubra*	1	
6. White Ibis	—— *alba*	1	
			13
X. Anseres.			
1. Cereopsis Goose	*Cereopsis novæ-hollandiæ*	8	
2. Wild Goose	*Anser ferus*	4	
3. Chinese Goose	—— *cygnoides*	1	
4. Barnacle Goose	*Bernicla leucopsis*	1	
5. Upland Goose	*Chloëphaga magellanica*	4	
6. Ashy-headed Goose	—— *poliocephala*	13	
7. Ruddy-headed Goose	—— *rubidiceps*	8	
8. Sandwich-Island Goose	—— *sandvicensis*	11	
9. Egyptian Goose	*Chenalopex ægyptiaca*	2	
10. Black-necked Swan	*Cygnus nigricollis*	8	
11. Black Swan	—— *atratus*	14	
12. Common Sheldrake	*Tadorna vulpanser*	1	
13. Ruddy Sheldrake	—— *rutila*	7	
14. White-faced Sheldrake	—— *cana*	1	
15. Variegated Sheldrake	—— *variegata*	3	
16. Summer Duck	*Aix sponsa*	20	
17. Mandarin Duck	—— *galericulata*	13	
18. Bahama Duck	*Pœcilonetta bahamensis*	19	
19. Red-billed Duck	—— *erythrorhyncha*	4	
20. Dusky Duck	*Anas obscura*	19	
21. Yellow-billed Duck	—— *xanthorhyncha*	4	
22. Australian Wild Duck	—— *superciliosa*	1	
23. Gadwall	—— *strepera*	14	
24. Common Teal	*Querquedula crecca*	7	
25. Garganey	—— *circia*	2	
26. Shoveller	*Spatula clypeata*	7	
27. Tufted Duck	*Fuligula cristata*	21	
28. Castaneous Duck	*Nyroca leucophthalma*	6	
29. Eider Duck	*Somateria mollissima*	2	
30. Herring-gull	*Larus argentatus*	6	
			231

Table II.

	No. of species in list.	No. of breeding species.	Proportion of breeding species to total number.
I. Passeres	178	7	1 in 25·4
II. Picariæ	25		
III. Prehensores	110	5	1 in 22·0
IV. Accipitres	94	2	1 in 47·0
V. Columbæ	51	19	1 in 2·6
VI. Gallinæ	83	31	1 in 2·7
VII. Struthiones	7	4	1 in 1·7
VIII. Grallæ	57	6	1 in 9·0
IX. Herodiones	35		
X. Anseres	80	30	1 in 2·6
	720	108	1 in 6·6

6. On a new Kingfisher belonging to the Genus *Tanysiptera*. By R. B. Sharpe.

While on a recent visit to Paris, Mr. D. G. Elliot, F.Z.S., saw, in the hands of M. Jules Verreaux, what appeared to him to be an undescribed species of *Tanysiptera*. The specimen in question was the property of Count Turati of Milan, and had been sent to M. Verreaux for mounting. The latter gentleman, with his usual courtesy, permitted Mr. Elliot to bring the bird to England for my inspection. I certainly know of no known species for which it could be taken, and therefore do not hesitate to describe it, and propose to call it *Tanysiptera ellioti*, after my friend Mr. Elliot, as a slight tribute of my admiration for his talents as an ornithologist.

Tanysiptera ellioti, sp. nov.

Supra saturate ultramarina: capite toto cum tectricibus alarum superioribus lætissime cyaneis: dorso postico cum uropygio et rectricibus omnibus purissime albis: rectricibus duabus mediis haud spatulatis, apice tantum paulo dilatatis: subtus pure alba, tibiis ultramarinis; hypochondriis striis ultramarinis longitudinaliter notatis.

Head uniform brilliant cobalt; cheeks, ear-coverts, and the whole of the back rich ultramarine; lesser and least coverts brilliant cobalt, the second series bright ultramarine, the cubital and primary coverts ultramarine, uniform with the back; quills entirely black, the outer web broadly washed with deep ultramarine; lower part of the back, rump, and upper tail-coverts pure white; tail-feathers all pure white, the middle ones with no attenuated end and no perceptible spatula, these feathers when observed from a distance and placed on a level with the eye having a faint blue lustre; entire under surface white, thighs ultramarine, and the flanks longitudinally marked with this colour also; bill vermilion; feet olive-brown. Total length 13·5 inches; of bill from front 1·4, from gape 1·7; wing 4·5; tail 4·5, middle rectrices 8·0; tarsus 0·5, middle toe 0·7, hind toe 0·35.

Unfortunately we are not aware of the exact habitat of the present bird. It forms part of the magnificent collection of Count Turati, whose generosity in lending me rare and valuable Kingfishers has before been acknowledged by me.

Notwithstanding the objections of Professor Schlegel as to the admission of the different *Tanysipteræ* enumerated by Mr. Wallace (P. Z. S. 1863, p. 24), I believe them all to be good species; but I have not replied to Professor Schlegel's article on the genus *Tanysiptera* (Ned. Tydschr. 1866, p. 272), as the learned Professor has such ample materials at his command in the Leyden Museum that it seems hardly fair to criticise his decisions with the limited materials we possess in this country. Nevertheless I believe all Mr. Wallace's species are good, and the following table will illustrate the present condition of the genus *Tanysiptera* as acknowledged

by me. Of those here enumerated I have seen specimens of every one except *T. riedeli*, which, however, is undoubtedly a very distinct species.

A. Macula dorsali alba.
  a. Subtus cinnamomina ..... 1. *T. sylvia.*
  b. Subtus alba.
    a'. Scapularibus saturate ultramarinis: tectricibus supracaudalibus cum rectricibus cæruleo marginatis..... 2. *T. doris.*
    b'. scapularibus nigris, ultramarino clare lavatis: tectricibus supracaudalibus cum rectricibus albis ..... 3. *T. sabrina.*
B. Macula dorsali nulla.
  a. Uropygio coccineo ..... 4. *T. nympha.*
  b. Uropygio albo.
    a'. Cauda haud spatulata..... 5. *T. ellioti.*
    b'. Cauda spatulata.
      a''. Genis, regione parotica et collo postico nigris.
        a'''. Rectricibus exterioribus nigris, cæruleo marginatis..... 6. *T. hydrocharis.*
        b'''. Rectricibus exterioribus albis, cæruleo marginatis..... 7. *T. acis.*
      b''. Genis, regione parotica et collo postico saturate cæruleis.
        a'''. Pileo ultramarino: superciliis cum nucha cyaneis: tectricibus caudalibus postremis nigris ..... 8. *T. margarethæ.*
        b'''. Pileo concolori: tectricibus caudalibus omnino albis.
          a''''. Dorso cyaneo maculato ..... 9. *T. nais.*
          b''''. Dorso concolori..... 10. *T. galatea.*
      c''. Genis, regione parotica et collo postico viridi-cyaneis ..... 11. *T. riedeli.*

7. Third List of Birds collected at Conchitas, Argentine Republic, by Mr. William H. Hudson. By P. L. Sclater, M.A., Ph.D., F.R.S., and Osbert Salvin, M.A., F.L.S.

A third collection of birds formed by Mr. Hudson at Conchitas having been submitted to our examination by the authorities of the Smithsonian Institution, we beg leave to communicate the following notes on it.

The collection contains about 260 specimens, referable to ninety-two species. Those not included in the two former lists (P. Z. S. 1868, p. 137, and 1869, p. 158), or which require further remarks, are the following:—

1. Parula pitiayumi (Vieill.).

Sylvia pitiayumi, Vieill. N. D. xi. p. 276, et E. M. p. 479, ex Azara, no. 109.

Sylvicola venusta, Burm. La Plata-Reise, ii. p. 473.

Three examples obtained in September 1868, and marked "Summer visitor, very rare."

2. STEPHANOPHORUS LEUCOCEPHALUS (Vieill.); Scl. et Salv. P. Z. S. 1869, p. 161.

Several skins of this Tanager.

3. SPERMOPHILA ORNATA (Licht.); Burm. Syst. Ueb. iii. p. 243, et La Plata-Reise, ii. p. 488.

Several skins, all males, of this Finch.

4. GUBERNATRIX CRISTATELLA (Vieill.); Burm. *l. c.* p. 482.

One skin of this species.

5. DONACOSPIZA ALBIFRONS (Vieill.); Scl. et Salv. P. Z. S. 1869, p. 161.

Three examples of this bird.

6. SYCALIS CHLOROPSIS, Bp.; Scl. et Salv. P. Z. S. 1869, p. 161.

Two skins of this species.

7. XANTHOSOMUS FLAVUS (Vieill.); Sclater, Cat. A. B. p. 137.

Tordo cabeza amarilla, Azara, Apunt. i. p. 299.

Ten skins of this bird, which is not included by Burmeister in his La Plata list.

8. AMBLYRHAMPHUS HOLOSERICEUS (Scop.); Scl. et Salv. P. Z. S. 1869, p. 161.

Many examples of this species.

9. LEPTASTHENURA ÆGITHALOIDES (Kittl.).

Synallaxis ægithaloides, Burm. Syst. Ueb. ii. p. 469.

Two examples of this species, which was accidentally termed *Synallaxis albescens* in our first list (P. Z. S. 1868, p. 140).

10. SYNALLAXIS SPIXI, Sclater, Cat. A. B. p. 151.

Three examples of this *Synallaxis*, which does not appear to be included in Burmeister's list, unless it be his *S. ruficapilla*, *l. c.* p. 468.

11. SYNALLAXIS SULPHURIFERA, Burm. P. Z. S. 1868, p. 636.

Two immature birds, apparently of this new species, recently described by Dr. Burmeister.

12. SYNALLAXIS, sp.?

One skin, in bad condition, of a species belonging to the group containing *S. humicola* (Kittl.), *S. orbignyii*, Reich., and *S. arequipæ*, nobis, P. Z. S. 1869, p. 417. It is marked "very rare." It is perhaps *S. humicola* of Burmeister, *l. c.* p. 468, but is decidedly distinct from the Chilian bird of that name.

13. PHLEOCRYPTES STRIATICEPS (Lafr. et D'Orb.); Burm. *l. c.* p. 469.

Five specimens of this species.

14. TÆNIOPTERA DOMINICANA (Vieill.); Burm. *l. c.* p. 460.

Four skins of this species, all in female plumage, in which stage it is the *Tænioptera albogrisea* of Sclater's Catalogue (*Tyrannus albogriseus* of Lesson). Herr. v. Pelzeln has described the female dress (Orn. Bras. p. 97); and in Sclater's collection is one of Natterer's marked specimens, which agrees with the present birds. The male is well figured by Gould as *Fluvicola azaræ* (Zool. Voy. Beagle, iii. pl. x.).

15. FLUVICOLA ALBIVENTRIS (Spix); Sclater, Cat. A. B. p. 200.

Suiriri dominico, Azara, Apunt. ii. p. 100.

A single skin of this species is marked "Summer bird, very rare in Buenos Ayres." Burmeister does not mention it.

16. EMPIDAGRA SUIRIRI (Vieill.); Cab. et Hein. Mus. Hein. ii. p. 59.

Tænioptera suiriri, Burm. *l. c.* p. 464.
Elainea albescens, Burm. P. Z. S. 1868, p. 634.

Three examples of this rather peculiar form, the synonyms of which are given by Cabanis and Heine (*l. s. c.*) at full length.

17. COCCYZUS MELANOCORYPHUS (Vieill.); Sclater, Cat. A. B. p. 323; Cab. et Hein. Mus. Hein. iv. p. 77.

C. seniculus, Burm. *l. c.* p. 444 (*partim*).

Many examples of this widely distributed species.

18. COCCYZUS CINEREUS (Vieill.); Cab. et Hein. Mus. Hein. iv. p. 77; Sclater, P. Z. S. 1864, p. 120; Burm. P. Z. S. 1868, p. 634.

Many examples of this Cuckoo, which, as Burmeister remarks, differs from the typical *Coccyzi* in having a nearly square tail. *Coccyzus pumilus*, Strickland, from Trinidad, Venezuela, and New Granada, is of the same form.

19. LEPTOPTILA CHALCAUCHENIA, Salvadori, MS.

Paloma parda tapadas rozas, Azara, Apunt. iii. p. 12. no. 320.
Peristera jamaicensis, Hartl. Ind. Az. p. 20.
Peristera frontalis, Burm. *l. c.* p. 497.

Several examples of this Pigeon, of which the only specimen that has previously occurred to us was received from Dr. Salvadori for examination with the above MS. name.

It is nearest to *L. brasiliensis*, but larger in size, has a shorter bill, is rather whiter on the throat, and has the back of the neck almost entirely bronzy green, with but a very slight purplish tinge.

20. Polyborus tharus (Mol.).

P. vulgaris, Burm. *l. c.* p. 434.

Three examples.

21. Urubitinga meridionalis (Lath.).

Three examples.

22. Buteo albicaudatus, Vieill., ex Azara, no. 10.

B. pterocles, Temm.

A young bird, probably referable to this species.

23. Asturina pucherani, Verr.; Scl. et Salv. Ex. Orn. p. 177, t. 86.

Four skins, none of them quite mature.

24. Otus americanus (Gm.).

Nacurutu chorreado, Azara, Apunt. i. p. 202.
O. mexicanus, Hartl. Ind. Az. p. 3.

One skin of this Owl.

25. Porphyriops melanops (Vieill.).

Two skins of this bird. In our synopsis of Rallidæ (P. Z. S. 1868, p. 461) we have admitted with doubt two species of *Porphyriops*, observing that we could not consider them established until we had had an opportunity of examining further specimens. We have now before us five examples of this bird from New Granada, Chili, and Paraguay, but cannot satisfy ourselves that there are grounds for making two species of them. The white edgings of the external secondaries vary in extent, being best shown in one of the Bogota specimens, but apparently depend more upon age and sex than upon locality. We are of opinion therefore that there is but one valid species of this genus, which must be called *P. melanops* (Vieill.).

26. Rhynchops nigra (Linn.); Burm. *l. c.* p. 520.

One skin.

27. Ardea cocoi, Linn.; Burm. *l. c.* p. 508.

One skin.

28. Ardea sibilatrix (Temm.); Pl. Col. 271.

Flauta del Sol, Azara, Apunt. iii. p. 169.

Two examples, marked "very rare, eye white." Not mentioned by Burmeister.

29. Ardetta involucris (Vieill.).

Garoa varia, Azara, Apunt. iii. p. 185.
Ardea involucris, Vieill. N. D. xiv. p. 424, et E. M. p. 1127.
Ardetta erythromelas, jr., Bp. Consp. ii. p. 135, et al. auct.

Mr. Hudson sends two examples of a Little Bittern, which is cer-

tainly the bird described by Azara and Bonaparte as above quoted. We are, however, inclined to doubt very much whether this is really the young of *A. erythromelas*, as referred by Bonaparte, Burmeister, and other authors; and prefer waiting for other examples before arriving at a definite conclusion upon this point. We are not at present able to distinguish the so-called *A. erythromelas* (adult) from *A. exilis* of North America.

30. Ibis cærulescens, Vieill.

Ibis plumbea, Temm. Pl. Col. 235; Burm. *l. c.* p. 510.

One skin of this species.

31. Dendrocygna fulva.

Anas fulva, Gm. S. N. i. p. 530; Wagl. Isis, 1831, p. 532.
Dendrocygna fulva, Baird, B. N. A. p. 771, t. 63.
Anas virgata, Max. Beitr. iv. p. 918; Burm. Syst. Ueb. iii. p. 435, et La Plata-Reise, ii. p. 514.
Dendrocygna fulva et *D. virgata*, Sclater, P. Z. S. 1864, p. 301, et 1866, p. 149.

A good skin of this species, which we have compared with a Mexican specimen, and find to be undistinguishable.

32. Querquedula brasiliensis (Gm.).

Anas brasiliensis, Gm. S. N. i. p. 517; Max. Beitr. iv. p. 936; Burm. La Plata-Reise, ii. p. 517.

Two skins. "*Pato portuguese*, found in pairs."

33. Querquedula torquata.

Pato collar negro, Azara, Apunt. iii. p. 452.
Anas torquata, Vieill. N. D. v. p. 110, et E. M. p. 355 (♂).
Querquedula torquata, Gray, Gen. iii. p. 616, et List of Gall. (1843) p. 139; Hartl. Ind. Az. p. 28 (♂).
Pato ceja blanca, Azara, *l. c.* p. 453 (♀).
Anas leucophrys, Vieill. N.D. v. p. 156, et E. M. p. 355; Hartl. Ind. Az. p. 28; Gray, Gen. iii. p. 616 (♀).

Two males and one female of this fine duck, of which we have only previously seen the pair in the British Museum. Azara's *Pato ceja blanca*, which has puzzled Hartlaub and others, is certainly the female. This sex differs from the male in the absence of the dark chestnut on the scapularies, which are of a dull brown, in the brown head and nape, in the absence of the black collar, and in the pure white throat and irregular superciliary stripe. The breast is mottled with brown, instead of being of a salmon-colour with distinct round black spots. The flanks are white, with brown mottling, instead of being white minutely freckled with grey.

34. Mareca chiloensis (King).

Anas chiloensis, Burm. La Plata-Reise, ii. p. 517.

Two examples of this species.

Mr. Hudson's first collection contained examples of 96 species, his second of 14 additional species, and the present of 33 species not included in the two former, making altogether 143 species obtained by Mr. Hudson in the neighbourhood of Conchitas.

8. On Two new Species of *Synallaxinæ*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

(Plate XLIX.)

1. Synallaxis curtata, sp. nov. (Pl. XLIX. fig. 1.)

Fusca, subtus dilutior, alis intus nigricantibus: pileo, tectricum alarium et remigum marginibus cum cauda tota læte rufis: subalaribus et remigum marginibus internis pallide fulvo-rufis: rostro pallide corneo, mandibula ad basin carnea: pedibus fuscis: caudæ rectricibus duodecim valde graduatis: long. tota 5·0, *alæ* 2·5, *caudæ rectr. med.* 2·3, *ext.* 1·2, *tarsi* 0·7, *rostri a rictu* ·75.

Hab. in Nova Granada int.

This *Synallaxis*, of which I possess two "Bogota" skins, resembles in coloration the true *S. ruficapilla*, but is of the same olive-brown below as above, and has 12 (not 10) rectrices in its tail. It is also not unlike *S. erythrops*, but has the red colour entirely confined to the crown of the head.

2. Leptasthenura andicola, sp. nov. (Plate XLIX. fig. 2.)

Supra murino-fusca, pileo nigro rufo striato: dorso toto albo flammulato: loris et superciliis cum mento albis: subtus dilutior flammulis albis frequenter variegata, hypochondriis et ventre inferiore cum tectricibus subalaribus ochraceo lavatis: alis caudaque fusco-nigricantibus, secundariis intus ad basin macula magna pallide rufa ornatis, et rectricibus quatuor externis in pogonio exteriore limbo albicante præditis: rostro et pedibus nigris: long. tota 6·6, *alæ* 2·9, *caudæ rectr. ext.* 1·3, *med.* 3·4, *rostri a rictu* 5·55.

Hab. in Andibus reipubl. Æquatorialis (*Fraser*).

A specimen of this bird was collected by Fraser, at Panza on the southern slope of Chimborazo in Ecuador, in January 1859, but was confounded by me with *Synallaxis flammulata** (Jardine, Contr. Orn. 1850, p. 82, t. 56), to which it presents a very considerable general resemblance, and has remained in my collection unnoticed ever since. It belongs, however, essentially to a different group from *S. flammulata*, its nearest real allies being *S. ægithaloides* and *S. fuliginiceps*, which are peculiar for their small, short, straight beaks, slender tarsi, and sharp-pointed tail of twelve rectrices—the number of rectrices in typical *Synallaxis* being ten. *S. flammulata* on the other hand

* I have recently discovered that my *S. multostriata*, P. Z. S. 1857, p. 273 (ex Bogota), = *S. flammulata*, ex rep. Æquator.

has large and strong tarsi and a rather elongated bill, and appears to belong to a group which embraces *S. anthoides*, *S. humicola*, *S. orbignii*, and their allies. These birds have also twelve rectrices in their tail. For the former group the name *Leptasthenura* (proposed by Reichenbach for *S. ægithaloides*) may be used; the latter section does not seem to have yet had any generic name applied to it, unless it be possible to employ for it *Asthenes* of Reichenbach.

Besides the skin in my collection, I have only seen one other example of this species, which was received by Mr. Gould from Loxa in Ecuador along with other birds, and is now in the collection of Salvin and Godman.

9. Note on the Habits of *Myrmecocichla formicivora*, as observed near Windvogelberg, S. Africa. By G. E. Bulger, F.L.S., F.R.G.S., C.M.Z.S., &c.

The "Mocking-bird," so called (*Myrmecocichla formicivora*, Vieill.), is common about Windvogelberg*; but I do not remember having seen it elsewhere at the Cape. Its plumage is of a very unpretending description, being much the colour of dark smoke, excepting a white patch on the wings, which shows very distinctly when it flies. On the 31st August, 1863, I saw several of them hopping about and chirping amongst the grass. One, mounted on the summit of an ant-heap, delighted me with a very sweet, though rather feeble, song, which I then heard for the first time. He jerked his tail violently up and down during the performance. Subsequently, on the 6th September, I heard my friend the "Mocking-bird" singing loudly a long continuous song, of which the principal part resembled the words "Peter-wee-wee-Peter." I had had no idea that his lungs were so powerful, his usual note being rather weak and inaudible, excepting at a short distance. I had been told by a brother officer that these birds formed their domiciles in holes in the large ant-heaps of the country; and on the 5th November a nest, containing the female and four young ones, was brought to me by one of the men of the detachment, who found it in a hole in the ground—a small hole, he said, into which he could scarcely get his hand, inside another larger one, one of the many kinds of burrow so common on the Cape flats. The nest was shallow, cup-shaped, and loosely made of grass. We put the whole concern into a large cage, and left it for a time—within sight, however, of where we were sitting. The old bird did not appear to be much frightened, though she sat perfectly still upon one of the perches of the cage, seemingly in great astonishment. Thinking that, perhaps, she *might* come back and feed her young, if I let her go, I opened the cage-door, and presently she hopped out on to the wall close by, and began to chirrup; she then flew away, and we saw no more of her. We

* See, for list of other birds observed here, P. Z. S. 1866, p. 21.

were obliged to kill the young ones, as they would not eat. Whilst in the cage, the old bird whistled, every now and then, its clear, peculiar call-note.

I have often seen these birds poised in the air, almost stationary, with their wings quivering rapidly, after the manner of some Kingfishers, for perhaps a minute or two at a time, after which they would shoot down suddenly to the earth, and bear off in triumph the victim of these operations, which, I imagine, must have been some insect. A friend of mine saw one of them engaged in devouring a large beetle; so that the story of their living exclusively on ants cannot be true. They are, apparently, inquisitive birds; for whenever I approached one of them, he stretched out his neck, and, figuratively speaking, stood on his "tip-toes" to have a better look at me. I found them exceedingly tenacious of life, requiring a deal of killing for so small a bird. The origin of the soubriquet "Mocking-bird," which, I believe, is shared by some others of the Saxicolinæ, I have been unable to discover. I have never heard any mimicry in its notes, though it will readily answer if whistled to.

10. On the Species of *Hyrax* inhabiting Abyssinia and the Neighbouring Countries. By WILLIAM T. BLANFORD, C.M.Z.S.

During the last two years Dr. Gray has described, from specimens in the British Museum, four new species of *Hyrax* from Abyssinia. Two of these, *H. brucei* and *H. alpini*, were described in 1867, before the Abyssinian expedition (Ann. & Mag. Nat. Hist. ser. 4. vol. i. pp. 44, 45); and two other species, one belonging to each of the proposed genera *Euhyrax* and *Dendrohyrax*, were also shown to have been brought from southern Abyssinia.

My attention was thus drawn to the subject of the Abyssinian *Hyraces* just when starting for the expedition. During the time spent in Abyssinia, I had many opportunities of collecting and observing these animals; and the first few specimens obtained exhibited such an unusual amount of variation, that I endeavoured to procure as large a series as I could. I collected altogether twenty-eight specimens from various localities, about twenty of which are now in the British Museum; and these enable me, I think, to throw some light upon the specific characters. Since returning from Abyssinia I have had opportunities of examining both Dr. Gray's types in the British Museum and the specimens now in the Berlin Museum described by Hemprich and Ehrenberg in the 'Symbolæ Physicæ.' Meantime Dr. Gray had described as new *H. ferrugineus* and *H. irrorata*, with a variety named *luteogaster* considered to be probably also distinct, from specimens brought from Abyssinia by my friend Mr. Jesse.

Of the specimens obtained by me, one was shot on the shores of Annesley Bay; three in the passes leading to the highlands, at heights of 2000 to 4000 feet above the sea; two at Senafé, 8000 feet; a series

of seventeen of all ages at Adigrat, also at about 8000 feet (these were procured by a collector whom I left with especial instructions to shoot and preserve as many as he could); one at Agula, 7000 feet; one near Antalo, 7000 feet; two on the Wadela plateau, at above 1000 feet; and one in the Anseba valley near Bogos, at about 4000 feet above the sea.

The specimen shot at Annesley Bay differs from all the others in its short rather harsh fur and apparently small size. It is immature, but seems smaller than specimens of similar age from the highlands; and other individuals seen about the same burrow were equally small. Except in size, this specimen agrees very fairly with the type of *Hyrax abyssinicus** of Hemprich and Ehrenberg; for it has a rudimentary black dorsal spot, a character which appears usually more developed in adult or aged specimens than in the young. It, however, has not the smallest resemblance to the skins from Shoa in the British Museum identified by Dr. Gray with that species, but which certainly belong to a different species, much larger in size, and with very long soft hair instead of the short harsh fur of *H. abyssinicus*.

Whether my specimen be correctly referred to *H. abyssinicus* of Hemprich and Ehrenberg or not, there can be but little doubt that this species is a well-marked form inhabiting the shores of the Red Sea, and that Dr. Gray is right in separating from it the common *Hyrax* of the Abyssinian highlands with a yellow dorsal spot.

It is on the species inhabiting the highlands that my specimens throw most light. The characters mainly relied upon for the discrimination of the species of *Hyrax* are the colour of the dorsal spot, the colour and texture of the fur, and the form of the skull. In all these characters there is so much variation that I am not in the least surprised that Dr. Gray should have considered that there were several species indicated by the few skins to which he had access. I cannot, however, quite coincide in this opinion. For some time I thought that I could distinguish two species amongst my collections—one with a well-marked yellow dorsal spot, the other with the same rudimentary or wanting (*H. irroratus*, Gray). But further examination showed that those specimens in which the dorsal streak is entirely absent are immature, and that in the adult it is always slightly indicated; and there is a perfect transition from the merest indication to a distinct well-marked yellow spot. The colour of the fur varies in the most singular manner, the principal distinction being in the greater or less amount of rufous; but that this is simply an individual character is shown by the circumstance that on several occasions I saw one or more rufous individuals (*H. ferrugineus*, Gray) amongst the ordinary dusky grey animals belonging to the same burrow, and also by the variation in the extent and shade of rufous, some skins having

* Hemprich and Ehrenberg write *habessinicus*; but the other spelling is that adopted by the older writers, such as Gmelin. The name Abyssinia being generally adopted from mediæval if not from classical Latin, it seems unnecessary to change it, although the true name of the country is Habesh.

only the head or back thus coloured, while in others it extends more or less throughout. Even the texture of the fur is variable, some specimens being rather harsher than others. One of my skins, which appears to differ conspicuously from all the others in its excessive softness and grey tint, is only distinguishable from a specimen of *H. brucei* in the British Museum by its greyer colour and rather longer fur. Other specimens collected by me are perfectly intermediate between the types of *H. brucei* and *H. alpini*, while others completely connect the first named with the two species described by Dr. Gray from Mr. Jesse's collections. I am therefore obliged to conclude that these species are founded on characters which, however apparently marked, are in reality only individual and not specific.

The only skins which I am inclined to consider possibly distinct from *H. brucei* are one from Adigrat and two from Wadela. These may possibly be varieties of the same species, as all have a rudimentary black dorsal spot. The first specimen is of a very dark brown colour much mottled with black, all the under-fur near the skin being blackish; the hairs are yellowish brown near the end and tipped with black. The skull is crushed and I have not extracted it.

In the two specimens from above 10,000 feet elevation the fur is also dark, long, and moderately fine, with much less mottling than usual. The soles of the feet, of the hinder ones especially, appear very short. The nasal bones of the skull appear shorter. This of course is a character varying with age; but the comparison is made between skulls of similar development. The zygomatic arch is broader and the series of molar teeth in the upper jaw is very much curved in the Wadela specimens; and in one of them, in which all the hinder molars are well grown, although not worn, the foremost premolar is wanting on each side of both jaws. This tooth is frequently wanting here and there in skulls of *H. brucei* and is usually deficient in the lower jaw of aged specimens; but amongst eight adult skulls which I examined, I could find no instance of its absence throughout both jaws.

I do not think these skins belong to the same species as the specimens from Shoa already mentioned (*Euhyrax abyssinicus*, Gray); they appear to me to belong to a much smaller animal, and the colour and texture of the fur are dissimilar. I think they probably belong to an undescribed form. I shall not, however, attempt to name it on the evidence of only two skins.

With regard to the Abyssinian *Dendrohyrax* I can say nothing. Dr. Gray only indicates its existence from a portion of an Abyssinian skull figured by v. Jaeger. I have already shown that *Euhyrax abyssinicus*, Gray, is not *Hyrax abyssinicus* of Hemprich and Ehrenberg. Dr. Gray states that the skin of *E. abyssinicus* is not distinguishable from that of *Hyrax capensis*, but that the skull differs in the length of the diastema or space between the upper cutting-teeth and the first premolar of the upper jaw, which is very much greater

in *Euhyrax*, being more than the length of the outer sides of the first three premolars, whilst in *Hyrax* it is less*.

It is only with the greatest diffidence that I venture to offer an opinion on a subject with which I have so very small an acquaintance as osteology; but I cannot help thinking that if the difference in question be really of generic importance, it is remarkable that there are no external characters in addition; and, so far as my own specimens enable me to judge, the length of the diastema in *Hyraces* is a very variable character. That it differs enormously with age is a matter of course, but I am now speaking of adult skulls. In two from Adigrat, the lengths are as follows in decimals of an inch: —

	I.	II.
Length of diastema	0·35	0·45
Length of first three premolars.....	0·48	0·48

In these two, both aged specimens, the development of the teeth is precisely similar. The skins only differ in one being more ferruginous than the other, a character certainly of no importance. Other skulls show intermediate proportions in the length of parts of the jaw.

I am inclined to conclude that the differences pointed out by Dr. Gray may be of specific value, but that, where so much variation exists within the limits of a single species, it can scarcely take generic rank. But, as I have already stated, my knowledge of osteology is insufficient to enable me to judge fully on this subject; and as I may be falling into the not uncommon error of underestimating the importance of characters to which I have not given much study, I can only leave the matter in the hands of those better acquainted with them. Meantime, if the Shoa animal be really distinguishable from *H. capensis*, it will require a name.

The only remaining observation I can add is, that, by examination of the specimens in both cases, I have ascertained that the species described by Dr. Gray as *Hyrax burtoni* is identical with the type in the Berlin Museum of Hemprich and Ehrenberg's *H. ruficeps* vel *dongolanus*. As the former name is objectionable, the rufous head being apparently an individual peculiarity, I would suggest that the latter be retained.

The following, therefore, appears to me to be the synonymy of the *Hyraces* hitherto described as inhabiting North-eastern Africa. The species indicated above may have to be added, and also, if Dr. Gray's suggestion be correct, *H.* (*Dendrohyrax*) *dorsalis* or an allied form. But the last identification is only based as yet on a figure of part of a skull.

* In Cat. Carn., Pachyd., and Edent. Mamm. in Brit. Mus. 1869, p. 289, Dr. Gray says, "in the *H. brucei* it (the diastema) is as long as the length of the outer sides of the first three premolars and the half of the fourth one; in *H. capensis* it is only as long as the outer sides of the first two premolars and one-third of the third one." From the context it is evident that *H. brucei* is a misprint for *Euhyrax abyssinicus*. I have not access at present to the 'Annals' in which the description originally appeared.

I. *Dorsal streak black.*

a. *Fur harsh, mottled; size moderate.*

1. HYRAX ABYSSINICUS.

H. habessinicus, Hemp. & Ehr. Symb. Phys. pl. 2. f. 2 (the smaller specimen only).

Hab. Shores of Red Sea near Massowa and Annesley Bay.

b. *Fur soft, long; size large.*

2. H. CAPENSIS?

Euhyrax abyssinicus, Gray, Ann. & Mag. Nat. Hist. ser. 4. vol. i. p. 47.

Hab. Shoa, Southern Abyssinia.

II. *Dorsal streak yellow.*

a. *Fur soft, variable in colour, but usually dark brownish grey or brown, and mottled.*

3. H. BRUCEI.

*Ashkoko** of Bruce, Travels, vol. v. p. 139.

Gike of Salt.

Hyrax brucei and *H. alpini*, Gray, Ann. & Mag. Nat. Hist. for 1868, ser. 4. vol. i. pp. 44, 45; Cat. Carn. Mamm. in Brit. Mus. 1869, p. 287.

H. ferrugineus, *H. irroratus*, and *H. irroratus* var. *luteogaster*, Gray, Ann. & Mag. Nat. Hist. 1869, ser. 4. vol. iii. p. 242; Cat. Carn. Mamm. Brit. Mus. 1869, p. 288.

H. abyssinicus, auct. nec Hempr. et Ehr.

Hab. Highlands of Tigré in northern Abyssinia, above 2000 feet.

b. *Fur harsh, yellowish brown; size moderate.*

4. H. DONGOLANUS.

H. ruficeps vel *dongolanus*, Hempr. & Ehr. Symb. Phys. Mamm. t. 2. fig. 1.

H. burtoni, Gray, Ann. & Mag. Nat. Hist. 1868, ser. 4. vol. i. p. 43; Cat. Carn. Mamm. in Brit. Mus. 1869, p. 285.

Hab. Dongola (*H. & E.*); Egypt (*Burton*).

H. syriacus, Schreb. (*H. sinaiticus*, H. & E. and Gray), approaches *H. dongolanus* in colour, being dull isabelline with a large pale dorsal spot, but the fur is soft. It inhabits Palestine, Syria, and Northern Arabia. No species of *Hyrax* appears to have been as yet procured from Southern Arabia.

* *Ashkoko* is Amharic, *Gike* Tigrai or Geez; the former the language of South Abyssinia, Amhara and Shoa, the latter of Northern Abyssinia or Tigré.

11. Description of *Emys flavipes*.

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

(Plate L.)

The Zoological Society have lately received, as a present from the Rev. Basil Wilberforce, a series of four specimens of a freshwater Tortoise, which have been for several years in his possession. They belong to a most distinct species, and one which has never before come under my observation and is easily known by its beautiful lined head and neck, the presence of a spot behind the eye, and a distinct ring round the tympanum, the bright orange-colour on the underside of the fore legs, and the narrow orange streak on the suture between the end of the abdominal and the marginal plates, and the blackness of the underside of the margin and the sternum. I propose to call it

EMYS FLAVIPES. (Plate L.)

The crown olive, sides of the face greenish, with a narrow streak from the nostril through the eye extending on the side of the back of the neck. Another streak from the lower side of the eyes to the angle of the mouth, a short streak from the sides of the beak. The under beak with a forked streak on each side, a broader transverse band behind it; one long oval spot on the hinder part of the side of the jaw. A line on each side of the temple, an oval spot behind each eye, and a ring round the ear, extending behind into a longitudinal streak. Pupil round, with a square spot on each side, forming a band obliquely across the eye; neck olive with obscure reddish spots; sides of the neck and throat with orange streaks. Legs black, varied with orange; the lower side of the fore legs orange; the tail tapering, with orange lines. Thorax oblong, bluntly keeled; the keel narrower and more prominent behind. Above pale olive-brown, slightly waved with reddish on the middle of the shield, more marked where it makes a distinct square spot in the middle of the first vertebral shield; the lateral margin slightly revolute and the hinder edge entire; the underside of the marginal shields and the sternum black, with more or less white on the lateral margin of the latter; the suture between the abdominal and the marginal plates marked by a distinct narrow orange streak.

The different specimens vary in the quantity of white on the sternum; in one the sternum is nearly white, clouded with black.

In the British Museum there is a specimen of a young Terrapin brought by Mr. Fraser from North Africa, which is very similar to the above, and has the same black underside of the margin; but its neck has many much narrower streaks, and there is no spot behind the eye or rings round the ear. This specimen appears to indicate the existence of another species, which may be called *Emys fraseri*.

In the same collection there is a young specimen of Terrapin in spirit that was brought home in the Euphrates expedition, which is somewhat like the above, but there are indications of dark rings on the dorsal plates. The sternum is black, edged with white; the whole of

the sternum, costal process, and the underside of the marginal shield is white, there being two small round black spots on the underside of each of the five front marginal shields. The head and neck are beautifully marked with very regular pale streaks, but there is no spot behind the eye, and no ring round the margin of the ear. This indicates the existence of a very distinct species; and Dr. Günther thinks that it is the young state of the *Emys grayii*, which he has lately described (see *anteà*, p. 504) from the adult shell, without the animal.

The *Mauremys fuliginosa* (*anteà*, p. 500) has the markings on the head and neck somewhat similar to those of *Emys flavipes*, but sufficiently distinct to define this species, which is also at once known by the depressed and nearly uniform black shields of the shell.

12. On the Classification of the *Helicterinæ*.

By Harper Pease, C.M.Z.S.

From a history of the genus *Helicter* which I published in this Society's 'Proceedings' (1862, p. 3) it appears that it was first named and described by Férussac in 1821*, and that this term consequently takes precedence of *Achatinella* (Swains.), 1828†.

I now propose to elevate it to the rank of a subfamily, and to distinguish the several groups of species which it comprises by generic names. They are as distinct, as strictly definable, and vary even more widely than those of any other subfamily of land shells. From the difference in their habits and stations, we may also expect to find the animals to vary correspondingly when examined.

Had the several species been received in Europe at different times without their locality being known, they would have been distributed over five or six old established genera. They are, in fact, a natural subfamily, confined to the Hawaiian Islands, representing within themselves, by the forms of their shells, several genera inhabiting distant localities, in a similar manner to several other genera inhabiting Polynesia, such as *Pitys*, species of which have been classed by authors with the European genus *Patula*, although the animals of the two are widely distinct. I will not notice at present the several attempts made of late years to dismember the *Helicterinæ* and unite several species to foreign genera, such as *Balea* and others, as I am convinced that the "Testaceous classification" adopted by those authors will be abandoned so soon as the result of the researches of persons now permanently located at many localities in the tropics and elsewhere, formerly but rarely visited and hastily explored, are made known.

As to the distribution of genera and species over the several islands of the group, I remark generally that, with the exception of the genus *Leptachatina* (the species of which are small and of simple

* Tableau Syst. des An. Mollusques, 1821, p. 56; Voy. par M. de Freycinet, 1824, p. 475.

† Quarterly Journal of the Royal Institution, 1828, p. 81.

character), no species is common to any two of the islands, and but few analogous; most of the genera are not only confined to one island, but to a certain district on that island. The localities recorded are in many cases incorrect, especially of those species furnished to the late H. Cuming by Dr. Frick.

Ten subgenera of *Helicterinæ* have been proposed by authors, all of which, with slight modifications, I retain as genera, adding three.

388 species have been described, 166 of which I class as synonyms or varieties; 222 consequently remain distinct. The following Table furnishes the area of each island in square miles, and the number of species and genera described from each*:—

	Kauai.	Oahu.	Molokai.	Maui.	Lanai.	Hawaii.
Area . .	630	610	220	650	150	3800
Species .	21	128	24	31	12	6
Genera .	2	9	7	8	6	3

I introduce only such synonyms as have not been recorded heretofore. They are explained below.

Family Helicidæ.

Subfamily Helicterinæ.

Testa imperforata vel subperforata; sinistrorsa vel dextrorsa; columella plica torta munita, rarius Bulimi- *vel* Achatiniformi; *labro intus plus minusve incrassato, rarius tenui; sæpe magis minusve expanso.*

Animal ovoviviparum.

Genus 1. Helicter (Fér.).

T. crassa, solida, polita, globoso-conica; apice acuto; plica columellari valida; labro incrassato.

Helicter aptycha (Pfr.).
—— *bicolor* (Gul.).
—— *cestus* (Newc.).
—— *decora* (Fér.).
—— *lugubris* (Chem.).
—— *lorata* (Fér.).
—— *mustelina* (Migh.).
—— *morbida* (Pfr.).
Helicter multilineata (Newc.).
—— *ovum* (Pfr.).
—— *pulchella* (Pfr.).
—— *perversa* (Swains.) = "*cinerosa*" (Pfr.).
—— *swifti* (Newc.).
—— *turgida* (Newc.).
—— *vittata* (Rve.).

I retain the generic name given by Férussac to the whole subfamily

* The small islands of Kahului, 40 square miles, and Niihau, 10 square miles, have not been examined. They have a scanty growth of low bushes over a portion of their surface, where one or two species of *Leptachatina* may possibly be found. [For a recent Map of the Sandwich Islands, see Journ. R. Geograph. Soc. 1868, p. 361.—P. L. S.]

for the group of species represented by *H. lugubris* (Chem.), which was the first species described.

The species of this genus are thick, solid, polished, globose conic, with the apex acute. They are quite distinct from *Bulimella*, with which they have heretofore been associated.

Genus 2. Achatinellastrum (Pfr.).

Achatinellastrum, Pfr. Mal. Blätt. 1854, p. 133; Mon. Hel. Viv. 1859, vol. iv. p. 531.

T. turrita aut elongato-conica, solida, epidermide nitida; plica columellari valida, torta, dentiformi; perist. recto; labro vix incrassato.

Achatinellastrum bilineatum (Rve.).
—— *buddi* (Newc.).
—— *castaneum* (Rve.) = "*adustum*" (Rve.).
—— *cucumis* (Gul.).
—— *fulgens* (Newc.).
—— *formosum* (Gul.).
—— *grayanum* (Pfr.).
Achatinellastrum johnsoni (Newc.).
—— *liliaceum* (Pfr.).
—— *olivaceum* (Rve.).
—— *productum* (Rve.).
—— *pulcherrimum* (Swains.).
—— *trilineatum* (Gul.).
—— *vulpinum* (Fér.).
—— *versipilis* (Gul.).

Sec. 2.

—— *dubium* (Newc.).
—— *radiatum* (Gld.).

I restrict the above genus to the species allied to *A. productum* (Rve.). They are confined in their habitat to the easterly end of the island of Oahu.

Sec. 2 includes two aberrant forms, which agree with each other in their general characters, but differ from the type in being of thinner texture, not so elongate. *A. dubium* is without any columellar fold, and *A. radiatum* has it but slightly developed.

Genus 3. Bulimella (Pfr.).

Bulimella, Pfr. Mal. Blätt. 1854, p. 119; Mon. Hel. Viv. vol. iv. 1859, p. 518.

T. imperforata, bulimiformis, polita, solida, ovato-conica, apice obtuso; plica columellari valida; labro intus incrassato.

Bulimella bulimoides (Swains.).
—— *elegans* (Newc.).
—— *faba* (Pfr.).
—— *glabra* (Newc.).
—— *hanleyana* (Pfr.).
—— *ovata* (Newc.).
Bulimella rosea (Swains.).
—— *rutila* (Newc.).
—— *sowerbyana* (Pfr.).
—— *swainsoni* (Pfr.).
—— *tæniolata* (Pfr.).

Sec. 2.

—— *byronii* (Gray).
—— *decipiens* (Newc.).
—— *rugosa* (Newc.).
—— *subvirens* (Newc.).
—— *viridans* (Migh.).

Sec. 3.

Bulimella abbreviata (Rve.) = *"bacca"* (Rve.).
—— *colorata* (Rve.).
—— *germana* (Newc.).
Bulimella sordida (Newc.).
—— *solitaria* (Newc.).
—— *multicolor* (Pfr.).

This genus is restricted to the species with obtuse apex, represented by *B. rosea* (Swains.). They inhabit the westerly end of the island of Oahu. A short distance from their habitat several species are found, which we class under Sec. 2, not so robust in shape, with apex less obtuse, and surface rough. Sec. 3 comprises a few species still further removed from the type, being smooth, and the apex subacute. They might also with propriety be classed under the genus *Achatinellastrum*.

Genus 4. EBURNELLA (Pse.).

T. solida, polita, lævis, oblongo-ovata, plica columellari valida, torta; labro vix incrassato; apice obtusiusculo, aut acuto.

Eburnella casta (Newc.).
—— *curta* (Newc.).
—— *livida* (Swains.).
—— *porcellana* (Newc.).
Eburnella recta (Newc.).
—— *saccata* (Pfr.).
—— *undulata* (Newc.).

Sec. 2.

—— *semicarinata* (Newc.).
—— *variabilis* (Newc.).

This genus is established for a group of small, solid, polished species, resembling in their texture those of *Helicter*. They are of an elongate ovate form, the apex somewhat obtuse, and the columellar fold prominent and twisted; lip but slightly thickened within, its edge thin. They inhabit the westerly end of the island of Oahu.

I add two species from the island of Lanai, which are more nearly allied to this genus than any other.

Genus 5. PARTULINA (Pfr.).

Partulina, Pfr. Mon. Hel. Viv. vol. iv. 1859, p. 516.

Partulina compta (Rve.).
—— *dwighti* (Newc.).
—— *gouldi* (Newc.).
—— *marmorata* (Gld.).
—— *proxima* (Pse.).
Partulina rufa (Newc.).
—— *splendida* (Newc.).
—— *tappaniana* (C. B. Ad.).
—— *tessellata* (Newc.).
—— *virgulata* (Migh.).

Sec. 2.

—— *crassa* (Newc.)
—— *dolium* (Pfr.).
—— *grisea* (Newc.).

The above genus is confined to the islands of Maui and Molokai.

Of Sec. 2 the most aberrant form is *Partulina crassa*, which inhabits the island of Lanai.

Genus 6. Laminella (Pfr.).

Laminella, Pfr. Mal. Blätt. 1854, p. 126; Mon. Hel. Viv. 1859, vol. iv. p. 546.

T. elongato-ovata vel turrita; plica columellari lamellæformi, torta, compressa; perist. simplici, recto; labro tenui aut subincrassato.

Laminella gravida (Fér.).
—— *picta* (Migh.).
—— *straminea* (Rve.).
Laminella magna (C. B. Ad.) = "*baldwini*" (Newc.).
—— *violacea* (Newc.) = "*gigantea*" (Newc.).

Sec. 2.

—— *bella* (Rve.) = "*polita*" (Newc.).
—— *concavospira* (Pfr.).
—— *concinna* (Newc.).
—— *erecta* (Pse.).
—— *fusoidea* (Newc.).
—— *mighelsiana* (Pfr.).
—— *remyi* (Newc.).
—— *sanguinea* (Newc.).
—— *terebra* (Newc.).
—— *tetrao* (Newc.).
—— *venusta* (Migh.) = "*citrina*" (Pfr.).
—— *zebra* (Newc.).

Sec. 3.

Laminella physa (Newc.).

The typical species of this genus are peculiar in having their outer lip thin. We place provisionally under Sec. 2 a number of species which agree with the type in the character of the outer lip. They are of smaller size and generally more elongate in shape.

I also add a peculiar species, inhabiting Hawaii, which has no distinct allies.

Genus 7. Frickella (Pfr.).

Frickella, Mal. Blätt. 1855, p. 2; Mon. Hel. Viv. 1859, vol. iv. p. 569.

Frickella amœna (Pfr.).

Genus 8. Perdicella (Pse.).

T. dextrorsa vel sinistrorsa, bulimiformi, turrita vel elongato-conica, imperforata, tenuiter striata; plica columellari vix conspicua vel nulla; perist. simplici; labro tenui.

Perdicella alexandri (Newc.).
—— *helena* (Newc.).
—— *minuscula* (Pfr.).
—— *manoensis* (Newc.).
Perdicella sandwichensis (Pfr.).
—— *ornata* (Newc.).
—— *zebrina* (Pfr.).

A group of prettily painted little shells, strictly bulimiform in all their characters.

Genus 9. NEWCOMBIA (Pfr.).

T. sinistrorsa, subimperforata, elongata, costata, plicata, aut sulcata; plica columellari nulla; perist. simplici, subrecto.

Newcombia cumingi (Newc.).
—— *cinnamomea* (Pfr.).
—— *newcombiana* (Pfr.).
Newcombia plicata (Migh.).
—— *philippiana* (Pfr.).
—— *sulcata* (Pfr.).

Sec. 2.

—— *hutchinsonii* (Pse.).
—— *obscura* (Newc.) = "*mœsta*" (Newc.).

The species of this genus are easily distinguished by their slender elongate shape and simple columella.

I add, in Sec. 2, two species, similar in shape, but covered with a coarse epidermis, and furnished with a slight columellar fold; one is dextral.

Genus 10. AURICULELLA (Pfr.).

Auriculella, Pfeiff. Proc. Zool. Soc. 1855, p. 1; Mon. Hel. Viv. 1859, vol. iv. p. 569.

T. subperforata vel imperforata, oblongo-conica aut elongata; pariete aperturali lamella spiraliter intrante munito; plica columellari supera dentiformi vel obsoleta; perist. expansiusculo.

Auriculella auricula (Fér.).
—— *ambusta* (Pse.).
—— *cerea* (Pfr.).
—— *chamissoi* (Pfr.).
—— *expansa* (Pse.).
—— *lurida* (Pfr.).
Auriculella obeliscus (Pfr.).
—— *pulchra* (Pse.).
—— *petitiana* (Pfr.).
—— *pumicata* (Migh.).
—— *triplicata* (Pse.).
—— *uniplicata* (Pse.).

This genus is the most aberrant in form of the family. The species are small and distinguished by a lamina on the wall of the aperture, in addition to the usual columellar fold. The young have in some cases been mistaken for *Tornatellinæ*.

Genus 11. AMASTRA (H. & A. Ad.).

Amastra, Adams, Gen. Mollusca, 1858, vol. ii. p. 137.

T. plerumque dextrorsa, epidermide munita; plica columellari valida, sublamellæformi; perist. intus incrassato, interdum subperforato.

Amastra anthonii (Newc.).
—— *farcimen* (Pfr.).
—— *inflata* (Pfr.).
—— *irregularis* (Pfr.).
—— *nigra* (Newc.).
—— *nucleola* (Gld.).
—— *obesa* (Newc.).
—— *porphyrostoma* (Pse.).
—— *rugulosa* (Pse.).
Amastra reticulata (Newc.).
—— *similaris* (Pse.).
—— *solida* (Pse.).
—— *sphærica* (Pse.).
—— *tristis* (Fér.).
—— *textilis* (Fér.).
—— *ventulus* (Fér.).
—— *biplicata* (Newc.) = "*deshayesii*" (Morelet).

Sec. 2.

Amastra assimilis (Newc.).
—— *affinis* (Newc.).
—— *flavescens* (Newc.).
—— *humilis* (Newc.).
—— *lineolata* (Newc.).
—— *micans* (Pfr.).
—— *modesta* (C. B. Ad.).
Amastra mastersii (Newc.).
—— *mucronata* (Newc.).
—— *melanosis* (Newc.).
—— *nubilosa* (Migh.).
—— *pusilla* (Newc.).
—— *rubens* (Gld.).
—— *variegata* (Pfr.).

Sec. 3.

—— *petricola* (Newc.).
—— *soror* (Newc.).
—— *elongata* (Newc.).

Sec. 4.

—— *spirizona* (Fér.).
—— *turritella* (Fér.) = "*luteola*" (Fér.).
—— *porphyrea* (Newc.).
—— *intermedia* (Newc.).
—— *luctuosa* (Pfr.).
—— *cylindrica* (Pfr.).
—— *sericea* (Pfr.).

All the species of this genus are terrestrial. They are covered with an epidermis, more or less roughened and striate, occasionally smooth. Their colour is of a uniform dark brown, sometimes inclined to chestnut on the smoother species, and occasionally relieved by light yellowish bands, at the suture usually. As the genus is represented on all the islands of the group, they present more variation in shape than those of the other genera, which may lead, when more fully known, to their separation.

A. obesa (Newc.) and *A. sphærica* (Pse.) are quite distinct from the other species. I have separated, under Sec. 2, a number of lighter growth, thin epidermis, sometimes reticulated; and three species under Sec. 3, of small size, thin, and outer lip simple and acute. A group inhabiting a separate range of hills on Oahu have been associated under Sec. 4. Although the extreme shapes appear to be widely apart, they are connected by intermediate forms.

Genus 12. Leptachatina (Gld.).

Leptachatina, Gould, Proc. Bost. Soc. 1848, p. 200; Mon. Hel. Viv. 1859, vol. iv. p. 563.

T. ovato-oblonga vel turrita, tenuis, vitrea, plerumque pellucida; plica columellari debili, sæpe nulla; perist. simplici, acuto, recto.

Achatini- *vel* Bulimiformes.

Leptachatina acuminata (Gld.).
—— *accincta* (Migh.).
—— *chrysalis* (Pfr.).
—— *clausina* (Migh.).
—— *cylindrata* (Pse.).
—— *kanaiensis* (Pfr.).
Leptachatina lucida (Pse.).
—— *obsoleta* (Pfr.).
—— *sandwichensis* (Pfr.).
—— *saxatilis* (Gul.).
—— *scutilus* (Migh.).
—— *sculpta* (Pfr.).

Sec. 2.

Læves aut tenuiter striatæ.

Leptachatina antiqua (Pse.).
—— *brevicula* (Pse.).
—— *cerealis* (Gld.).
—— *cornea* (Newc.).
—— *cingula* (Migh.).
—— *compacta* (Pse.).
—— *exilis* (Gul.).
—— *extincta* (Pfr.).
—— *grana* (Newc.).
—— *guttula* (Gld.).
Leptachatina gracilis (Pfr.).
—— *lævis* (Pse.).
—— *nitida* (Newc.).
—— *obclavata* (Pfr.).
—— *obtusa* (Pfr.).
—— *pyramis* (Pfr.).
—— *resinula* (Gul.).
—— *simplex* (Pse.).
—— *teres* (Pfr.).

Costulosæ.

—— *balteata* (Pse.).
—— *costulosa* (Pse.).
—— *dimidiata* (Pfr.).
—— *extensa* (Pse.).
—— *fusca* (Newc.).
—— *fuscula* (Gul.).
—— *glutinosa* (Pfr.).
—— *margarita* (Pfr.).
—— *oryza* (Pfr.).
—— *striatula* (Gld.).
—— *semicostata* (Pfr.).
—— *tenuicostata* (Pse.).
—— *terebralis* (Gul.).
—— *tenebrosa* (Pse.).

All the species of this genus are small, thin, and those of the type without columellar fold. They are widely distributed, being found on all parts of the several islands. There are a number of species which agree with the type in their general characters, but are usually thicker, and have a columellar fold more or less developed, and more elongate in shape. They unite with species of the genus *Labiella*.

Genus 13. Labiella (Pfr.).

Labiella, Pfeiff. Mon. Blatt. 1854, p. 142; Mon. Hel. Viv. 1859, vol. iv. p. 530.

T. oblonga, solida; plica columellari torta; perist. obtuso, labiato, margine dextro incrassato.

Labiella callosa (Pfr.).
—— *labiata* (Newc.).
Labiella pachystoma (Pse.).

Sec. 2.

—— *corneola* (Pfr.).
—— *crassilabrum* (Newc.).
—— *ellipsoidea* (Gld.).
—— *alholabris* (Newc.).
—— *fumosa* (Newc.).
—— *succincta* (Newc.).
—— *subrostrata* (Pfr.).
—— *turgidula* (Pse.).
—— *vitrea* (Newc.).

This genus was founded by Dr. Pfeiffer on two species, of which the outer lip is unusually thickened.

Mature specimens of these species not more thickened than several other species closely allied to them in their other characters, are common. I have consequently added several to this genus. They approach through their varieties certain species of *Leptachatina*.

Both this and the previous genus will require revision as more specimens and species are collected.

Synonymy.

H. deshayesii (Morelet). This species appears to have been overlooked by all writers on the genus. I learn, however, from its author that it is identical with *H. biplicata* (Newc.).

H. luteola (Fér.). This is the only one of the early described species which remains unidentified. It was described by Férussac from the specimens collected at our islands by M. Quoy. It will be observed that all the species collected by him are from the island of Oahu. A variety of *H. turritella* (Fér.) agrees, as to colour and other characters, with the description of M. Deshayes especially; and we have placed it consequently as a synonym of this species.

H. mœsta (Newc.) inhabits the island of Lanai, in company with *H. obscura* (Newc.), of which it is a small variety.

H. citrina (Migh.) varies from *H. venusta*, Migh., only in being of a plain uniform yellowish colour. This species also occurs of a uniform slate- or occasionally olive-colour. Most of the specimens are ornamented with black reticulated lines, more usually confined to the spire; occasionally, however, the whole shell is densely covered with black markings.

H. bacca (Rve.) is a variety of *H. abbreviata* (Rve.), of smaller size, and of uniform colour.

H. polita (Newc.) inhabits the island of Molokai, in company with *H. bella* (Rve.), from which it varies only in the disposition of its colours. This species passes through more variations of colour and shape than have been noted heretofore. It may be always distinguished by its purple-tinted columella.

13. On the Cervine Animals of the Island of Hainan (China). By Robert Swinhoe, F.Z.S.

I have brought with me from Hainan the horns and skins of three species of Deer (a *Cervulus*, a *Panolia*, and a *Rusa*), which, with Mr. Gerrard's kind assistance, I have compared with specimens in the British Museum.

1. The *Cervulus* I have identified with the *C. vaginalis* of India. But, of the seven flat skins I procured, only one has the head skin remaining. From the frontal markings on this no doubt is left as to the Hainan species being the Indian, and not *C. reevesi* of China as one would rather have expected it to be. The forehead of this specimen is rich chestnut, with two tufts of black hair, about $\frac{3}{4}$ inch in diameter each, set between the eyes but in rear of their line. Its upper parts are bright chestnut, deeper along the back, and yellower on the sides; under parts brighter-coloured, whitish on the throat and under neck. Its short tail is rich chestnut above, pure white below. In one or two of the skins the fore leg from the shoulder to the knee is strongly tinged with black.

Judging from my own skins and the specimens in the Museum, *Cervulus vaginalis* attains a much larger size (say one-third) than *C. reevesi*. It is of a darker and richer colour, and is at once distinguished by the two round black tufts on the forehead. In *C. reevesi* these tufts are replaced by black lines, with a longer black line starting between the ears and running along the back of the neck to the shoulder.

I have two pairs of horns of the *Cervulus* from Hainan. The one I take to have belonged to a two-year-old. In this the brow-antler is a tine set inwards of the front of the beam. Total length of horn $3\frac{1}{4}$ inches, cleft from base 1, brow-tine from cleft $\frac{1}{2}$. The horn bends inwards at its tip; it is mounted on a long bony pedicle $2\frac{1}{2}$ inches long. Breadth between bases of bony pedicles $2\frac{1}{8}$ inches, between horns at base $3\frac{3}{4}$, between horns at tips $4\frac{3}{4}$.

The second pair belonged to an older animal, I should say a 3–4-year-old. In this the brow-antler is set more inwards still. The horn measures $4\frac{1}{4}$ inches, its bony pedicle $1\frac{1}{8}$; breadth between the latter at bases $2\frac{1}{4}$, between horns at bases $3\frac{1}{2}$, between horns at tips $3\frac{7}{8}$; circumference of horn at base $2\frac{1}{8}$. As the animal grows older the bony pedicle shortens and thickens, and, as shown by these two cases, the horns grow more parallel.

Mr. Blyth agrees with me in my identification of the Hainan Muntjac. He writes, "Your Hainan *Cervulus* is of the species inhabiting all India, with Ceylon, Indo-China, Malacca, and Sumatra, as distinguished from that of Java."

In a native work, containing some notes on the natural productions of Hainan, no difference is recognized between this and the ordinary Chinese species, *C. reevesi*. The work alludes to it as "the *Chang*, like a small deer, but more elegant. The male is the *Keun*, the female the *Yu*. Delights in a display of colours. The hunters flourish before it rags of brilliant colours, and it stops to stare at them." The *C. vaginalis* is known to the Hainanese as the *Hwangkia*, and under that name is spoken of as distinct from the *Chang* in the above Chinese work. The note on the *Hwangkia* is as follows:—"Large as a dog, has horns, and is in form a good deal like a Deer. Its flesh, when sliced and dried, is in taste somewhat similar to that of the Deer." The cry of this species is very like the short bark-like grunt uttered by *C. reevesi*.

2. The Hainan *Panolia* agrees with the *Cervus eldi* of Burmah and Siam. I have five pairs of horns and two odd ones, and the skin of a female in summer coat, and one of a fawn. The skin of the fawn is of a rich chestnut, deeper, with black hairs intermingled, on the back. A line of indistinct yellowish spots runs along either side of the dorsal centre from the shoulders to the tail, and a few more of similar spots occur in rear of shoulder-blade and about the hip-joint. The breast-girdle is brown. Between the fore legs and hind legs is pure white, the white running down the inner centre of the hind legs to below the shank; the under part of the tail and between the buttocks are also pure white; a dark brown line passes down the front of the fore legs. The female skin answers well to the skin of the buck, in summer dress, that died in the Society's Gardens

and is now in the British Museum, except that its hair is shorter and white spots are disposed in two lines, one on either side of the dorsal ridge, from the shoulders to the tail. The skin from the Gardens has no white spots; but *Cervus dimorphe* of Hodgson, also in the Museum, and without doubt a male *Panolia*, shows a few scattered spots.

Fig. 1.

Cervus eldi.

a, *b*. Second year. *c*. Third year. *d*. Fourth year.

Two pairs of my antlers (fig. 1, *a* & *b*) are of animals of about the same age; I think, the second year. Both of these have the brow-antler, but a postlateral snag only on the left horn. The brow-antlers appear to acquire their full proportionate growth at this stage, but the growth of the postlateral snag is irregular. The beams of the horns lean backwards from their base, and at first approach one another, and then, widening their distance apart, they curve well forward, the points falling short of the vertical line from the long brow-antler tips. The brow-antlers start forward, downwards, and outwards from the base, and curve upwards from the middle of their length, their tips inclining inwards; on a side view they form, with the shaft, two-thirds of a circle.

In a five-year old (fig. 2, p. 655) the postlaterals have lengthened and become lateral, and a diminutive snag or two show themselves near the points. In a three-year old (fig. 1, *c*) the beams are spread out much more laterally; on the left horn the postlateral occurs as a diminutive snag; on the right horn two together, and on the right brow-antler, near its base, is also a small snag.

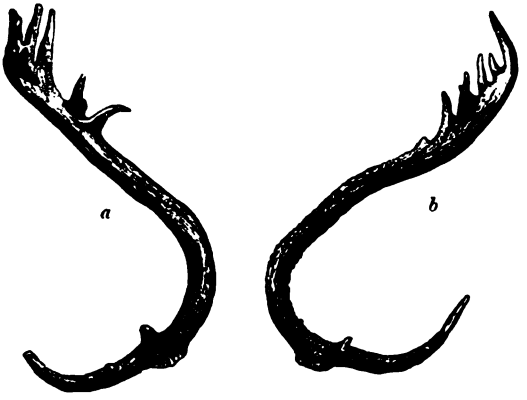
In another, somewhat larger and probably a year older (fig. 1, *d*), the postlateral snags are well determined; each brow-antler has a small snag near its base, and the points have—the right one two snags and the left one one. Then in order comes the five-year old, on which I have before remarked.

Next I have two odd horns of still older animals, differing greatly in their curve. The smaller one is thicker, has one good-sized snag

Fig. 2.

Cervus eldi. (Fifth year.)

Fig. 3.



Cervus eldi.

at base of brow-antler; the postlateral snag fully developed, with two diminutive tines together in rear of it. The point is greatly flattened and forked on giving off a snag from above with a pimple-like tine lower on the same surface. In the larger of the old horns the snag at the base of the brow-antler is diminutive; the postlateral snag small, the point somewhat flattened, with two small tines on its upper edge, near the postlateral, and a larger tine higher up, making a fork with the tip. I exhibit two somewhat similar horns (fig. 3, *a*, *b*), perhaps of animals still more aged.

I conclude that the typical horn is free from all snags except the postlateral, which itself is of uncertain growth.

A pair of antlers in the British Museum tally with my five-year old; but most of the horns there are large and of more adult

animals. They have none so young as my first four; but the same irregularity of the growth of tines and snags and the variability of the horn obtains among them.

My old single horns, with flattened tips, afford connecting-links between those of *Panolia acuticornis*, Gray, from Pegu, and of *P. platyceros*, Gray, from Siam.

Mr. Blyth is of opinion that "the Hainan *Panolia* is identical with that of Siam (*P. platyceros* of Gray), the distinction from the other, or western form, being apparent as the horns increase in size."

The Chinese do not value the hide of the *Panolia*, as they consider it too thin for useful purposes. They are therefore rarely brought from the mountains, and I had much difficulty in procuring the skins above referred to. The Chinese destroy this Deer, as they do all others, for the young horn. The native work on Hainan makes no distinction between this and other spotted Deer. It simply gives, "Deer (spotted). The male is the *Kia*, the female the *Yew*, the fawn the *Me*. Its young horns are like pink brinjals, three or four inches in length, and lovely fresh red; but in a very short time their tops decay and their bases get dry. If you break one it is like hard wood inside. These horns are called 'pink horns,' and are not equal to the product of Szechuen." This Deer is called *Liak* in the Hainan dialect.

3. Of the Hainan Sambur I have three pairs of horns, and the skins of a male and female, both adult, in winter coat. The skin of the male has coarse and stiffish hair, which is softer in the female. The former has blackish-brown on the forehead and between the horns, fading into a brown line along the back of the neck, which broadens and blends away along the back. In the female the neck-hair is shorter and the line more distinct. General colour of the male skin umber-brown, deeper on the back. Fore legs deeper-coloured on the outer surface, buff-white on the under and between the legs. Breast with softer and more woolly hair, of a blackish umber-brown. Belly, under hind legs, and buttocks white. The upper hair terminates at the buttocks and thighs with chestnut, which is followed by the white of the under sides. Hind legs deep umber, white on their inner sides. Hair of the hind neck and back with light brown basal halves; that of the sides with white bases, which gives a grizzly appearance in some lights.

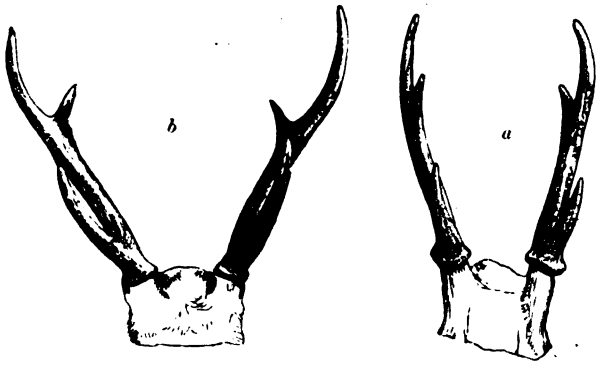
The female fur is softer and of a more uniform colour, with a wash of chestnut, which is rather darker and richer on the rump. The white on the under parts is disposed as in the male.

The male skin measures, from behind the horns to the root of the tail, 4½ feet, the female skin 3 feet 8 inches. The grizzled appearance of the fur struck me at once as peculiar, and I felt sure that I had got a Sambur different from the dark Formosan race. In this respect it is very similar to the skins of the Indian Sambur, but approaches the *C. rusa* of Java in the whiteness of the under parts.

My three pairs of antlers, which are of different ages, are all characterized by having the hind prong of the apical fork short. The youngest pair (fig. 4, *a*) I take to have belonged to an animal of two years, the second pair (fig. 4, *b*) to an animal of three years, and the

third pair (fig. 5) to an animal of, say, five years. They all have brow-antlers and a postlateral snag below the point of the main beam. The youngest pair incline away from one another at a very slight angle, being $3\frac{1}{4}$ inches apart at the base and 7 inches between the upper forks; the points stand 8 inches apart. The right horn measures $13\frac{1}{2}$ inches in length, the left horn $12\frac{1}{2}$. Their circumference

Fig. 4.



Sambur from Hainan.
a. Two years old. *b*. Three years old.

Fig. 5.

Sambur from Hainan. (Five years old.)

at base of beam is $5\frac{1}{4}$, at middle of beam $3\frac{1}{4}$. The brow-antler inclines outwards, and measures from the cleft $1\frac{3}{4}$ inch; the postlateral snag a little inwards, and measures from its cleft $1\frac{1}{4}$; the point from upper cleft $3\frac{3}{4}$. From the brow-cleft to base of horn is $3\frac{1}{8}$, and the bony pedestal below is high, and inclines forwards and

then backwards. The beam inclines backwards and upwards, and then curves gradually forwards and sidewards.

In the three-year pair the bony pedicle sinks in height, and the brow-antler lengthens greatly, making a deeper cleft; the horns incline from each other at a much greater angle; the hind snags lengthen and become more lateral, and the points are much larger; the beam the while remains much the same in length and thickness.

The measurements are—

	inches.
Total length of horn	14½
Length of brow-antler from cleft	6⅝
——— of cleft to base of horn	2⅛
——— of upper cleft to point	6⅝
——— of postlateral snag	2¼
Distance apart at base of horn	3¾
——— below upper cleft	10½
——— of brow-antlers	11
——— at tips	16½
——— of hind snags	10¼

In the five-year old the horns are in every way larger and longer; the brow-antlers and the points are much lengthened, and curve inwards. The postlateral snags become still more lateral, and a rudimentary tine shows itself on the inner side of the right brow-antler, near the cleft.

Measurements.

	inches.
Total length of horn	18
Length of brow-antler from cleft	8½
——— of cleft to base of horn	2⅛
——— of upper cleft to point	7¾
——— of postlateral snag	4
Distance apart at base of horns	4½
——— below upper cleft	12¾
——— of brow-antlers	11½
——— at points	12
——— of hind snags	9
Circumference at base of beam	5⅞
——— at centre	4

The horn of the typical Sambur (*C. aristotelis*), of which there is a large series in the British Museum, is well marked by having the hind snag of the apical fork prolonged into the main prong, while the fore snag is reduced into a secondary position; this character seems to hold good throughout the series. But the Museum has also horns from unknown localities, which resemble our Hainan specimens in the shortness of the hind snag and the prolongation of the fore snag; and in Mr. Flower's possession I have seen horns which agree closely with mine. Mr. Flower's specimens were received from Mr. Blyth, but, unfortunately, it is not known in what part of India they were collected. The horns of the Formosan Sambur (*C. swinhoii*) are of much the same form as those of the Hainan race,

but are stouter in the beam, while those of *C. rusa* of Java approximate to those of the typical Sambur. I am led to the conclusion that the Hainan race is distinguishable from the Sambur of India proper (*C. aristotelis*) by the shape of its horns at their apical bifurcation and by its smaller size, and from the *Cervus swinhoii*, Sclater, of Formosa, by the longer and less robust beam of horn, and by the different coloration of the fur; and I believe it to be identical with the *Cervus equinus*, Cuv., of Sumatra and Borneo, a good figure and description of which are given by S. Müller in the 'Verhandelingen,' Zool. p. 213, pl. 42.

Mr. Blyth was so good as to inspect my horns from Hainan, and has written to me the following:—"As for the Sambur horns, I consider *Cervi equinus*, *aristotelis*, and *hippelaphus* to be one and the same, though showing some local differences, as is equally the case with horns of *C. elaphus*. Eastwards of the Bay of Bengal the animal seems to be smaller, and more or less nigrescent in Borneo, less so in Malacca and Sumatra than in Borneo, but always different from *C. rusa* of Java, of which *C. moluccensis* is a diminutive, and *C. timoriensis* a further diminutive. *C. swinhoii* of Formosa holds the same relation to *C. hippelaphus* as *C. taivanus* to *C. mantchuricus*, and *C. moluccensis* to *C. rusa*."

The Sambur is an abundant species on the jungly mountains of the southern half of Hainan; and large numbers are yearly slaughtered by the independent *Le* tribes, and the skins and horns bartered to the Chinese. The skins are carried to the capital city, where the hair is planed off, and are then exported as raw hides to Canton.

The only time I saw the Hainan Sambur in its live state was on the 19th March, at Nychow (S. Hainan). We had scrambled through the jungle near the shore on to an open hill. Beyond us and the mountain was a deep ravine, with a stream trickling through it. We stopped to rest on the hill-top overlooking the ravine, when, on the opposite side, passing up from the streamlet, we noticed a fine hornless buck and two doe Sambur. They did not observe us, but continued lazily upwards, nibbling off the leaves of bushes as they went. We crossed the ravine and ascended to the edge of an open greensward, which the deer had already gained. At the further corner of the sward, about 60 yards off, with jungle in rear of them, they stood staring at our intrusion. My comrade bustled up behind with his gun, and they took alarm. The buck stamped his foot and uttered a loud half grunt, half scream, and they all charged into the thicket. After they had attained a height on the hill, the noise of the crushing and cracking of the brush before them ceased, as if they had stopped to have another look at us; but the noise was soon resumed, until they were too far off to be heard.

This Deer is called by the Hainanese *Twabé*, or Mountain Horse. The Chinese work has the following remarks on the species:—"The ancients say it is like a Deer, but larger, and assembles in herds of a hundred or more. Its horns bend backward, and are without tines. Its hair is like that of the Mountain-Cow. Below its eyes are two other eyes, which close in the day and open at night. It delights

to enter thorny thickets. The *Le* people procure them, and barter their hides for cloth. The hides are good for sleeping upon, as they protect against the damp ground."

4. This allusion to the "Mountain-Cow" induces me to extract the observations in the same Chinese work on that animal. After mentioning domestic cattle which have run wild, the book says:—"There is another race, like cattle, but with red eyes. They walk about among the hills in herds, and are not pressed at the sight of men. They are called 'Mountain Cows.' In the hills of the *Le* territory they are particularly abundant." The "Mountain Horse," or Sambur, has similar hair, we are told. Can the "Mountain Cow" be the *Budorcas taxicolor* of Hodgson, or some species allied to it? This must for the present remain a question, as I learned nothing of this animal from the natives, and got no samples of it.

5. The *Kiung shan Heen che* (or Gazetteer of the Kiungshan District of Hainan), the Chinese work referred to above, also mentions the *King*, an animal "like the Spotted Deer, but smaller, and of a black colour." The character *King* (pronounced Kiu-*ng* in Amoy) is the local name in Fokien for the *Cervulus reevesi*; and the same character is read *Kia* in the Hainan dialect; but in this work another character is given for the *Kia* of *Hwangkia*, the Hainan name for the *Cervulus vaginalis*. I should have thought that the *King* of the Chinese work might apply to some species of *Capricornis*, perhaps to *C. sumatrensis*, which occurs in Malacca and Tenasserim, but for the following remarks made in the same list of Hainan animals. "The *Choo* or *Me* drops its horns in the fifth moon (July). The velvety horns are of use, and as good as those of the Spotted Deer." A work of the former Han dynasty says that the hills of Tanurh and Choogai (districts into which Hainan was divided in the last century B.C.) abound in Choos and Kings. Yen Shekoo, in a commentary on the above, explains that the Choo is like a spotted deer, but larger. The '*Ming Yuen*,' or "clear illustrations," "affirms that a full-grown *Luh*, or spotted deer, is called a *Choo*. The herd follow it, observing its tail as their guide. Its tail is used for brushing off dust. Flap carpets with it, and they will not breed moths. Placed between crimson silks, the colour of the silks will not fade for years." It will thus be seen that *Choo* (which is written with the radical for deer, and the character for lord) is simply the monarch or leader of a herd of spotted deer, which in Hainan would be *Panolia*. In the same way, with reference to the Formosan Deer, I have discovered that *Me* applies to a large buck of the Sambur group. The character *King* is here adopted, apparently, for the *Panolia* in its dark winter dress.

6. Under the head of Hare another and the last *Cervine* animal is spoken of as "a large species (of Hare), called *Pé*, of a grey colour, with feet like a deer. The *Kiungchow* people often keep it alive." This must be a species of *Tragulus*, and probably, I think, *T. meminna*, of which the British Museum has a specimen from Cambodia. I did not have the good fortune to fall across this little animal on my visit to Hainan.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1869.

Jan. 1. 1 Black Ape (*Cynopithecus niger*), ♀. Purchased.
2. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Elmhirst.
4. 1 Spotted Hyæna (*Hyæna crocuta*), ♂. Born in the Menagerie.
8. 1 Marmoset Monkey (*Hapale jacchus*), ♀. Presented by Miss F. Hill.
11. 1 Black Swan (*Cygnus atratus*). Presented by H. R. Cox, Esq.
12. 1 Black-necked Swan (*Cygnus nigricollis*), ♂. Received in exchange.
13. 1 Two-wattled Cassowary (*Casuarius bicarunculatus*), ♀. Purchased.
1 Cinnamon Bear (*Ursus americanus*, var. *cinnamomea*), ♂. Purchased.
1 Javan Civet (*Viverra tangalunga*). Purchased.
14. 1 Ring-necked Parrakeet (*Palæornis torquata*), ♂. Presented by Vero K. Shaw, Esq.
1 Golden Eagle (*Aquila chrysaëtos*), ♀. Presented by Alfred Dixon, Esq.
2 pairs Impeyan Pheasants (*Lophophorus impeyanus*). Received in exchange.
19. 1 King Vulture (*Gyparchus papa*). Purchased.
2 Jerboas (*Dipus ægyptius*). Purchased.
4 Orange-headed Conures (*Conurus jendaya*). Purchased.
20. 1 White Peafowl (*Pavo cristatus*), ♂. Received in exchange.
500 Salmon Ova (*Salmo salar*). Presented by F. T. Buckland, Esq., F.Z.S.
200 Great-Trout Ova (*Salmo lacustris*). Presented by F. T. Buckland, Esq., F.Z.S.
200 Salmon-Trout Ova (*Salmo trutta*). Presented by F. T. Buckland, Esq., F.Z.S.
100 Charr Ova (*Salmo umbla*). Presented by F. T. Buckland, Esq., F.Z.S.
1 Crowned Eagle (*Spizaëtus coronatus*), ♀. Purchased.

Jan. 20. 1 Rose-crested Cockatoo (*Cacatua moluccensis*), ♂. Presented by Mrs. Hutton.
21. 2 Rhesus Monkeys (*Macacus erythræus*), ♂. Presented by F. Luck, Esq.
5 Bass (*Labrax lupus*). Presented by H. Lee, Esq.
2 Soles (*Solea vulgaris*). Presented by H. Lee, Esq.
3 Flounders (*Platessa flesus*). Presented by H. Lee, Esq.
1 Turbot (*Psetta maxima*). Presented by H. Lee, Esq.
1 Armed Bullhead (*Aspidophorus cataphractus*). Presented by H. Lee, Esq.
1 Unctuous Sucker (*Liparis vulgaris*). Presented by H. Lee, Esq.
22. 1 Arabian Baboon (*Cynocephalus hamadryas*). Presented by Com. W. G. Aldrich, R.N.
1 Chimpanzee (*Troglodytes niger*), ♂. Deposited.
1 Mandarin Duck (*Aix galericulata*), ♂. Purchased.
23. 4 Red-bellied Waxbills (*Estrelda rubriventris*). Presented by W. G. Dowling, Esq.
2 Nutmeg Birds (*Munia undulata*), ♂. Presented by W. G. Dowling, Esq.
1 Red-headed Weaverbird (*Euplectes madagascariensis*). Presented by W. G. Dowling, Esq.
1 American Badger (*Taxidea americana*). Purchased.
24. 1 Wood-Owl (*Syrnium aluco*). Presented by F. Petford, Esq.
1 Pallas's Eared Pheasant (*Crossoptilon auritum*), ♂. Received in exchange.
25. 1 Crested Ground-Parrakeet (*Calopsitta novæ hollandiæ*). Presented by A. M. Speer, Esq.
27. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by G. B. Train, Esq.
1 Marmoset Monkey (*Hapale jacchus*). Presented by T. W. Newman, Esq.
1 Dusky Parrot (*Pionus violaceus*). Purchased.
29. 1 Large Swiss Trout (*Salmo lacustris*). Presented by Mr. Groves.
30. 1 One-streaked Hawk (*Melierax monogrammicus*). Purchased.

Feb. 2. 1 Kinkajou (*Cercoleptis caudivolvulus*), ♂. From Buenos Ayres. Presented by Dr. John Palin, C.M.Z.S.
2 Capybaras (*Hydrochœrus capybara*). From Buenos Ayres. Presented by George Wilks, Esq., C.M.Z.S.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Psesented by Charles James, Esq.
3. 1 Hawk's-billed Turtle (*Caretta imbricata*). Presented by Messrs Gilson and Quelch.
1 American Brown Crane (*Grus canadensis*). Purchased.
1 Carolina Conure (*Conurus carolinensis*). Presented by F. G. Streatfield, Esq.
4. 2 Globose Curassows (*Crax globicera*). Received in exchange.
3 Crested Pigeons (*Ocyphaps lophotes*). Received in exchange.
4 Green-winged Doves (*Chalcophaps chrysochlora*). Received in exchange.
4 Barred-shouldered Doves (*Geopelia humeralis*). Received in exchange.
1 Talegalla (*Talegalla lathami*). Received in exchange.
1 Laughing Kingfisher (*Dacelo gigantea*). Received in exchange.
11 King Parrakeets (*Aprosmictus scapulatus*). Received in exchange.

Feb. 5. 7 River-Lampreys (*Petromyzon fluviatilis*). Presented by F. T. Buckland, Esq., F.Z.S.
6. 1 Grey Parrot (*Psittacus erithacus*). Purchased.
1 Common Wild Cat (*Felis catus*). Presented by Capt. the Hon. H. T. Fraser.
10. 1 Dingo (*Canis dingo*), ♂. Presented by J. C. Macdonald, Esq., F.Z.S.
13. 1 Vieillot's Fire-backed Pheasant (*Euplocamus vieilloti*), ♂. Deposited.
1 Temminck's Tragopan (*Ceriornis temminckii*). Deposited.
1 West-African Crocodile (*Crocodilus vulgaris*). Purchased.
15. 1 Egyptian Jerboa (*Dipus ægyptius*). Presented by Capt. Pain.
2 Bengalese Leopard Cats (*Felis bengalensis*). Presented by Major J. Pearse, Madras Staff Corps.
16. 1 European Lynx (*Felis lynx*). Purchased.
1 Mallee Bird (*Leipoa ocellata*). Presented by the Directors of the Botanic Gardens, Adelaide, South Australia.
3 Australian Monitors (*Monitor gouldii*). Presented by the Directors of the Botanic Gardens, Adelaide, S. Australia.
4 Stump-tailed Lizards (*Trachydosaurus rugosus*). Presented by the Directors of the Botanic Gardens, Adelaide, S. Australia.
3 Maugé's Dasyures (*Dasyurus maugæi*). Presented by the Directors of the Botanic Gardens, Adelaide, S. Australia.
1 Golden-bellied Beaver Rat (*Hydromys chrysogaster*), ♂. Presented by the Directors of the Botanic Gardens, Adelaide, S. Australia.
1 White Rat (*Mus rattus*). Presented by W. A. Forbes, Esq.
17. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Capt. Melville Clarke.
18. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Capt. R. O. B. Crowther.
19. 1 Syrian Fennec (*Canis famelicus*), ♂. Presented by the Sinai Survey Expedition.
1 American Brown Crane (*Grus canadensis*). Purchased.
1 Emu (*Dromæus novæ hollandiæ*). Presented by H.R.H. the Prince of Wales.
2 Brazilian Tortoises (*Testudo tabulata*). Purchased.
20. 1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Presented by Capt. Jas. N. Smart.
22. 1 Jelerang Squirrel (*Sciurus bicolor*), ♀. Purchased.
24. 2 Yellow-footed Rock-Kangaroos (*Petrogale xanthopus*), ♀. Presented by Capt. Bolton, Edinburgh.
25. 4 Indian Chameleons (*Chamæleon vulgaris*). Purchased.
26. 1 Green Glossy Starling (*Lamprocolius chalybeus*). Presented by Mr. Edward Hawkins.
1 Teguexin Lizard (*Teius teguexin*). Purchased.
28. 1 Hog Deer (*Cervus porcinus*), ♂. Born in the Gardens.

Mar. 2. 2 Red-winged Parrakeets (*Aprosmictus erythropterus*). Deposited.
4. 2 Vulpine Phalangers (*Phalangista vulpina*), ♂ and ♀. Presented by J. W. Tyas, Esq.
1 Sooty Phalanger (*Phalangista fuliginosa*), ♂. Presented by J. W. Tyas, Esq.
1 Cereopsis Goose (*Cereopsis novæ hollandiæ*). Presented by J. W. Tyas, Esq.
5. 1 Pike (*Esox lucius*). Presented by Mr. P. W. Madsen.
1 Senegal Touracou (*Corythaix persa*). Purchased.

Mar. 5. 2 Leopards (*Felis leopardus*), ♂ and ♀. From Sierra Leone. Presented by Mrs. Thos. Brassey.
6. 1 Stump-tailed Lizard (*Trachydosaurus rugosus*. Presented by Capt. Clarke.
8. 2 Golden Agoutis (*Dasyprocta agouti*), ♂ and ♀. Presented by H. M. Ridley, Esq.
1 Restless Cavy (*Cavia aperea*). Presented by H. M. Ridley, Esq.
1 Senegal Coucal (*Centropus senegalensis*). Purchased.
9. 1 Red and Yellow Macaw (*Ara chloroptera*). Deposited.
2 Red-breasted Pigeons (*Phlogœnas cruentata*). Purchased.
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Presented by James Boorne, Esq.
1 Eland (*Oreas canna*), ♀. Born in the Gardens.
3 Menopomas (*Menopoma alleghaniense*). Presented by the Smithsonian Institution, Washington, U.S.A.
2 Florida Land-Tortoises (*Testudo polyphemus*). Presented by the Smithsonian Institution, Washington, U.S.A.
10. 2 Cuvier's Podargus (*Podargus cuvieri*). Purchased.
11. 1 Coati (*Nasua nasica*), ♀. Purchased.
12. 3 Barred-tailed Pheasants (*Phasianus reevesii*), 1 ♂ and 2 ♀. Deposited.
1 Cape-Bunting (*Fringillaria capensis*). Presented by Miss C. Boyle.
4 Yellow-backed Whydah Birds (*Vidua macroura*). Presented by Miss C. Boyle.
15. 3 Amaduvade Finches (*Estrelda amadava*). Purchased.
4 Orange-cheeked Waxbills (*Estrelda melpoda*). Purchased.
4 Crimson-eared Waxbills (*Estrelda phœnicotis*). Purchased.
4 Common Waxbills (*Estrelda cinerea*) Purchased.
4 African Silver-bills (*Munia cantans*). Purchased.
2 Yellow-rumped Seed-eaters (*Crithagra chrysopyga*). Purchased.
2 Occidental Finches (*Quelea occidentalis*). Purchased.
4 Hooded Finches (*Amadina cucullata*). Received in exchange.
16. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
24. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by Capt. G. E. Bird.
1 Yaguarundi Cat (*Felis jaguarundi*). Presented by Capt. G. E. Bird.
1 Dorsal Squirrel (*Sciurus dorsalis*). Presented by Capt. G. E. Bird.
25. 1 Egyptian Monitor (*Monitor niloticus*). Purchased.
3 Crested Ground-Parrakeets (*Calopsitta novæ hollandiæ*), 1 ♂, 2 ♀. Presented by John Lacey, Esq.
13 Ruffe or Pope (*Acerina cernua*). Presented by F. Jonas, Esq.
27. 1 Coati (*Nasua nasica*), ♂. Purchased.
30. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♀. Presented by Capt. J. Cracknell.
31. 1 Musk-Deer (*Moschus moschiferus*), ♀. Presented by Colonel F. R. Pollock, C.S.I. Commissioner, Peshawur, Punjaub, India.

Apr. 3. 1 Brown Bear (*Ursus arctos*), ♂. Deposited.
1 Domestic Dog (*Canis familiaris*), ♂. Deposited.
5. 2 Maguari Storks (*Ciconia maguari*). Presented by George Wilks, Esq., C.M.Z.S.
1 Great Eagle-owl (*Bubo maximus*). From Gibraltar. Deposited.
1 Cape Eared Owl (*Otus capensis*). From Spain. Deposited.
2 Kingfishers (*Alcedo ispida*). Purchased.

Apr. 6. 2 Black-tailed Water-hens (*Tribonyx ventralis*). Hatched in the Gardens.
1 Lion (*Felis leo*), ♂. From Babylonia. Deposited.
1 Aoudad (*Ovis tragelaphus*), ♂. Born in the Menagerie.
2 African Tantalus (*Tantalus ibis*). Purchased.
8. 1 Hybrid Kangaroo (between *Halmaturus bennettii*, ♂, and *Halmaturus ruficollis*, ♀). Born in the Menagerie.
1 Great Kangaroo (*Macropus giganteus*), ♀. Born in the Menagerie.
2 Cretan Goats (*Capra beden*), ♂. Born in the Menagerie.
1 Red and Yellow Macaw (*Ara chloroptera*). Presented by the Earl Nelson.
9. 1 Proteus (*Proteus anguinus*). Presented by Francis Halsey, Esq.
1 Blue-crowned Conure (*Conurus hæmorrhous*). Presented by Mrs. Wright.
1 Cretan Goat (*Capra beden*), ♂. Born in the Menagerie.
10. 1 Ibex (*Capra ibex*), ♂. Born in the Menagerie.
1 Common Adder (*Pelias berus*). Presented by W. R. Tate, Esq.
1 Tasmanian Piping Crow (*Gymnorhina organica*). Deposited.
11. 1 Equine Deer (*Cervus equinus*), ♀. Born in the Menagerie.
3 Black-tailed Water-hens (*Tribonyx ventralis*). Hatched in the Gardens.
12. 2 Pied Rats (*Mus rattus*), ♂ and ♀. Presented by J. Mason, Esq.
13. 1 Talapoin Monkey (*Cercopithecus talapoin*), ♂. Presented by John Gould, Esq., F.Z.S.
1 Blackheaded Gull (*Larus ridibundus*). Presented by John Gould, Esq., F.Z.S.
2 Common Peafowls (*Pavo cristatus*), ♂ and ♀. Presented by Maj.-Gen. J. K. Whistler.
14. 1 Mangabey Monkey (*Cercocebus æthiops*), ♀. Presented by Col. Addison.
2 Common Sheldrakes (*Tadorna vulpanser*), ♂ and ♀. Received in exchange.
1 Grey Parrot (*Psittacus erithacus*). Deposited.
1 Crimson-crowned Weaverbird (*Euplectes flammiceps*), ♂. Presented by Miss C. Boyle.
1 Obscure Finch (*Serinus*, sp. ign.), ♀. Presented by Miss C. Boyle.
1 Iceland Falcon (*Falco islandicus*), ♀. Presented by Capt. J. A. Martyn.
1 Burchell's Zebra (*Equus burchellii*), ♂. Deposited.
2 Secretary Vultures (*Serpentarius reptilivorus*). Purchased.
15. 1 Secretary Vulture (*Serpentarius reptilivorus*). Presented by J. S. Mackenzie, Esq.
1 Ælian's Wart-hog (*Phacochœrus æliani*), ♀. From Zoula, Abyssinia. Purchased.
1 Smew (*Mergus albellus*), ♀. Purchased.
5 Golden Plovers (*Charadrius pluvialis*). Purchased.
12 Lumpfish (*Cyclopterus lumpus*). Purchased.
16. 1 Javan Chevrotain (*Tragulus javanicus*), ♀. Presented by J. Deacon, Esq.
1 Polecat (*Mustela putorius*). Presented by F. H. Salvin, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by John Ferris, Esq.
1 Marsh Harrier (*Circus æruginosus*), ♂. Purchased.
1 Common Bittern (*Botaurus stellaris*). Presented by the Hon. T. de Grey, M.P., F.Z.S.

Apr. 16. 1 African Tantalus (*Tantalus ibis*). Purchased.
1 Squirrel Monkey (*Callithrix sciureus*), ♂. Purchased.
17. 1 Wood-Owl (*Syrnium aluco*). Presented by George W. Arnott, Esq.
1 Coati (*Nasua nasica*), ♀. Presented by Chas. Denneley, Esq.
1 Common Adder (*Pelias berus*). Presented by F. D. Drewitt, Esq.
1 Nilotic Trionyx (*Trionyx niloticus*). Presented by Alexander Baird, Esq.
19. 2 Bower-birds (*Ptilonorhynchus holosericeus*). Purchased.
2 Blue-crowned Hanging Parrots (*Loriculus galgulus*). Purchased.
1 Viscacha (*Lagostomus trichodactylus*). Born in the Menagerie.
1 Kinkajou (*Cercoleptes caudivolvulus*), ♂. Presented by D. M. Eder, Esq.
20. 1 Spotted Cavy (*Cœlogenys paca*). Presented by Dr. Somershield.
5 Cuming's Octodons (*Octodon cumingii*). Born in the Menagerie.
1 Entellus Monkey (*Semnopithecus entellus*), ♂. Purchased.
21. 1 Ring-necked Parrakeet, yellow var. (*Palæornis torquata*). Presented by Lieutenant C. H. T. Marshall.
2 pairs Virginian Colins (*Ortyx virginianus*). Purchased.
2 pairs Californian Quails (*Callipepla californica*). Purchased.
22. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
23. 2 Common Boas (*Boa constrictor*). Presented by Capt. Perry.
1 Common Badger (*Meles taxus*). Presented by the Lord Willoughby d'Eresby.
2 Tibetan Wolves (*Canis laniger*). Born in the Menagerie.
26. 1 Temminck's Snapper (*Macroclemmys temminckii*). Deposited.
1 Arabian Bustard (*Otis arabs*). Received in exchange.
6 Bourke's Parrakeets (*Euphema bourkii*). Purchased.
2 Blue-Bonnet Parrakeets (*Psephotus hæmatogaster*).
1 Hawk's-billed Turtle (*Caretta imbricata*). Presented by Capt. Miles.
27. 2 Red Ground-Doves (*Geotrygon montana*). Deposited.
4 Mountain Witch Doves (*Geotrygon sylvatica*). Deposited.
1 Goss's Owl (*Otus grammicus*). Deposited.
4 Zenaida Doves (*Zenaida amabilis*). Deposited.
4 White-fronted Doves (*Leptoptila jamaicensis*). Deposited.
1 White-crowned Pigeon (*Columba leucocephala*). Deposited.
1 Moustache-Pigeon (*Geotrygon mystacea*). Purchased.
2 Zenaida Doves (*Zenaida amabilis*). Purchased.
2 Macaque Monkeys (*Macacus cynomolgus*), ♂. Presented by Mrs. Stevens.
28. 1 Red and Yellow Macaw (*Ara chloroptera*). Presented by Mrs. Bancroft.
1 Chequered Elaps (*Elaps lemniscatus*). Purchased.
2 Virginian Colins (*Ortyx virginianus*), ♂ and ♀. Presented by P. L. Simon, Esq.
1 Dial Bird (*Copsychus saularis*). Purchased.
29. 1 Chimpanzee (*Troglodytes niger*), ♂. Deposited.
4 Common Adders (*Pelias berus*). Presented by W. B. Hume, Esq.
1 Markhoor (*Capra megaceros*), ♂. Born in the Menagerie.
30. 2 Masked Paradoxures (*Paguma larvata*). Born in the Menagerie.

May 1. 1 Grey Ichneumon (*Herpestes griseus*), ♀. Presented by George Felstead, Esq.
1 Ostrich (*Struthio camelus*), ♂. Purchased.
3. 2 Mouflons (*Ovis musimon*), ♂ and ♀. Born in the Menagerie.
1 Black-eared Marmoset (*Hapale penicillata*), ♂. Presented by Miss Cook.
5. 1 Bay Cow-bird (*Molothrus badius*). Presented by George Wilks, Esq., C.M.Z.S.
4 Southern Cow-birds (*Molothrus bonariensis*). Presented by George Wilks, Esq., C.M.Z.S.
1 Azara's Opossum (*Didelphys azaræ*), ♂. Presented by George Wilks, Esq., C.M.Z.S.
1 Tree-Boa (*Corallus hortulanus*). Purchased.
6. 1 Lumpfish (*Cyclopterus lumpus*). Purchased.
1 Armed Bullhead (*Aspidophorus cataphractus*). Purchased.
1 Sordid Dragonet (*Callionymus dracunculus*). Purchased.
4 Greenland Seals (*Phoca grœnlandica*), ♂. Purchased.
7. 1 Common Sturgeon (*Acipenser sturio*). Presented by Messrs. Grove and Co.
1 Marmoset Monkey (*Hapale jacchus*), ♂. Presented by Robert G. Moger, Esq.
8. 1 Diana Monkey (*Cercopithecus diana*), ♂. Purchased.
1 Crested Porcupine (*Hystrix cristata*). Purchased.
1 King Vulture (*Gyparchus papa*). Purchased.
2 St.-Helena Seed-eaters (*Crithagra butyracea*). Purchased.
1 Brush-tailed Porcupine (*Atherura africana*). Purchased.
2 Yellow-rumped Seed-eaters (*Crithagra chrysopyga*). Purchased.
1 Crimson-faced Waxbill (*Pytelia elegans*). Purchased.
1 Common Boa (*Boa constrictor*). Purchased.
1 Ocelot (*Felis pardalis*), ♂. Purchased.
2 Weasel-headed Armadillos (*Dasypus encoubert*). Purchased.
2 Vieillot's Pheasants (*Euplocamus vieilloti*), ♂ and ♀. Presented by Col. A. S. Greenlaw.
9. 1 Alexandrine Parrakeet (*Palæornis alexandri*). Deposited.
10. 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♀. Born in the Menagerie.
1 Bronze-winged Pigeon (*Phaps chalcoptera*). Hatched in the Gardens.
11. 1 Greenland Seal (*Phoca grœnlandica*), ♀. Purchased.
2 Spotted-sided Finches (*Amadina lathami*). Purchased.
1 Cashmere Shawl-Goat (*Capra hircus*), ♀. Born in the Menagerie.
2 Australian Wild Ducks (*Anas superciliosa*). Presented by Capt. S. Babot.
12. 6 Variegated Sheldrakes (*Tadorna variegata*). Hatched in the Gardens.
1 Syrian Wild Ass (*Equus hemippus*), ♂. Born in the Menagerie.
1 Cinereous Sea-Eagle (*Haliaëtus albicilla*). From the Island of Saghalin. Presented by Captain Blakiston.
1 Brown Bear (*Ursus arctos*), ♂. From Jesso, Japan. Presented by Captain Blakiston.
13. 1 Red and Yellow Macaw (*Ara chloroptera*). Deposited.
1 Grey Parrot (*Psittacus erithacus*). Presented by Mrs. Ford North.
1 Ursine Colobus (*Colobus ursinus*), ♀. Deposited.

May 13. 2 Peacock Pheasants (*Polyplectron chinquis*). Hatched in the Gardens.
3 Young Water-Ousels (*Cinclus aquaticus*). Presented by W. Dunbar, Esq.
14. 1 Pallas's Eared Pheasant (*Crossoptilon auritum*), ♂. Purchased.
1 Golden-headed Marmoset (*Hapale chrysomelas*). Purchased.
2 Alpine Choughs (*Pyrrhocorax alpinus*). Purchased.
2 Orange-winged Parrakeets (*Brotogerys pyrrhopterus*). Purchased.
18. 4 Olive Weaverbirds (*Hyphantornis capensis*). Purchased.
2 White-fronted Olive Weaverbirds (*Pyrenestes albifrons*). Purchased.
1 Rock-Thrush (*Petrocincla saxatilis*). Presented by Sir S. Lakeman.
1 Eastern Nightingale (*Luscinia major*). Presented by Sir S. Lakeman.
1 Spotted Ichneumon (*Herpestes auropunctatus*). Presented by C. Emery, Esq.
2 Greenland Seals (*Phoca grœnlandica*). Presented by Sir C. M. Lampson, Bart., F.Z.S.
1 Common Heron (*Ardea cinerea*). Presented by Mr. Alderman and Sheriff Cotton.
19. 8 Ruddy Sheldrakes (*Tadorna rutila*). Hatched in the Gardens.
20. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by F. Egerton Hine, Esq.
1 Stanley Crane (*Tetrapteryx paradiseus*). Purchased.
2 Secretary Vultures (*Serpentarius reptilivorus*). Purchased.
2 Aard-Wolves (*Proteles lalandii*). Purchased.
1 Common Otter (*Lutra vulgaris*). Presented by H. J. Rope, Esq.
1 Vulturine Eagle (*Aquila vulturina*). Presented by E. L. Layard, Esq., F.Z.S.
21. 1 Ursine Dasyure (*Dasyurus ursinus*). Presented by Dr. Geo. Bennett, F.Z.S.
1 Grey Spider Monkey (*Ateles hybridus*). Purchased.
4 Upland Geese (*Chloëphaga magellanica*). Hatched in the Gardens.
22. 1 Panda (*Ailurus fulgens*). Presented by Dr. Simpson.
25. 2 Peacock Pheasants (*Polyplectron chinquis*). Hatched in the Gardens.
26. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by A. M. Campbell, Esq.
6 Common Chameleons (*Chamæleon vulgaris*). Purchased.
1 Red-billed Tree-Duck (*Dendrocygna autumnalis*). Purchased.
1 Grey-cheeked Monkey (*Cercocebus albigena*), ♀. Purchased.
2 Sulphur-breasted Toucans (*Ramphastos carinatus*). Purchased.
27. 2 Spotted Hyænas (*Hyæna crocuta*). Born in the Menagerie.
29. 1 White-whiskered Capuchin Monkey (*Cebus fatuellus*), ♂. Deposited.
2 Grey-breasted Conures (*Conurus monachus*). Purchased.
2 Red-bellied Conures (*Conurus vittatus*). Purchased.
4 Temminck's Tragopans (*Ceriornis temminckii*). Hatched in the Gardens.
1 Burchell's Zebra (*Equus burchellii*). Born in the Menagerie.
1 Sulphur-breasted Toucan (*Ramphastos carinatus*). Presented by J. C. Shircore, Esq.
30. 1 Brown Pelican (*Pelecanus fuscus*). Presented by Capt. Dow.
31. 1 Cuckoo (*Cuculus canorus*). Presented by H. Clark, Esq.

June 1. 1 Chimpanzee (*Troglodytes niger*). Deposited.
2 Ursine Dasyures (*Dasyurus ursinus*). Presented by R. Firebrace, Esq., F.Z.S.
1 Australian Quail (*Synœcus australis*). Presented by Dr. F. von Mueller, C.M.Z.S.
1 Ashy-headed Goose (*Chloëphaga poliocephala*). Hatched in the Gardens.
2. 2 Macqueen's Bustards (*Otis macqueeni.*) Deposited.
3. 2 Double-striped Thicknees (*Œdicnemus bistriatus*). Presented by G. D. Rowley, Esq., F.Z.S.
4 Getulian Squirrels (*Xerus getulus*). Purchased.
5. 1 Dorsal Squirrel (*Sciurus dorsalis*). Presented by J. L. Guy, Esq.
6. 8 Egyptian Geese (*Chenalopex ægyptiaca*). Hatched.
4 Ruddy-headed Geese (*Chloëphaga rubidiceps*). Hatched.
7. 1 Anaconda (*Eunectes murinus*). Purchased.
1 Egyptian Monitor (*Monitor niloticus*). Purchased.
1 Common Hare (*Lepus europæus*). Purchased.
8. 1 Red-bellied Monkey (*Cercopithecus erythrogaster*), ♂. Purchased.
1 Rhesus Monkey (*Macacus erythræus*), ♀. Presented by Mrs. M. Round.
9. 1 Red-fronted Amazon (*Chrysotis vittatus*). Purchased.
1 Black-tailed Parrakeet (*Platycercus melanurus*). Presented by Dr. John Cooper.
10. 1 Ocelot (*Felis pardalis*), ♀. Presented by Capt. Glyn, H.M.S. 'Doris.'
1 Eye-browed Guan (*Penelope superciliaris*). Purchased.
1 New-Caledonian Rail (*Ocydromus lafresnayanus*). Presented by Dr. Geo. Bennett, F.Z.S.
1 Blue-shouldered Tanager (*Tanagra cyanoptera*), ♂. Purchased.
11. 1 King Parrakeet (*Aprosmictus scapulatus*), Presented by Mr. Sercombe.
12. 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Miss Lucy Royle.
14. 1 Japanese Deer (*Cervus sika*). Born in the Menagerie.
15. 2 Petz's Conures (*Conurus petzi*). Purchased.
2 Crested Pigeons (*Ocyphaps lophotes*). Hatched.
16. 9 Common Chameleons (*Chamæleon vulgaris*). Presented by Capt. Thos. Waite.
2 Getulian Squirrels (*Xerus getulus*). Presented by Capt. Thos. Waite.
4 North-African Jackals (*Canis anthus*), ♂. Presented by Capt. Thos. Waite.
1 Ocellated Skink (*Gongylus ocellatus*). Presented by Henry Denny, Esq.
1 Turquoisine Parrakeet (*Euphema pulchella*), ♀. Purchased.
1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Mr. J. Stanton.
17. 2 Red-shouldered Weaverbirds (*Euplectes axillaris*), ♂. Purchased.
1 Bengalese Ichneumon (*Herpestes malaccensis*), ♂. Presented by W. Ingram, Esq.
2 pairs of Common Wild Ducks (*Anas boschas*). Presented by D. B. Bullen, Esq.
18. 1 Cape Ant-Bear (*Orycteropus capensis*), ♂. Purchased.
3 Summer-Ducks (*Aix sponsa*). Hatched in the Gardens.

June 18. 3 Japanese Pheasants (*Phasianus versicolor*). Hatched.
13 Bamboo Partridges (*Bambusicola thoracia*). Hatched.
19. 1 Wedge-tailed Eagle (*Aquila audax*). Presented by H.R.H. the Duke of Edinburgh, F.Z.S.
20. 1 Honey-Buzzard (*Pernis apivorus*). Presented by J. Watkins Drew, Esq.
21. 3 Black-tailed Water-hens (*Tribonyx ventralis*). Hatched in the Gardens.
1 West-African Python (*Python sebæ*). Presented by Charles H. Cox, Esq., F.Z.S.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Received in exchange.
22. 1 Sly Silurus (*Silurus glanis*). Presented by Messrs. Gilson and Quelch.
1 Sun-bird (*Eurypyga helias*). Hatched in the Gardens.
1 Common Bluebird (*Sialia wilsonii*). Hatched in the Gardens.
2 Mexican Deer (*Cervus mexicanus*), ♂ and ♀. Born in the Menagerie.
1 Entellus Monkey (*Semnopithecus entellus*), ♂. Purchased.
23. 1 Common Hare (*Lepus europæus*). Purchased.
14 Chestnut-breasted Finches (*Donacola castaneothorax*). Presented by the Acclimatization Society of Queensland.
1 Banded Grass-Finch (*Poëphila cincta*). Presented by the Acclimatization Society of Queensland.
1 Temminck's Snapper (*Macroclemmys temminckii*). Deposited.
24. 4 Swinhoe's Pheasants (*Euplocamus swinhoei*). Hatched in the Gardens.
25. 1 Japanese Deer (*Cervus sika*). Born in the Menagerie.
26. 4 Bahama Ducks (*Pœcilonetta bahamensis*). Hatched.
28. 7 Undulated Grass Parrakeets (*Melopsittacus undulatus*). Hatched.
3 Common Adders (*Pelias berus*). Presented by Mr. Davy.
2 Wild Boars (*Sus scrofa*). Purchased.
1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mrs. Haynes.
29. 1 Guacharo or Oil-bird (*Steatornis caripensis*). From Trinidad. Presented by the Hon. A. Gordon, C.M.Z.S.
4 Australian Wild Ducks (*Anas superciliosa*). Hatched in the Gardens.
30. 2 Tigers (*Felis tigris*). Born in the Menagerie.
2 Common Kingfishers (*Alcedo ispida*). Presented by J. J. Habisch, Esq.
2 Black-headed Parrots (*Caica melanocephala*). Deposited.
2 Yellow-shouldered Amazons (*Chrysotis ochroptera*). Deposited by the Hon. A. Gordon, C.M.Z.S.

July 1. 1 Virginian Deer (*Cervus virginianus*). Born in the Menagerie.
1 Ortolan Bunting (*Emberiza hortulana*). Presented by Mr. J. W. Smart.
2 Black-headed Buntings (*Emberiza melanocephala*). Presented by Mr. J. W. Smart.
1 Chimpanzee (*Troglodytes niger*). Deposited.
1 Red-footed Falcon (*Erythropus vespertinus*). Deposited.
1 New-Zealand Hawk (*Hieracidea novæ hollandiæ*). Presented by J. M. Quade, Esq.
2. 2 Barbary Turtledoves (*Turtur risorius*). Presented by Capt. James Tough.

July 2. 2 Moustache-Monkeys (*Cercopithecus cephus*). Received in exchange.
3. 2 Temminck's Tragopans (*Ceriornis temminckii*). Hatched.
1 Macaque Monkey (*Macacus*, sp.). Presented by Mr. Ridgway.
1 Red-throated Amazon (*Chrysotis collaria*). Presented by J. W. Malcolm, Esq., F.Z.S.
1 Yellow-cheeked Amazon (*Chrysotis autumnalis*). Purchased.
5. 1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
6. 2 Jays (*Garrulus glandarius*). Received in exchange.
2 Common Magpies (*Pica caudata*). Received in exchange.
7. 1 Boobook Owl (*Athene boobook*). Purchased.
1 Roebuck (*Cervus capreolus*), ♀. Presented by Benjamin F. Turner, Esq.
8. 1 Andaman Monkey (*Macacus andamanensis*), ♀. Presented by Capt. R. A. Brown, R.N.
1 Kusimanse (*Crossarchus obscurus*), ♀. Purchased.
9. 6 Mandarin Ducks (*Aix galericulata*). Hatched in the Gardens.
2 Hartebeests (*Boselaphus caama*), ♂ and ♀. Purchased.
1 Javan Chevrotain (*Tragulus javanicus*), ♀. Presented by B. C. Nicholson, Esq.
4 Common Foxes (*Canis vulpes*), 3 ♂ and 1 ♀. Presented by H.R.H. the Prince of Wales, F.Z.S. &c. &c.
12. 1 Gazelle (*Gazella dorcas*), ♀. Purchased.
13. 1 Coati (*Nasua nasica*), ♀. Presented by W. M. Rose, Esq.
1 Brazilian Mocking bird (*Mimus saturninus*). Purchased.
1 Black Bulbul (*Pycnonotus pygæus*). Purchased.
1 Cat bird (*Galeoscoptes carolinensis*). Purchased.
2 Brown-necked Parrots (*Pœocephalus fuscicollis*). Purchased.
1 Pied Crow Shrike (*Strepera graculina*). Purchased.
14. 4 Black-backed Porphyrios (*Porphyrio melanotus*). Hatched in the Gardens.
1 Short-eared Owl (*Otus brachyotus*). Deposited.
1 Common Hare (*Lepus europæus*). Purchased.
1 Black Bear (*Ursus americanus*). Presented by G. Stanley Orred, Esq.
16. 1 Bless-bok Antelope (*Damalis albifrons*). Born in the Menagerie.
6 Amherst's Pheasants (*Thaumalea amherstiæ*), 5 ♀ and 1 ♂. Deposited.
17. 1 Maugé's Dasyure (*Dasyurus maugæi*), ♂. Presented by Wm. H. Holmes, Esq.
19. 1 Four-spotted Opossum (*Didelphys opossum*). Purchased.
2 Barred-shouldered Ground-Doves (*Geopelia humeralis*). Hatched in the Gardens.
1 Cornish Chough (*Fregilus graculus*). Presented by J. Ashmead, Esq.
1 One-streaked Hawk (*Melierax monogrammicus*). Purchased.
20. 11 Japanese Pheasants (*Phasianus versicolor*). Hatched.
21. 1 Yellow-faced Amazon (*Chrysotis xanthops*). Purchased.
1 Wild Boar (*Sus scrofa*). Presented by L. Levinsohn, Esq.
22. 1 Crested Ground-Parrakeet (*Calopsitta novæ hollandiæ*). Presented by Miss C. Boyle.
1 Pair Hybrid Cats (between *Felis catus* and *F. domestica*). Presented by S. E. B. Pusey, Esq., F.Z.S.
1 Coati, black variety (*Nasua nasica*), ♂. Presented by Peter Campbell, Esq.
2 European Tortoises (*Testudo græca*). Presented by Mrs. Lee.

July 22. 2 African Tantalus (*Tantalus ibis*). Purchased.
2 Saddle-billed Storks (*Xenorhynchus senegalensis*). Purchased.
26. 3 Glass Snakes (*Pseudopus pallasii*). Purchased.
27. 1 Vervet Monkey (*Cercopithecus lalandi*), ♀. Purchased.
1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by Dr. Owen Owen.
28. 1 Pennant's Parrakeet (*Platycercus pennantii*). Deposited.
2 Red Ground-Doves (*Geotrygon montana*). Hatched in the Gardens.
1 Common Viper (*Pelias berus*). Presented by E. P. R. Curzon, Esq.
1 Owen's Apteryx (*Apteryx owenii*). Presented by the Acclimatization Society of Otago.
29. 2 Blue Jays (*Cyanocitta cristata*). Purchased.
2 Pied Tanagers (*Cissopis leveriana*). Purchased.
2 Spotted Crakes (*Crex porzana*). Purchased.
2 Tiger Bitterns (*Tigrisoma brasiliense*). Purchased.
1 Vociferous Eagle (*Haliaëtus vocifer*). Purchased.
1 White-bellied Stork (*Ciconia abdimii*). Purchased.
2 Raccoons (*Procyon lotor*). Presented by C. Messiter, Esq.
1 Red Fox (*Canis fulvus*). Presented by C. Messiter, Esq.
1 Prairie-Marmot (*Arctomys ludovicianus*). Presented by C. Messiter, Esq.
1 Bonnet-Monkey (*Macacus radiatus*). Presented by Miss Geikie.
30. 2 American Tapirs (*Tapirus terrestris*), ♂ and ♀. Purchased.
1 Grey-cheeked Monkey (*Cercocebus albigena*), ♀. Purchased.
1 Blue Grosbeak (*Guiraca cyanea*). Purchased.
1 Harlequin Quail (*Coturnix histrionica*). Purchased.
1 Slender Loris (*Loris gracilis*), ♀. Purchased.
31. 3 Common Wild Ducks (*Anas boschas*). Presented by D. B. Buller, Esq.

Aug. 2. 2 Chinese Tailed Deer (*Elaphurus davidianus*), ♂ and ♀. Presented by H.E. Sir R. Alcock, K.C.B., C.M.Z.S.
1 Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*). Deposited.
1 White-billed Parrot (*Tanygnathus albirostris*). Purchased.
1 Mueller's Great-billed Parrakeet (*Tanygnathus muelleri*). Purchased.
2 Eider Ducks (*Somateria mollissima*), ♂ and ♀. Purchased.
2 Alpine Choughs (*Pyrrhocorax alpinus*). Purchased.
1 Pileated Vulture (*Neophron pileatus*). Purchased.
1 Wild Cat (*Felis catus*), ♀, from Hungary. Purchased.
3. 1 Common Seal (*Phoca vitulina*), ♂. Purchased.
1 Kit Fox (*Canis velox*), ♂. Presented by G. Peacock, Esq.
1 Hawk-headed Parrot (*Deroptyus accipitrinus*). Presented by G. Peacock, Esq.
1 Brown Capuchin Monkey (*Cebus apella*), ♂. Presented by G. Peacock, Esq.
4. 1 Feline Douroucouli (*Nyctipithecus felinus*). Purchased.
5. 3 Common Hares (*Lepus europæus*). Purchased.
6. 1 Puma, red variety (*Felis concolor*), ♀, from Demerara. Presented by the late W. D. Stewart, Esq.
7. 2 Snowy Owls (*Nyctea nivea*). Presented by Lord Ruthven.
1 Common Seal (*Phoca vitulina*), ♀. Purchased.
9. 1 Wheatear (*Saxicola œnanthe*). Purchased.

Aug. 10. 1 Great Eagle Owl (*Bubo maximus*). Returned.
1 Common Barn-Owl (*Strix flammea*). Presented by H. B. Harrison, Esq.
1 pair Passerine Parrakeets (*Psittacula passerina*). Purchased.
1 Musky Parrakeet (*Trichoglossus concinnus*). Purchased.
11. 1 Bennett's Wallaby (*Halmaturus bennettii*), ♀. Deposited.
4 Common Turtles (*Chelonia viridis*). Presented by Lieut. C. B. Clark, R.N.
12. 5 Wonga-wonga Pigeons (*Leucosarcia picata*). Presented by the Acclimatization Society of Victoria.
1 Amherst's Pheasant (*Thaumalea amherstiæ*), ♂. Deposited.
13. 3 Common Bluebirds (*Sialia wilsoni*). Hatched in the Gardens.
2 Weasel-headed Armadillos (*Dasypus encoubert*), ♀. Purchased.
1 Pleurodele Newt (*Pleurodeles waltii*). From Spain. Presented by Lord Lilford, F.Z.S.
14. 2 Crested Curassows (*Crax alector*). Presented by Col. May.
16. 1 Huanaco (*Auchenia huanaco*), ♀. Presented by H. T. Balfour, Esq.
17. 1 Wheat-ear (*Saxicola œnanthe*), ♀. Purchased.
6 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Hatched.
1 Rufous-necked Weaverbird (*Hyphantornis textor*). Hatched.
18. 2 Javan Pea-fowls (*Pavo muticus*), ♂ and ♀. Purchased.
2 Marabou Storks (*Leptoptilus crumeniferus*), ♂ and ♀. Purchased.
19. 1 Brush-Turkey (*Talegalla lathami*). Hatched in the Gardens.
1 St.-Helena Seed-eater (*Crithagra butyracea*). Presented by Miss Moss.
3 Australian Quails (*Synœcus australis*). Purchased.
20. 1 Chimpanzee (*Troglodytes niger*), ♀. Deposited.
23. 1 Garnett's Galago (*Galago garnettii*), ♂. Purchased.
2 Yellow Baboons (*Cynocephalus babouin*), ♂ and ♀. Purchased.
25. 2 Sun-birds (*Eurypyga helias*). Hatched in the Gardens.
1 Great Eagle-Owl (*Bubo maximus*). Presented by Charles Bamford, Esq.
26. 7 Garter-Snakes (*Tropidonotus ordinatus*). Presented by A. Downs, Esq., C.M.Z.S.
27. 1 Blue and Yellow Maccaw (*Ara ararauna*). Presented by Samuel Linder, Esq.
13 Barred-tailed Pheasants (*Phasianus reevesii*). Deposited.
2 Temminck's Tragopans (*Ceriornis temminckii*), ♂ and ♀. Deposited.
1 Common Buzzard (*Buteo vulgaris*), ♀. Presented by James Hartley, Esq.
3 Short-headed Phalangers (*Belideus breviceps*), 2 ♂ and 1 ♀. Presented by Robert G. Batten, Esq.
28. 1 Black Bear (*Ursus americanus*), ♂. Presented by Rees Davies, Esq.
4 Egyptian Mastigures (*Uromastix spinipes*). Received in exchange.
4 Egyptian Sand-Lizards (*Psammosaurus griseus*). Received in exchange.
1 Tree-Boa (*Corallus hortulanus*). Purchased.
29. 2 Glossy Ibises (*Ibis falcinellus*). Purchased.
1 Puma (*Felis concolor*), ♂. Presented by Capt. Dow, F.Z.S.
2 Sparrow-Hawks (*Accipiter nisus*), ♂ and ♀. Presented by Mr. R. B. Sharpe.

Aug. 29. 1 Cashmere Monkey (*Macacus pelops*), ♀. Presented by Rev. T. P. Methuen.

Sept. 2. 2 Black-eared Marmosets (*Hapale penicillata*), ♂ and ♀. Presented by Mr. E. Ball.

3. 2 Common Kestrels (*Tinnunculus alaudarius*). Presented by Mr. W. Lake.

4. 1 Potto (*Perodicticus potto*), ♂. Purchased.
1 Spanish Ibex (*Capra pyrenaica*), ♂. Presented by Major Howard Irby (74th Highlanders).
23 Edible Sea-Urchins (*Echinus esculentus*). Presented by Mr. A. D. Bartlett.
3 Shore-Crabs (*Carcinus mœnas*). Presented by Mr. A. D. Bartlett.

5. 2 Black-tailed Water-Hens (*Tribonyx ventralis*). Hatched in the Gardens.

6. 1 Wanderoo Monkey (*Macacus silenus*), ♂. Presented by Capt. A. A. Davidson.
2 Marmoset Monkeys (*Hapale jacchus*), ♂ and ♀. Presented by H. M. Wainwright, Esq.
2 Red Ground-Doves (*Geotrygon montana*). Hatched in the Gardens.

7. 1 Sooty Monkey (*Cercocebus fuliginosus*), ♀. Purchased.
4 Cuming's Octodons (*Octodon cumingii*). Born in the Menagerie.

8. 1 Wood-Pigeon (*Columba palumbus*). Presented by H. P. Hensman, Esq.
3 Island Hen Gallinules (*Gallinula nesiotis*). Presented by E. L. Layard, Esq., F.Z.S.

9. 1 White-backed Piping Crow (*Gymnorhina leuconota*). Presented by Higford Burr, Esq.

13. 1 Common Otter (*Lutra vulgaris*). Presented by Mr. A. Fairgrieve.
1 Egyptian Cobra (*Naia haje*). Purchased.
9 Puff-Adders (*Clotho arietans*). Purchased.
1 Greek Tortoise (*Testudo græca*). Presented by Mr. W. A. Jepson.
2 Greey's Guans (*Penelope greeyi*). Presented by Robert Gardner, Esq.

15. 1 Grys-bok (*Calotragus melanotis*), ♂. Purchased.

16. 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by George M'Leay, Esq., F.Z.S.
1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by George M'Leay, Esq., F.Z.S.
1 Grey Crow Shrike (*Strepera anaphonensis*). Presented by John Flexman, Esq.

18. 1 Marsh Harrier (*Circus æruginosus*). Purchased.

19. 1 Zebu (*Bos indicus*), ♀. Born in the Menagerie.

20. 2 Vulpine Phalangers (*Phalangista vulpina*), ♂. Born in the Menagerie.

22. 1 Nicobar Pigeon (*Calœnas nicobarica*). Hatched in the Gardens.
1 Crested Pigeon (*Ocyphaps lophotes*). Hatched in the Gardens.
1 Blue-winged Parrakeet (*Brotogerys tiriacula*). Presented by Mrs. M'Mullen.
2 Royal Pythons (*Python regius*). Presented by Mrs. Thomas Brassey, F.Z.S.
1 Sloth Bear (*Melursus labiatus*). Presented by Capt. A Morrel, R.N.

Sept. 24. 1 Sun-Bird (*Eurypyga helias*). Deposited.
25. 1 Black-crested Eagle (*Spizaëtus occipitalis*). Purchased.
1 Common Peafowl (*Pavo cristatus*). Presented by Lady Cranstoun.
26. 1 Common Camel (*Camelus dromedarius*), ♀. Purchased.
1 Korin (*Gazella rufifrons*), ♀. Purchased.
27. 2 Servals (*Felis serval*), ♂ and ♀. Presented by J. J. Monteiro, Esq., C.M.Z.S.
2 Persian Gazelles (*Gazella subgutturosa*), ♀. Presented by T. Kerr Lynch, Esq., F.Z.S.
1 Lion (*Felis leo*). Presented by T. Kerr Lynch, Esq., F.Z.S.
1 Superb Crested Eagle (*Spizaëtus ornatus*), ♀. From Costa Rica. Presented by Capt. Dow, F.Z.S.
28. 1 Patas Monkey (*Cercopithecus ruber*). Presented by Clement P. Penny, Esq.
29. 1 Two-toed Sloth (*Cholœpus hoffmanni*?), from Panama. Purchased.

Oct. 1. 1 Bengalese Leopard Cat (*Felis bengalensis*). Presented by Charles J. Sturt, Esq.
2. 1 Pair Swinhoe's Pheasants (*Euplocamus swinhoii*). Deposited.
2 Pallas's Eared Pheasants (*Crossoptilon auritum*). Deposited.
2 Rough-legged Buzzards (*Archibuteo lagopus*). Presented by Capt. Stuart.
4. 1 West-African Python (*Python sebæ*). Presented by Mr. C. Czarnikow, F.Z.S.
6. 1 Cape Ant-Bear (*Orycteropus capensis*), ♀. Purchased.
1 Aard Wolf (*Proteles cristatus*). Purchased.
7. 2 Common Chameleons (*Chamæleon vulgaris*). Presented by Mr. G. Bashford.
8. 1 Philantomba Antelope (*Cephalophus maxwellii*). Born in the Menagerie.
1 Mooruk (*Casuarius bennettii*). Purchased.
9. 1 Grey Parrot (*Psittacus erithacus*). Presented by Miss Paget.
11. 1 Common Buzzard (*Buteo vulgaris*). Presented by John Susini, Esq.
2 Horned Vipers (*Cerastes hasselquistii*). Received in exchange.
12. 4 Sand-Asps (*Vipera ammodytes*). Received in exchange.
1 Grizzled Spider Monkey (*Ateles grisescens*), ♂. Purchased.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by the Rev. F. E. Durnford.
13. 1 Cinereous Sea-Eagle (*Haliaëtus albicilla*). Presented by R. Albay, Esq.
1 Squirrel Monkey (*Callithrix sciureus*), ♀. Presented by F. G. H. Price, Esq.
14. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by Mr. Lucas.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
2 Axis Deer (*Cervus axis*), ♂ and ♀. Presented by Mrs. Morison.
3 Crested Ground-Parrakeets (*Calopsitta novæ hollandiæ*). Presented by Dr. J. S. Tulloch, F.Z.S.
15. 1 Chimpanzee (*Troglodytes niger*), ♀. Deposited.
2 Caspian Emys (*Emys caspica*). Purchased.
2 Mocassin Snakes (*Tropidonotus fasciatus*). Purchased.
1 Say's Snake (*Coronella sayi*). Purchased.

Oct. 16. 2 Eye-browed Guans (*Penelope superciliaris*). Presented by Edward Harris, Esq.
1 Bay Antelope (*Cephalophus dorsalis*), ♀, from the Gold Coast. Presented by C. B. Mosse, Esq.
1 Two-spotted Paradoxure (*Nandinia binotata*), from the Gold Coast. Presented by C. B. Mosse, Esq.
1 Brush-tailed Porcupine (*Atherura africana*), from the Gold Coast. Presented by C. B. Mosse, Esq.
17. 1 Spotted Cavy (*Cœlogenys paca*). Presented by Mrs. Hairby.
18. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by the Rev. H. H. Woods.
19. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Capt. Spencer.
1 Bonnet-Monkey (*Macacus radiatus*). Presented by Mr. J. Hutchinson.
20. 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by W. Worsfold, Esq.
22. 1 Common Barn-Owl (*Strix flammea*). Presented by E. H. Denison, Esq.
23. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mrs. Goodall.
25. 1 Vervet Monkey (*Cercopithecus lalandii*). Deposited.
1 Yellow Baboon (*Cynocephalus babouin*). Deposited.
2 Ring-necked Parrakeets (*Palæornis torquata*). Presented by Mr. J. Keene.
27. 1 Common Barn-Owl (*Strix flammea*). Presented by Thomas Johnson, Esq., F.Z.S.
1 Kit Fox (*Canis velox*). Presented by A. Shoobridge, Esq.
30. 1 Green Glossy Starling (*Lamprocolius chalybeus*). Presented by N. L. Austen, Esq., F.Z.S.
1 Black Bear (*Ursus americanus*). Deposited.

Nov. 1. 1 Clapperton's Francolin (*Francolinus clappertonii*). Purchased
1 Collared Fruit-Bat (*Cynonycteris collaris*). Purchased.
1 Quebec Marmot (*Arctomys empetra*). Presented by Norman Kerr, Esq., M.D.
2. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by J. Stillwell, Esq., F.Z.S.
1 Wonga-wonga Pigeon (*Leucosarcia picata*). Presented by C. H. Wigram, Esq.
3. 1 Great Eagle-Owl (*Bubo maximus*). Received in exchange.
2 Canadian Beavers (*Castor canadensis*). Deposited.
2 Canada Geese (*Bernicla canadensis*). Deposited.
1 Duck-Falcon (*Falco anatum*). Deposited.
4. 1 Common Jackal (*Canis aureus*), ♂. Presented by Captain Gallicher.
1 Coati, brown variety (*Nasua nasica*), ♀. Presented by Capt. J. Thwaites.
5. 1 Indian Leopard (*Felis leopardus*), ♀. Presented by Capt. Arthur Hazlerigg.
1 South-American Rat-Snake (*Spilotes variabilis*). Presented by Mr. Hounslow.
9. 1 Brazilian Hang-nest (*Icterus jamaicai*). Purchased.
10. 1 Great Eagle-Owl (*Bubo maximus*). From China. Presented by Dr. Somerville.
11. 1 Red and Blue Macaw (*Ara macao*). Presented by J. P. Wilson, Esq., F.Z.S.

Nov. 11. 1 Blackbird (*Turdus merula*). Presented by the Hon. H. M. Best.
3 Chinese Silk Fowls (*Gallus domesticus*). Presented by Lady Alcock.
12. 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by the Acclimatization Society of Queensland.
2 Indian Leopards (*Felis leopardus*), ♂ and ♀. Presented by Henry Bayley, Esq.
15. 1 Kingfisher (*Alcedo ispida*). Presented by Mr. J. W. Harrison.
16. 2 Common Hares (*Lepus europæus*). Purchased.
1 Barraband's Parrakeet (*Polytelis barrabandii*). Presented by George Cooke, Esq.
17. 1 Cape-Crowned Crane (*Balearica regulorum*). Presented by R. R. Juler, Esq.
1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by R. R. Juler, Esq.
1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by Alexander Sinclair, Esq.
1 White-tailed Gnu (*Catoblepas gnu*), ♂. Deposited.
2 White-handed Gibbons (*Hylobates lar*), ♂ and ♀. Presented by G. S. Rodon, Esq.
18. 1 Emu (*Dromæus novæ hollandiæ*). Presented by the Viscount Hill, F.Z.S.
1 Crested Ground-Parrakeet (*Calopsitta novæ hollandiæ*). Hatched in the Gardens.
19. 1 Grison (*Grisonia vittata*), ♀. Purchased.
20. 1 Palm-Squirrel (*Sciurus palmarum*). Presented by J. Hill, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♂, from Sumatra. Presented by L. T. Hyde Martin, Esq.
22. 1 Water-Rail (*Rallus aquaticus*). Purchased.
1 Mountain-Finch (*Fringilla montifringilla*). Purchased.
23. 2 Nylghaies (*Portax picta*). Born in the Menagerie.
1 Variable Skunk (*Mephitis varians*). Purchased.
1 Pennsylvanian Buzzard (*Buteo pennsylvanicus*). Purchased.
24. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by C. S. Robinson, Esq.
25. 1 Japanese Dove (*Turtur chinensis*). Received.
30. 1 Bennett's Wallaby (*Halmaturus bennettii*), ♀. Presented by R. C. Ross, Esq.

Dec. 4. 1 White-fronted Capuchin Monkey (*Cebus albifrons*), ♀. Deposited.
4 Yellow-footed Water Tortoises (*Emys flavipes*). Presented by the Rev. Basil Wilberforce.
2 Laniarian Water-Tortoises (*Emys luniaria*). Presented by the Rev. Basil Wilberforce.
6. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by J. Norris, Esq.
1 Red Kangaroo (*Macropus rufus*). Born in the Menagerie.
1 Common Genet (*Genetta vulgaris*). Deposited.
7. 1 Stock-Dove (*Columba œnas*). Presented by John Attlee, Esq.
1 Rock-Pigeon (*Columba livia*). Presented by John Gould, Esq., F.Z.S.
8. 2 Clapperton's Francolins (*Francolinus clappertonii*). Presented by Capt. W. H. Strachan.

Dec. 9. 1 Honey-Buzzard (*Pernis apivorus*). Presented by James D. Nicol, Esq.
10. 2 Wigeons (*Mareca penelope*). Purchased.
11. 1 Eland (*Oreas canna*). Born in the Menagerie.
1 Grey Parrot (*Psittacus erithacus*). Presented by G. A. Wilde, Esq.
1 Black-billed Tree-Duck (*Dendrocygna arborea*). Purchased.
13. 1 Common Boa (*Boa constrictor*). Purchased.
1 Globose Curassow (*Crax globicera*), ♀. Purchased.
1 Ocelot (*Felis pardalis*), ♂. Purchased.
1 White-fronted Capuchin Monkey (*Cebus albifrons*), ♂. Purchased.
3 Tigers (*Felis tigris*). Born in the Menagerie.
16. 1 Ouakari Monkey (*Pithecia ouakari*), ♀. Deposited.
17. 1 Common Paradoxure (*Paradoxurus typus*). Deposited.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. W. Goslett.
18. 1 Hybrid Gayal (*Bos indicus*, ♂, and *Bos frontalis*, ♀). Born in the Menagerie.
20. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂. Presented by Mr. R. Low.
8 Water-Rats (*Arvicola amphibius*). Presented by Mr. T. C. White.
21. 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Dr. Mueller, C.M.Z.S.
1 Black-backed Porphyrio (*Porphyrio melanotus*). Presented by Dr. Mueller, C.M.Z.S.
23. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Mr. J. W. Batten.
3 Slaty Egrets (*Egretta gularis*). Purchased.
29. 1 Common Badger (*Meles taxus*). Deposited.

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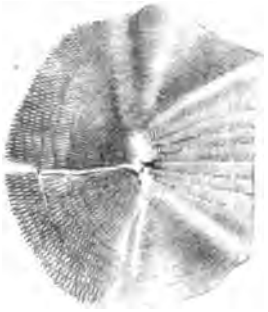
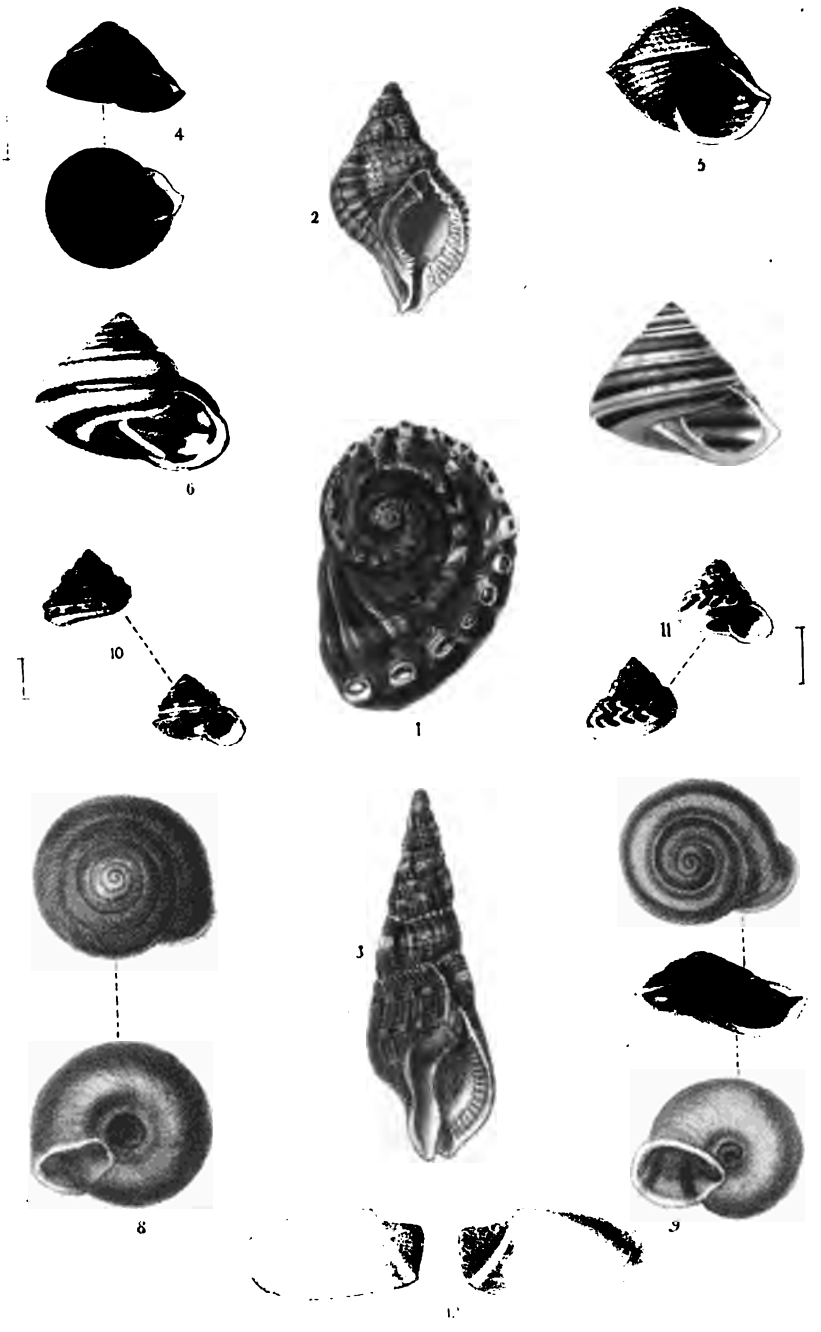


3

J.D. Macdonald ad nat del
J. Smit lith.

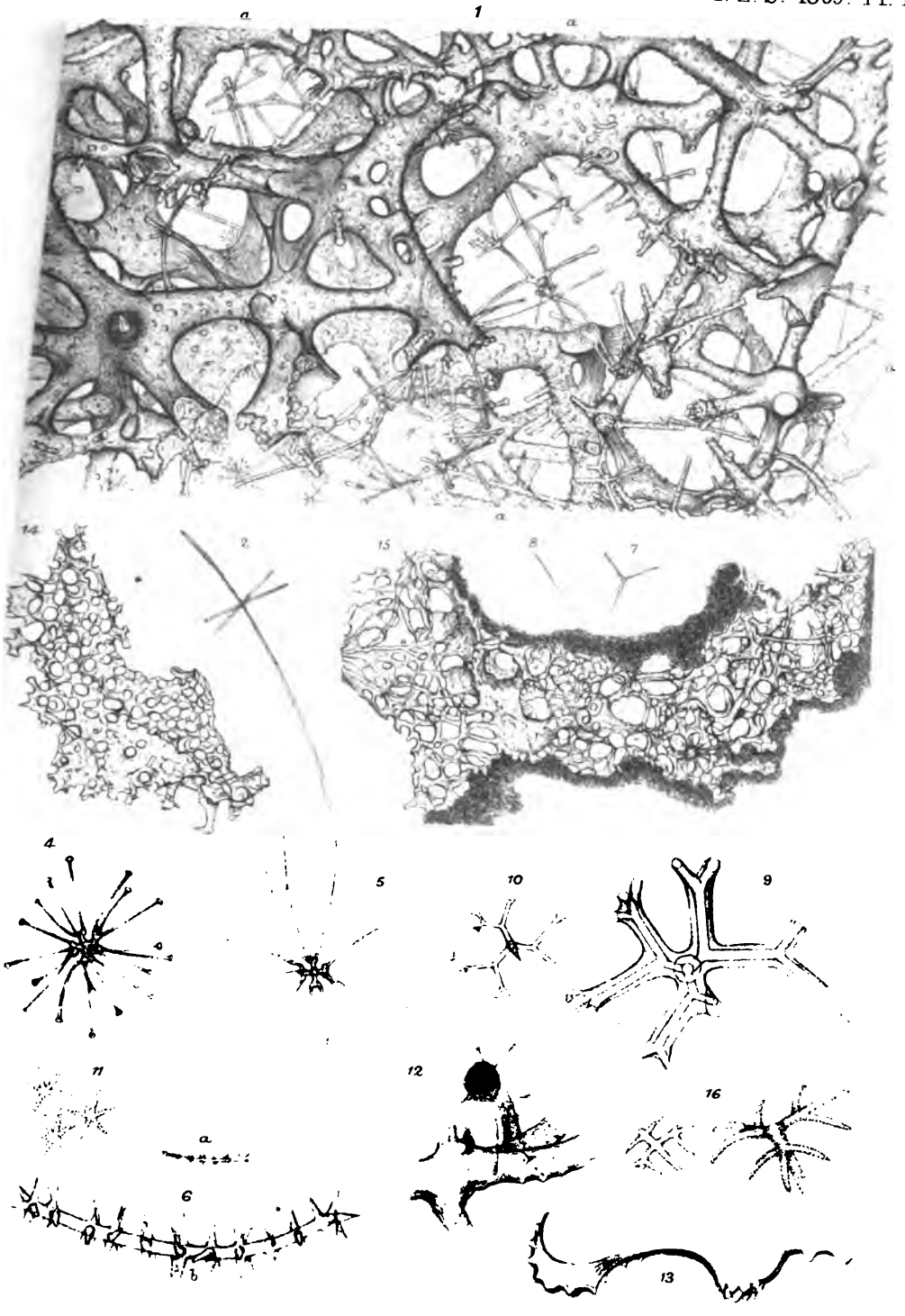
M & N Hanhart imp

CONOSTOMYXUS LOA-LOA.



M. & N. Hanhart, imp.

NEW SHELLS FROM AUSTRALIA & SOLOMON'S ISLANDS.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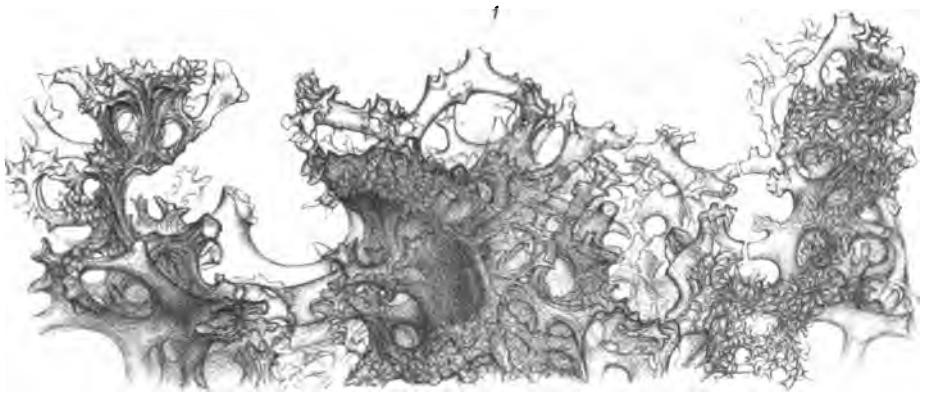
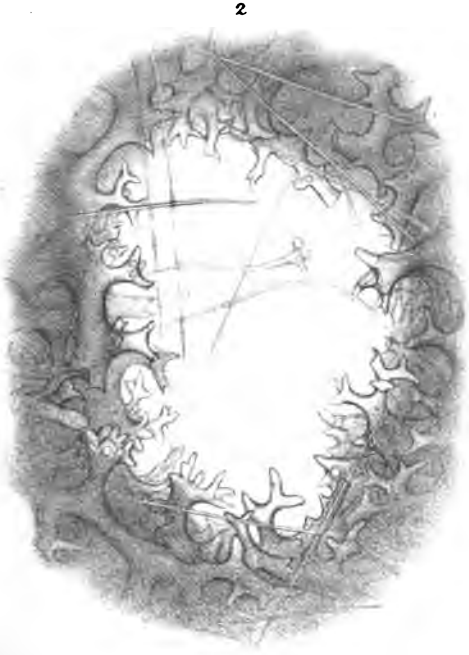
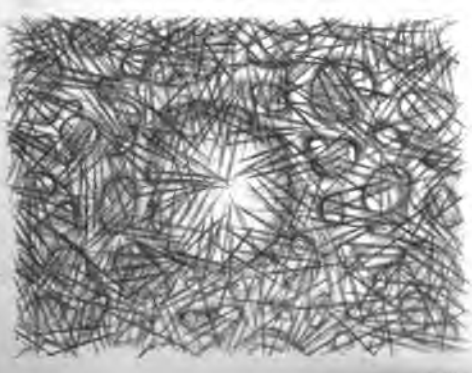


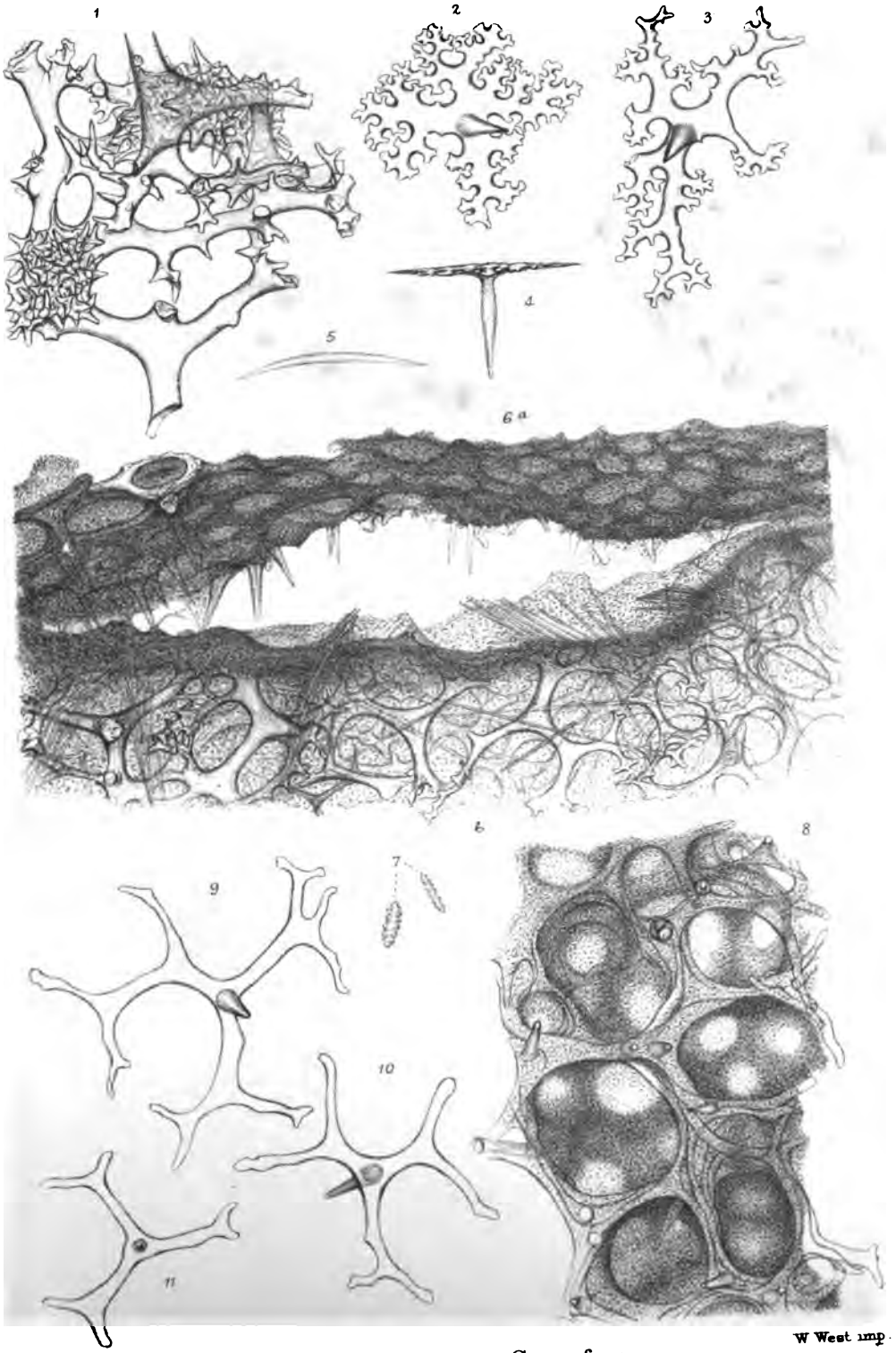




Lens Aldous del et lith.

W. West, imp.

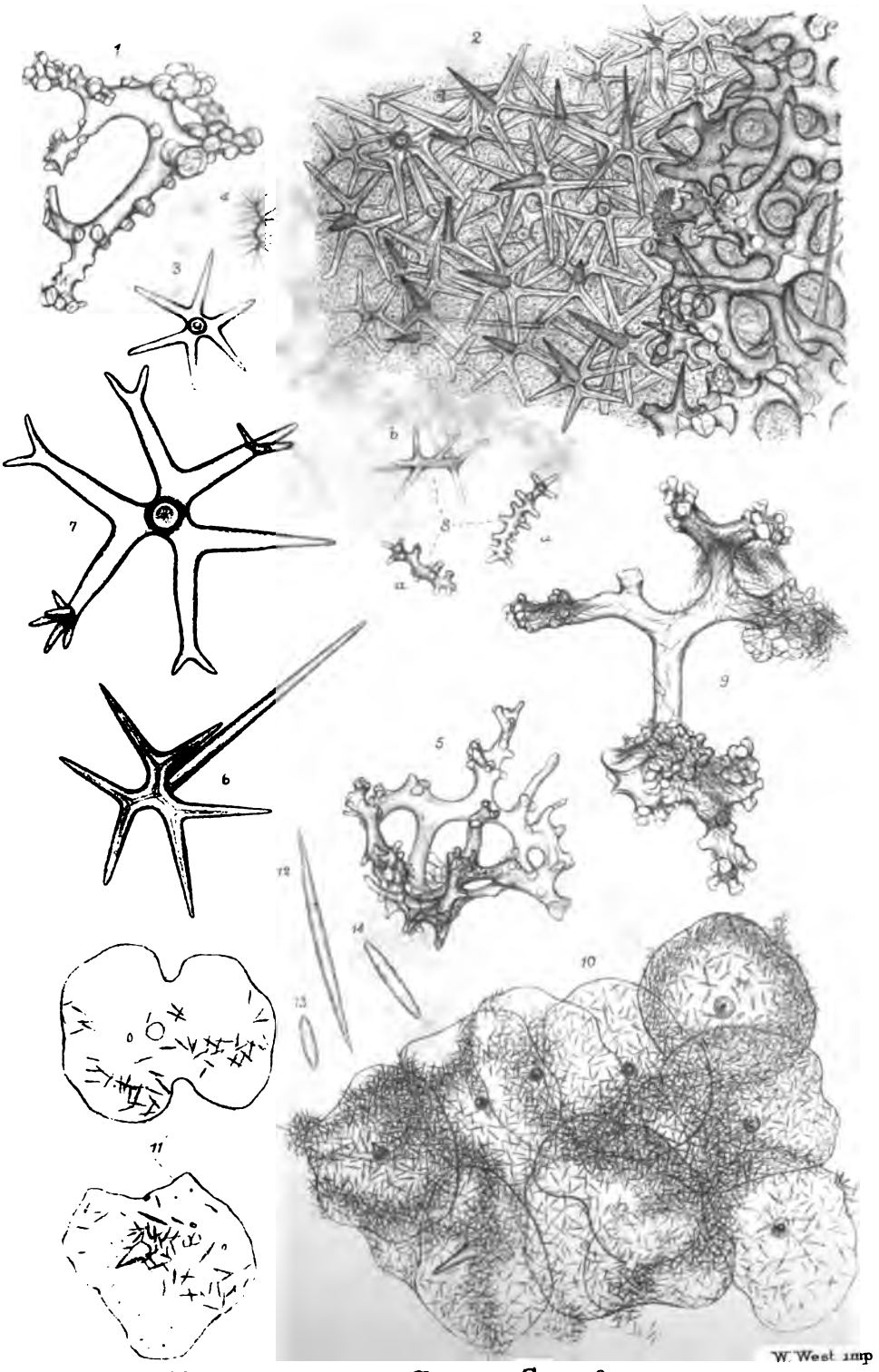
Fibrous Sponges.



Siliceo-fibrous Sponges.

Lovell Reeve & Co. Aldous del et lith.

W West imp.



Lens Aldous del. et lith.

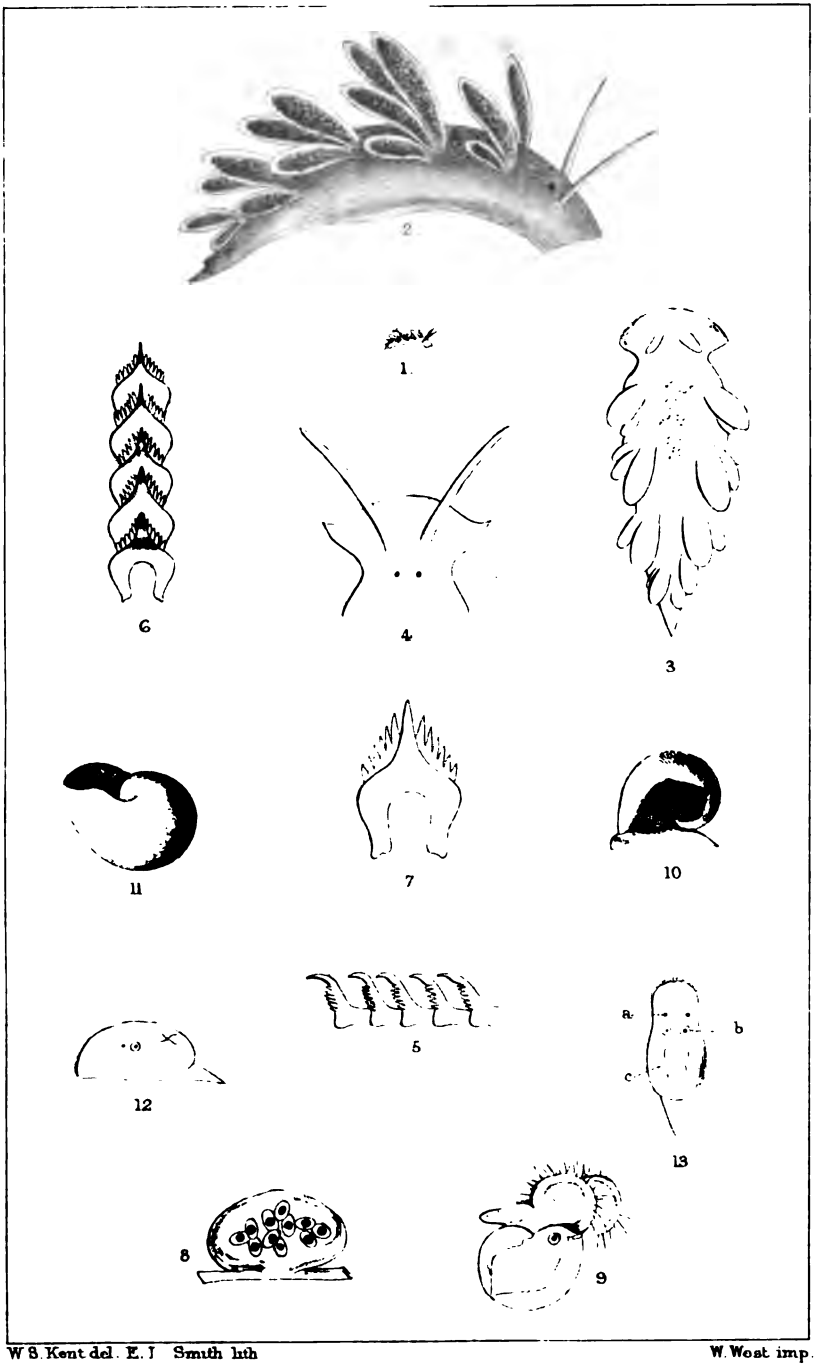
W. West imp

Siliceo-fibrous Sponges.

M & N HANHART IMP

C BERJEAU LITH

OTARIA JUBATA



W. S. Kent del. E. J. Smith lith. W. Wost imp.

Embletonia grayii.

J SMIT LITH

2/3

M.AN HANHART IMP

GRACULA KREFFTI.

1/2

J. SMIT LITH

M & N HANHART IMP

RALLUS INTACTUS

J. SMIT. LITH. M & N. HANHART IMP.

DOMICELLA CARDINALIS.

NEORHYNCHUS MASSUS

J SMIT LITH.

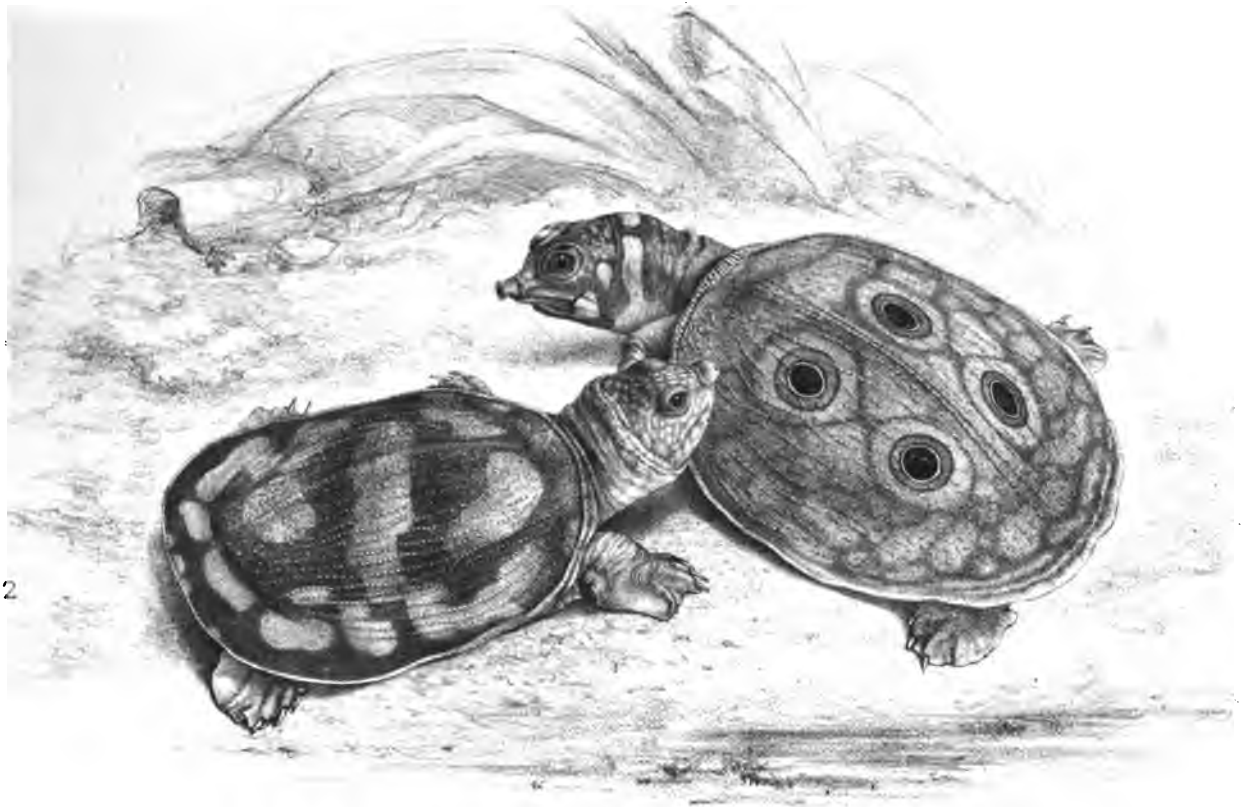
M & N HANHART LITH.

POOSPIZA CÆSAR

HEULEMANS LITH

X & P HANHART IMP

CHÆTOPS GRAYII



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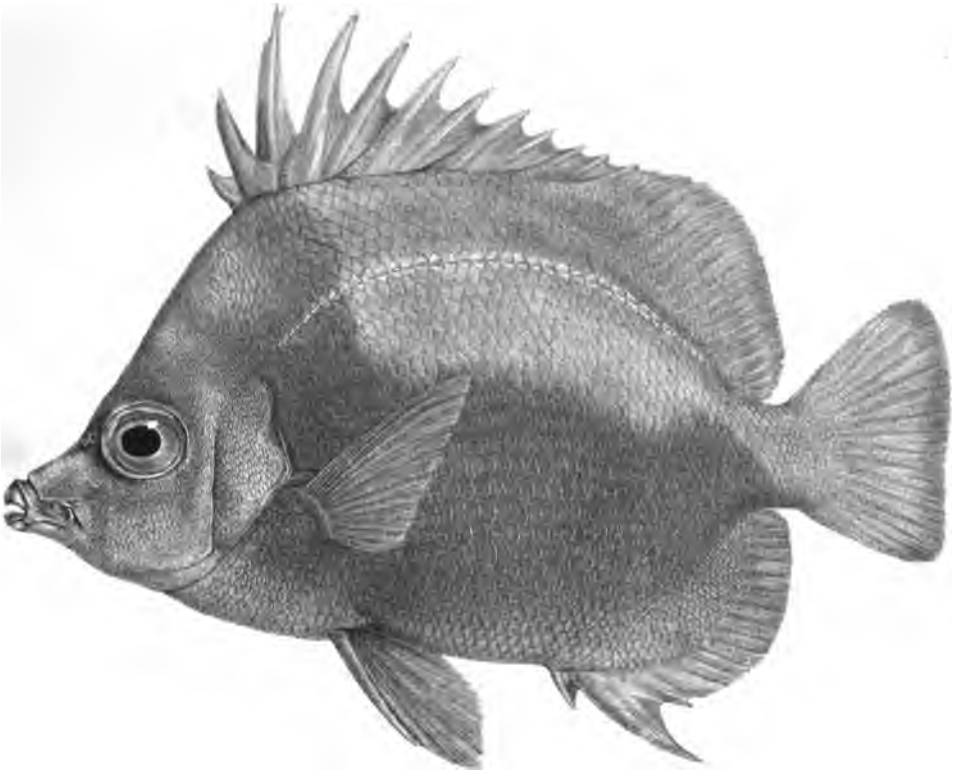


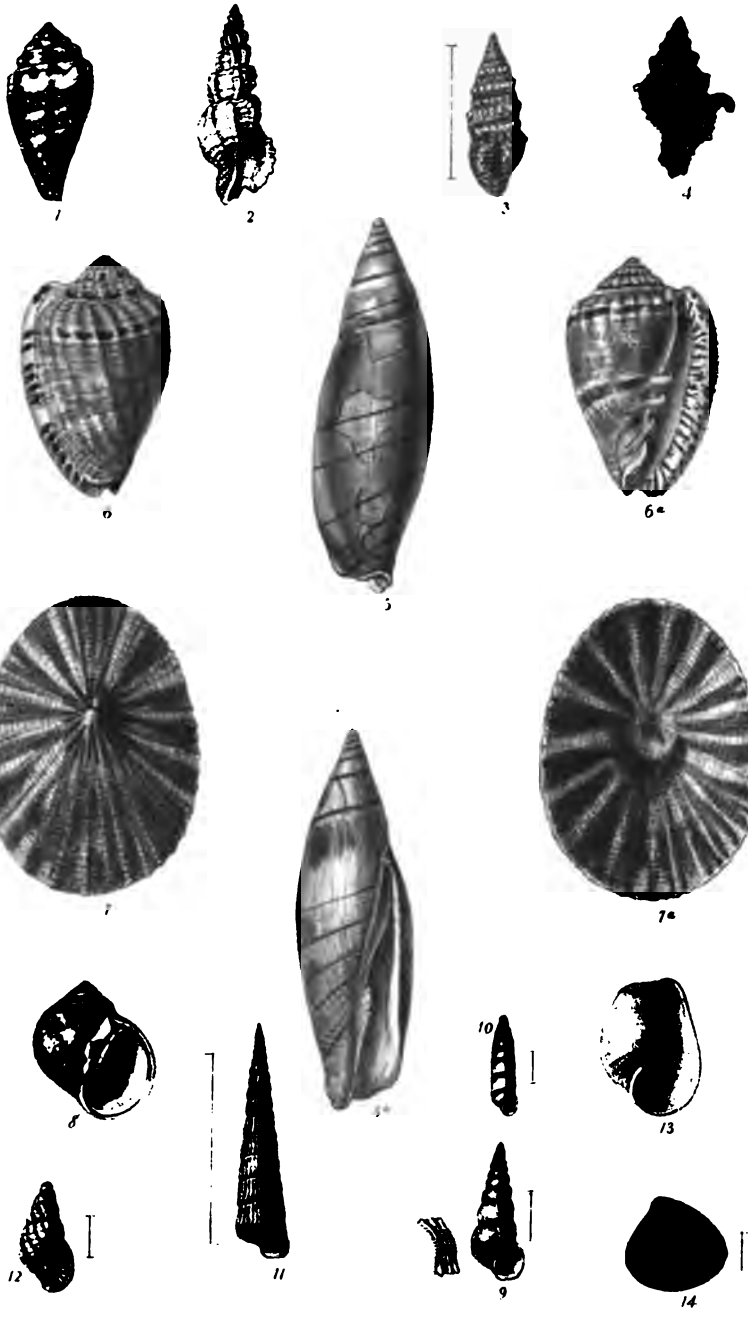
CHÆTODON DICHROUS

J. SMIT LITH.

NESTS OF PLOCEUS BAYA.

M & N HANHART IMP

BRACHYGALBA GOERINGI



G B Sowerby: lith.

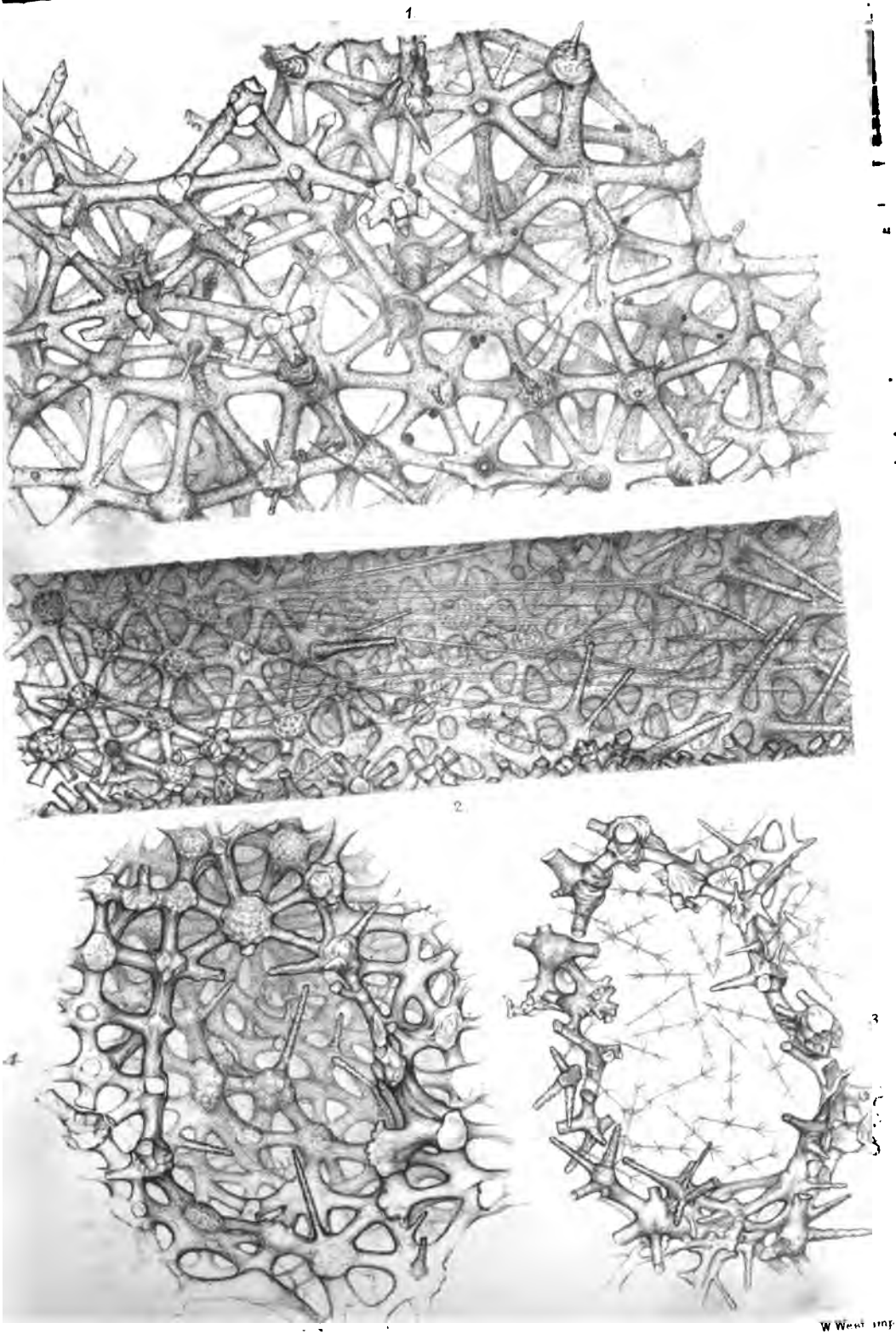
M&N Hanhart imp.

NEW MARINE SHELLS.

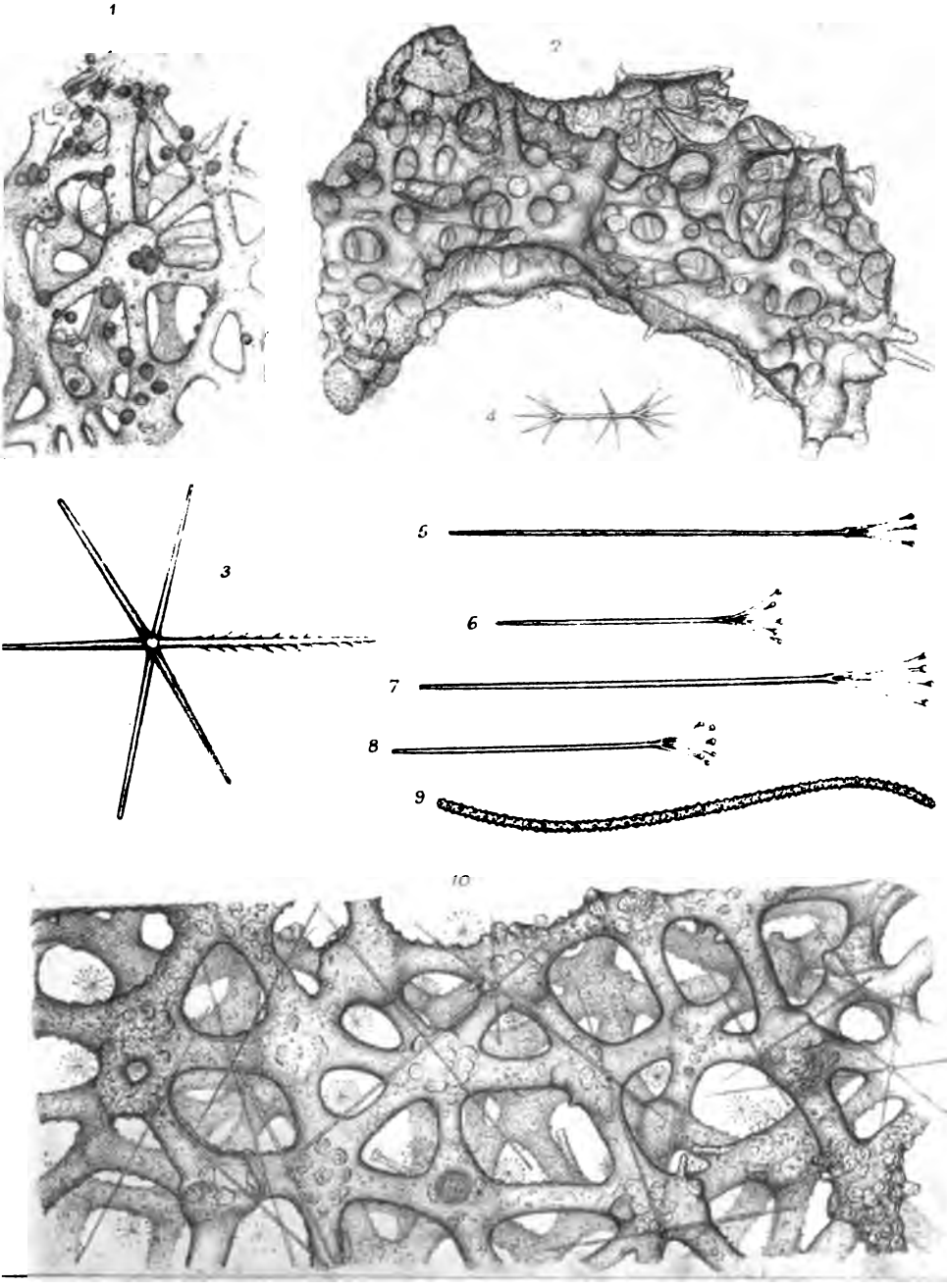
J. G. Keulemans .ad.

M & N Hanhart, imp.

PHACOCHŒRUS ÆLIANI. ♀



Calcisco-fibrous Sponges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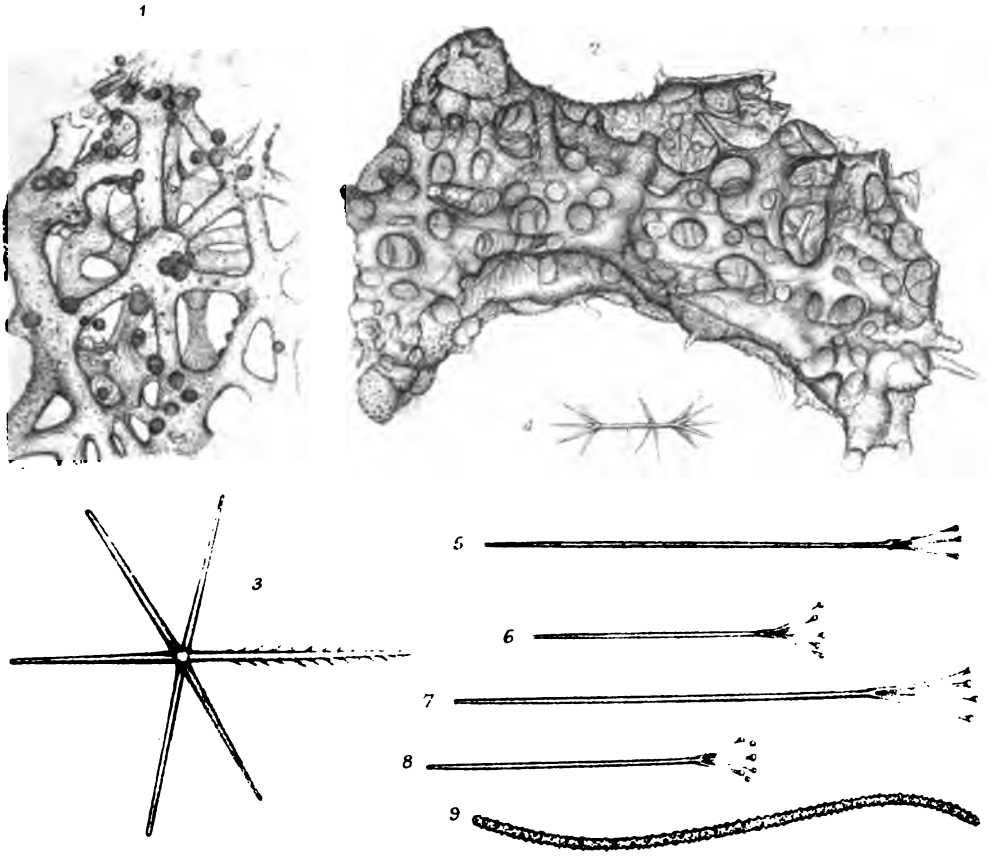
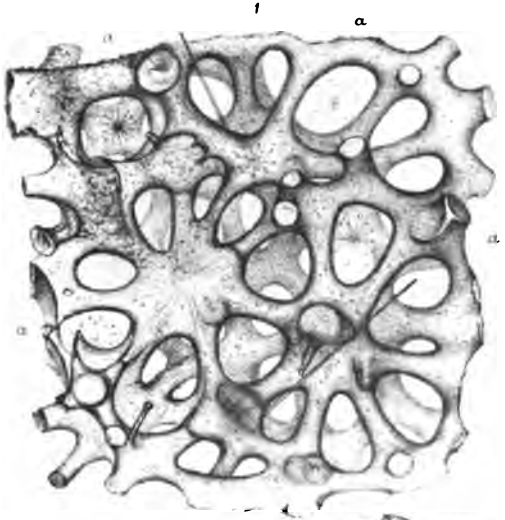
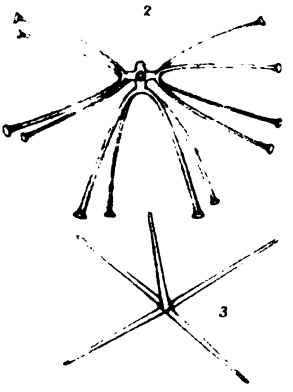


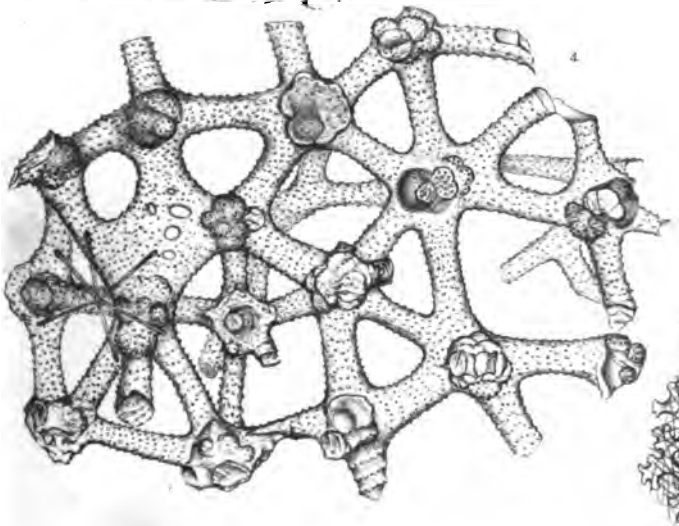
Laura Aldous del. et lith.

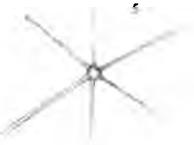
W. West

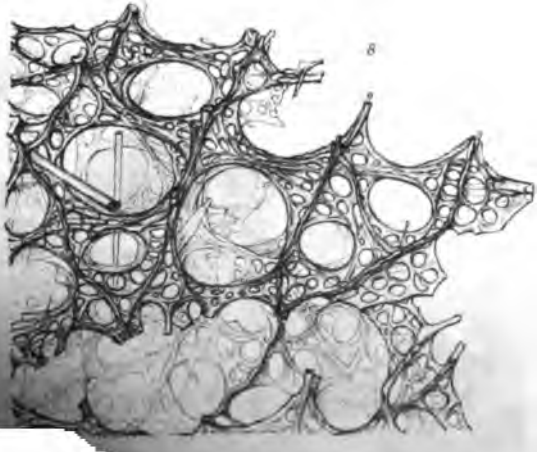
Siliceo-fibrous Sponges

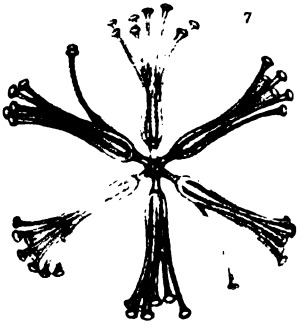






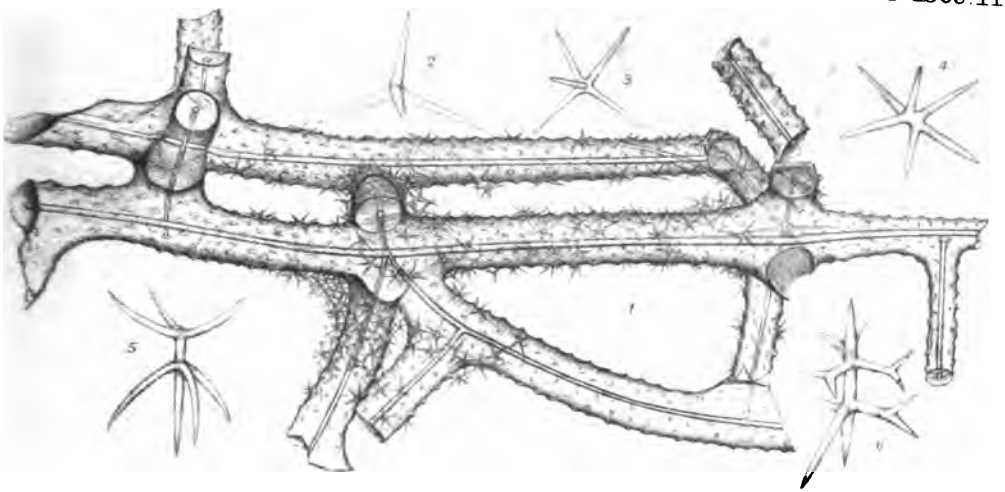


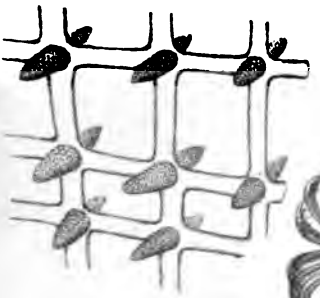


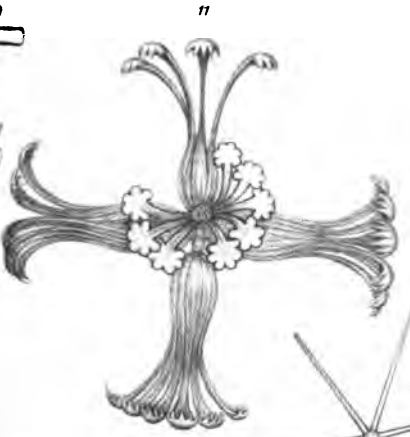


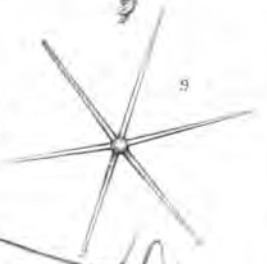
W West imp

Silicea-fibrosa. Sponges.

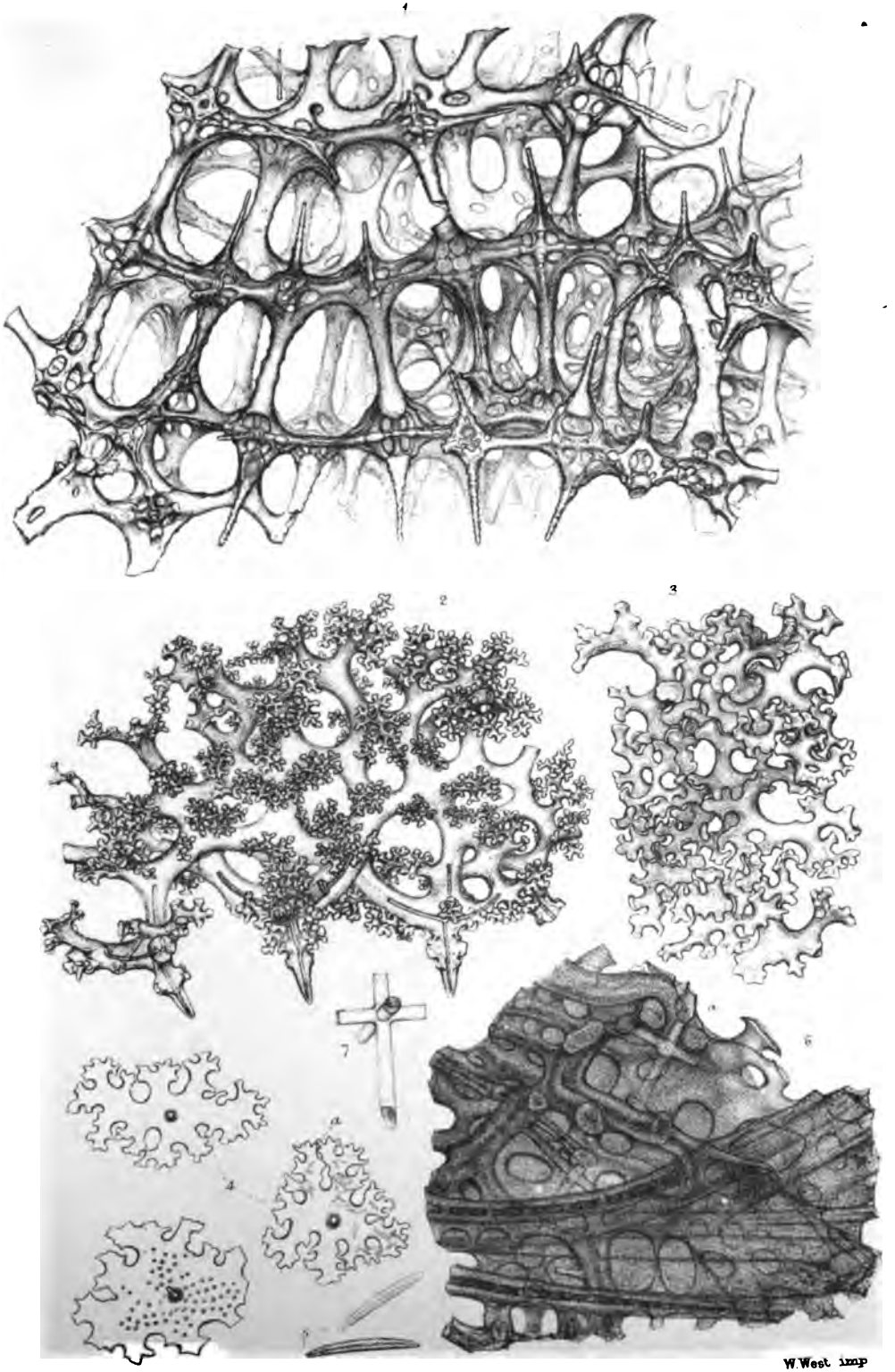








Silicco-fibrous Sponges



W.West imp

Lens Aldous del. et lith.

Siliceo-fibrous Sponges

G B Sowerby lith.

M & N Hanhart imp

NEW AUSTRALIAN SHELLS.

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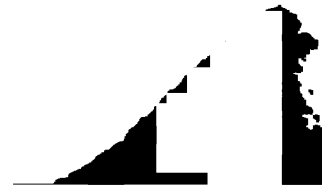
J. SMIT LITH. M. & N. HANHART IMP.

EGGS OF MALTHANIAN PHEASANTS AND
TALEIR FOSTER PARENTS

J SMIT LITH

M & N HANHART IMP.

CALLISTE FLORIDA.



M. & N. HANHART IMP.

LLISTE FLORIDA.

J. Keulemans lith. M & N Hanhart imp.

BUCCANODON ANCHIETÆ.

J. Smit lith.

M&N. Hanhart, imp.

1.2. EUPHONIA CHRYSOPASTA.
3. NEOPIPO RUBICUNDA.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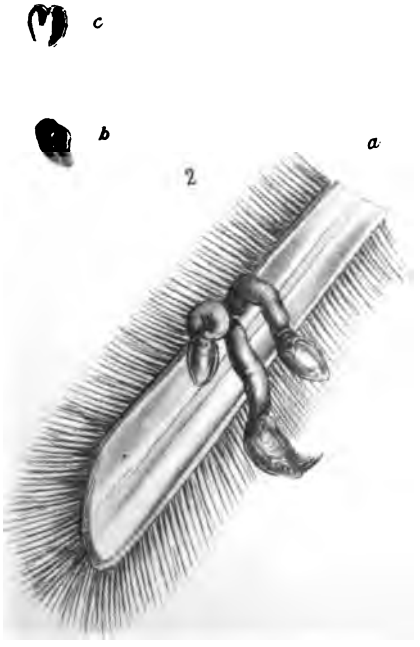
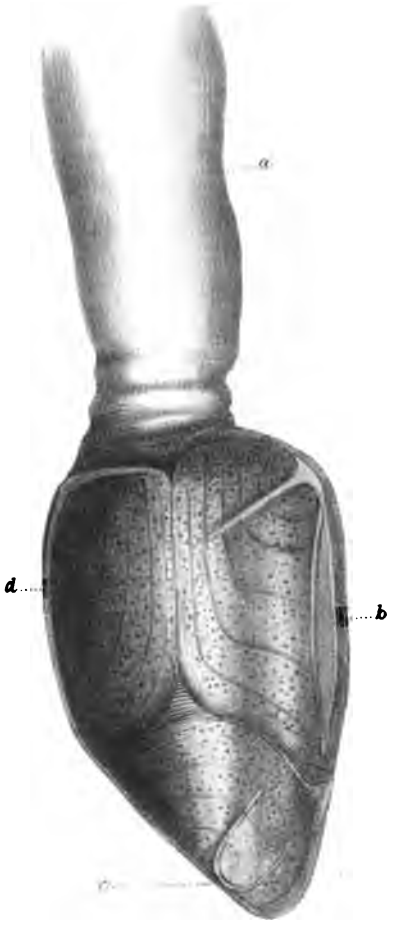
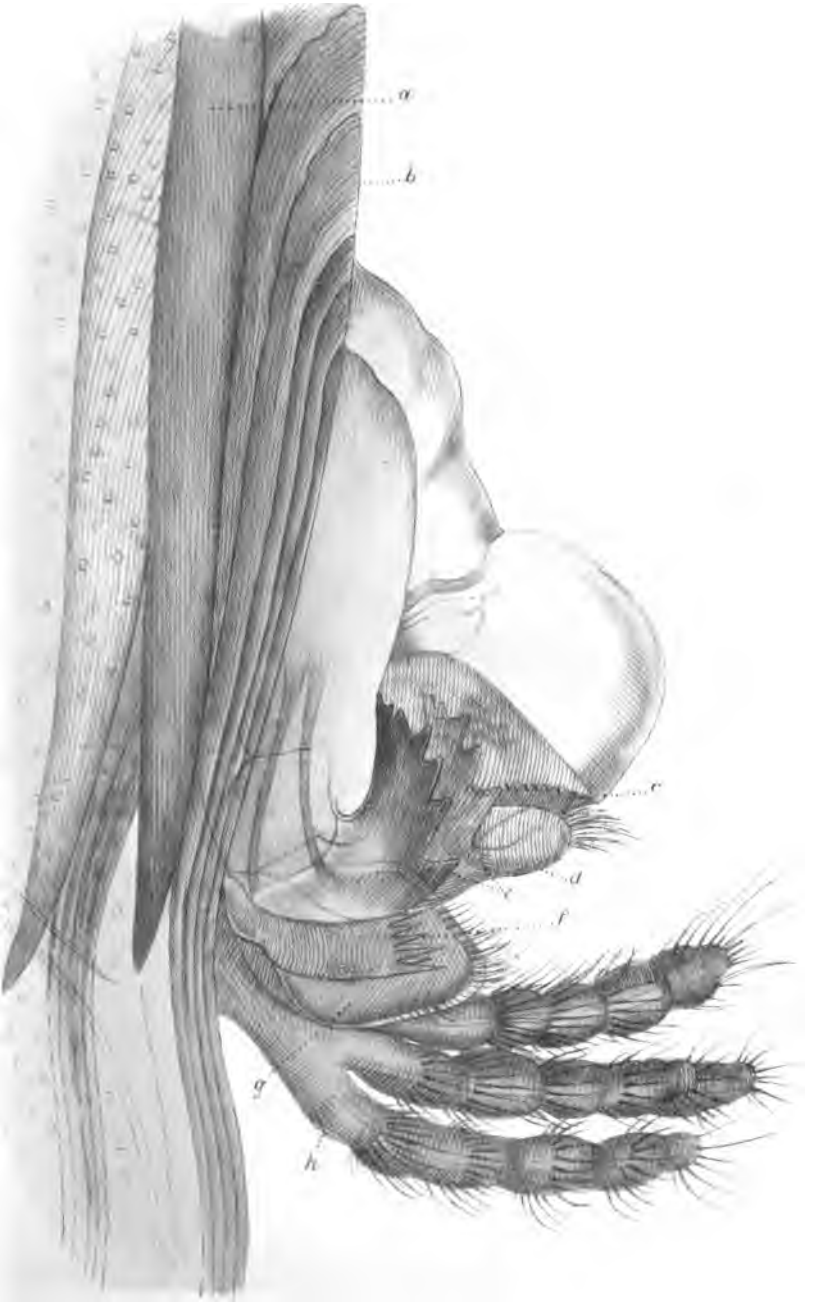




M & N Hanhart imp.

J. D. Macdonald del. et lith.

PARADOLEPAS NEPTUNI.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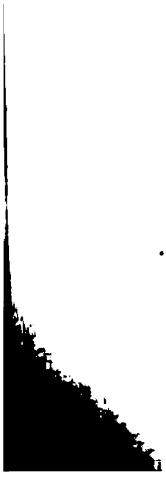
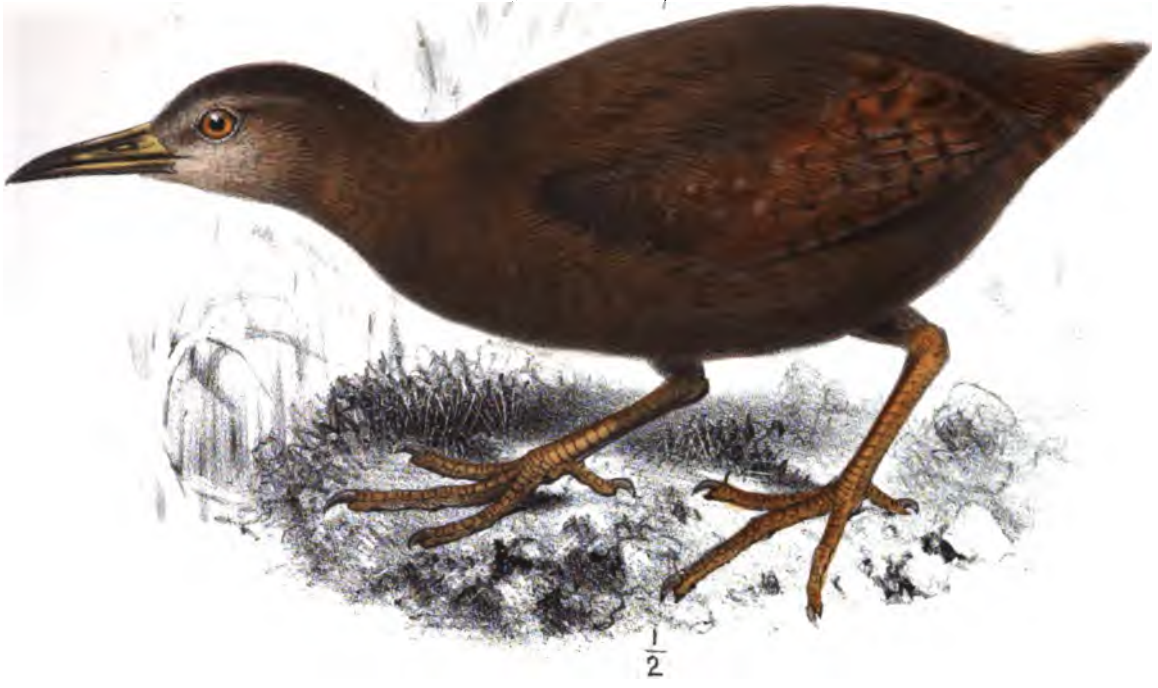




1/2

J Smit, lith.

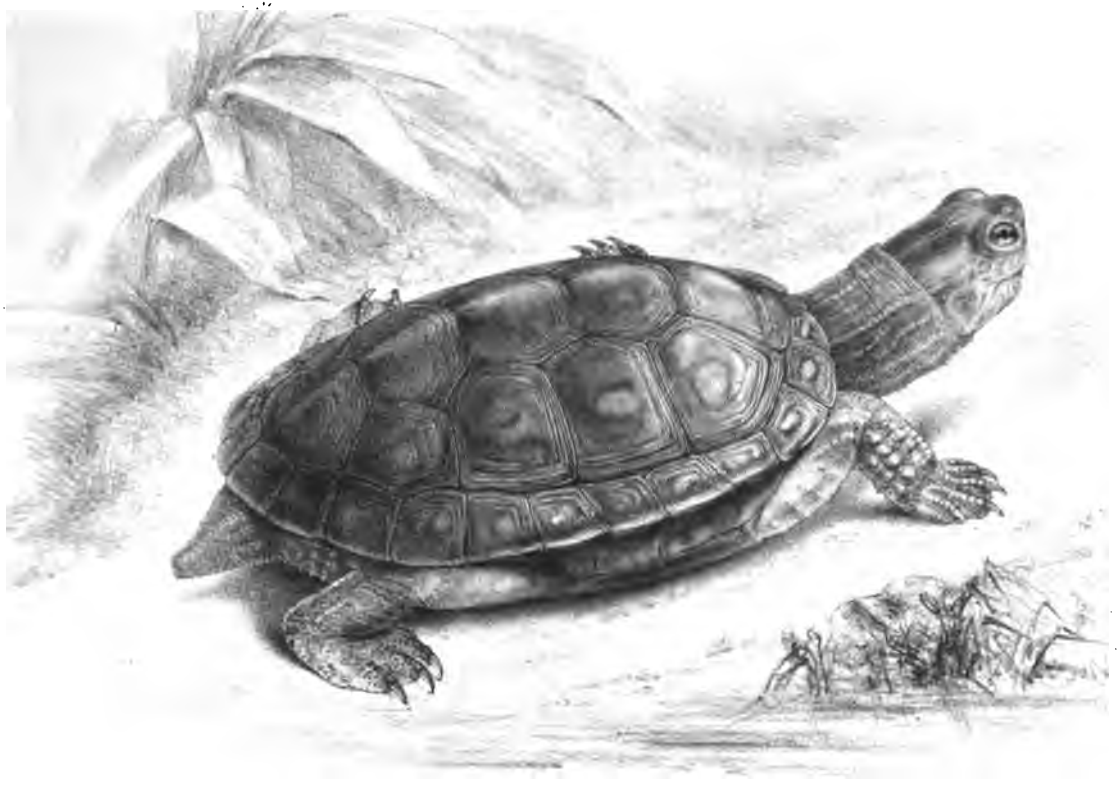
M & N. Hanhart imp

OCYDROMUS SYLVESTRIS.

M & N Hanhart imp

J. G. Keulemans lith

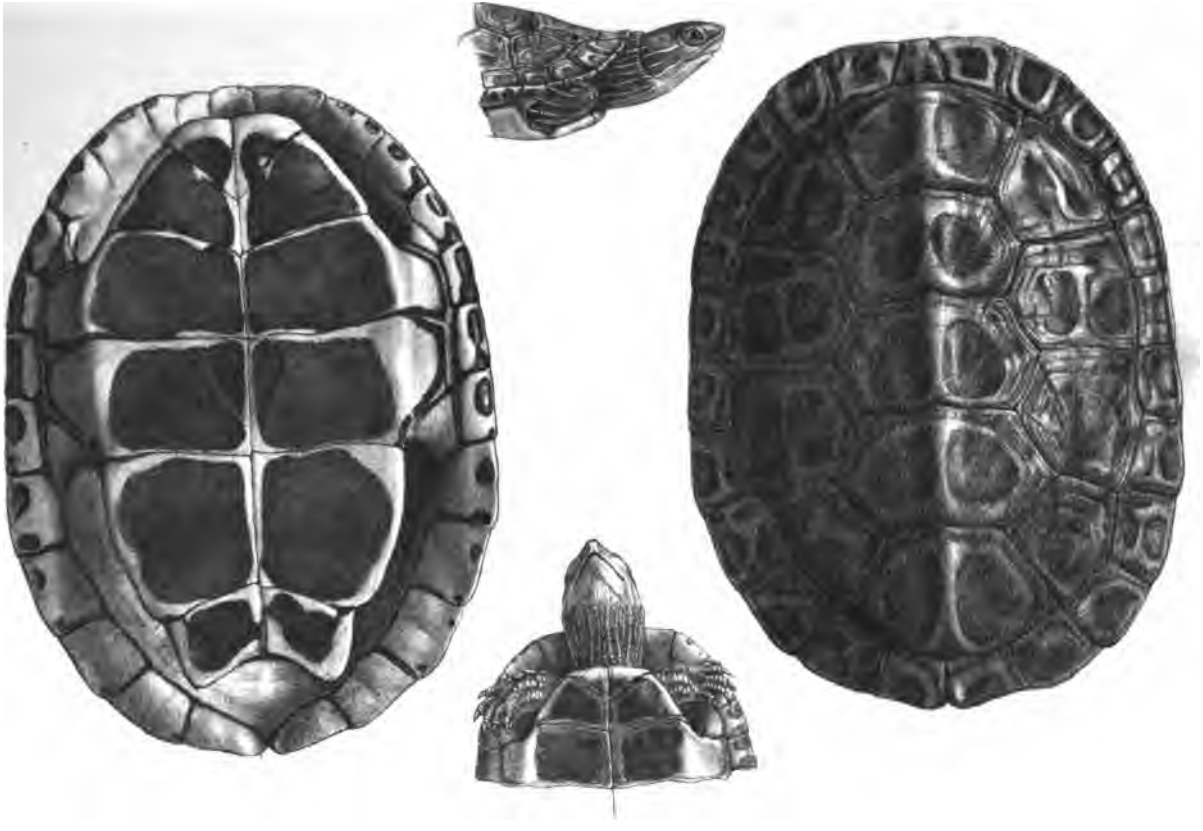
PROTELES CRISTATUS.



G.H.Ford.

W West imp

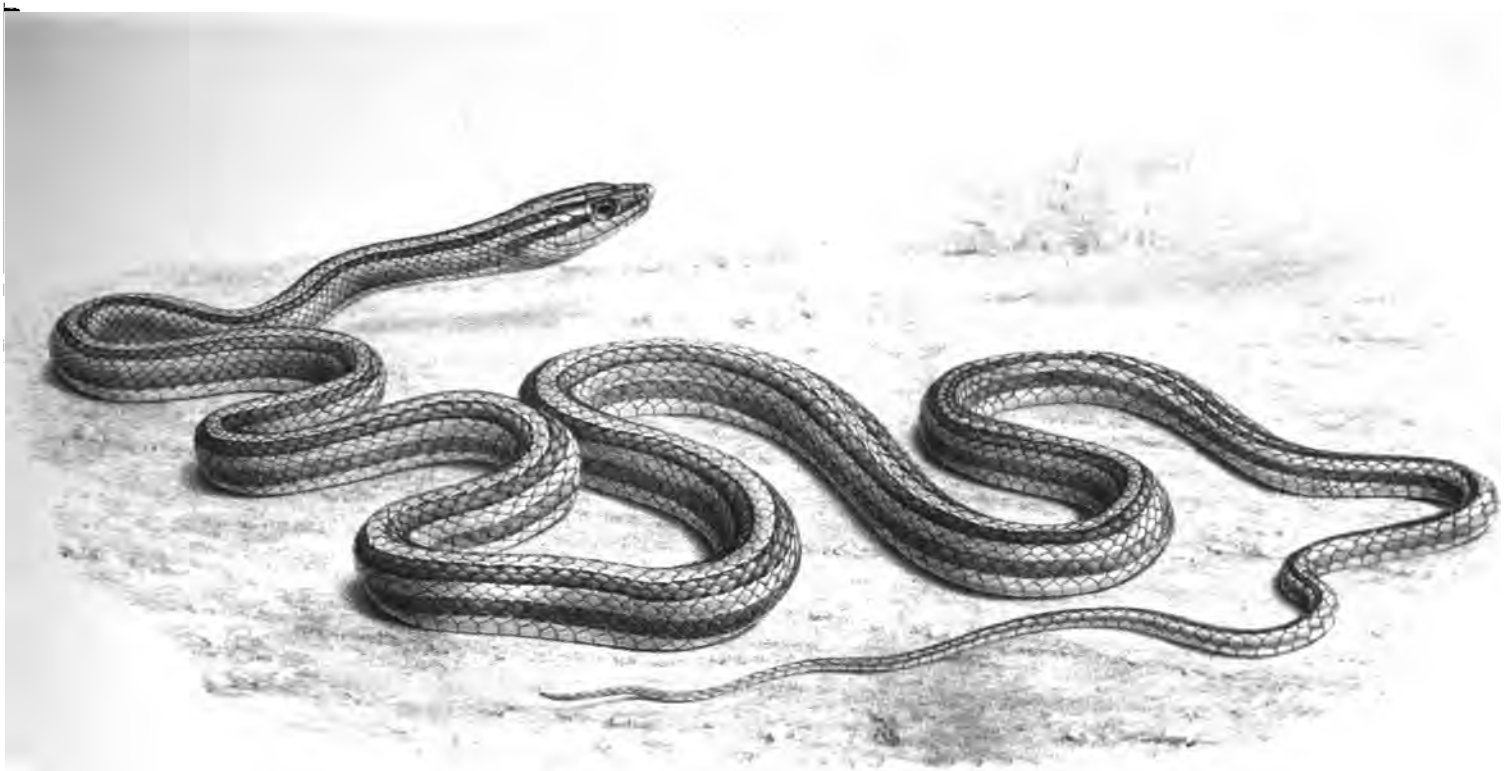
Mauremys laniaria.



G H Ford.

Emys grayi.

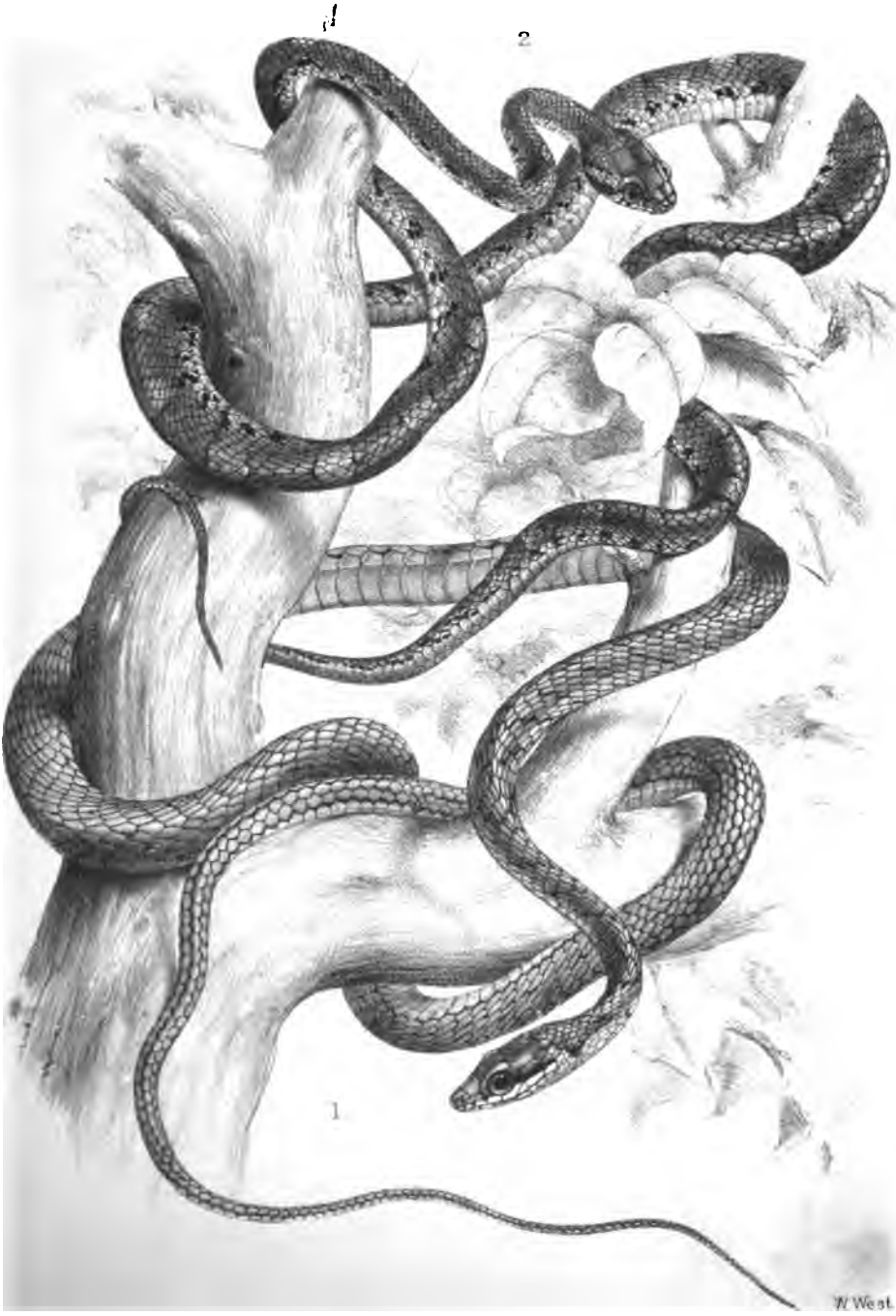
W. West imp.



G.H. Ford lith.

Psammophis leithii.

W. West imp.



W.West. imp

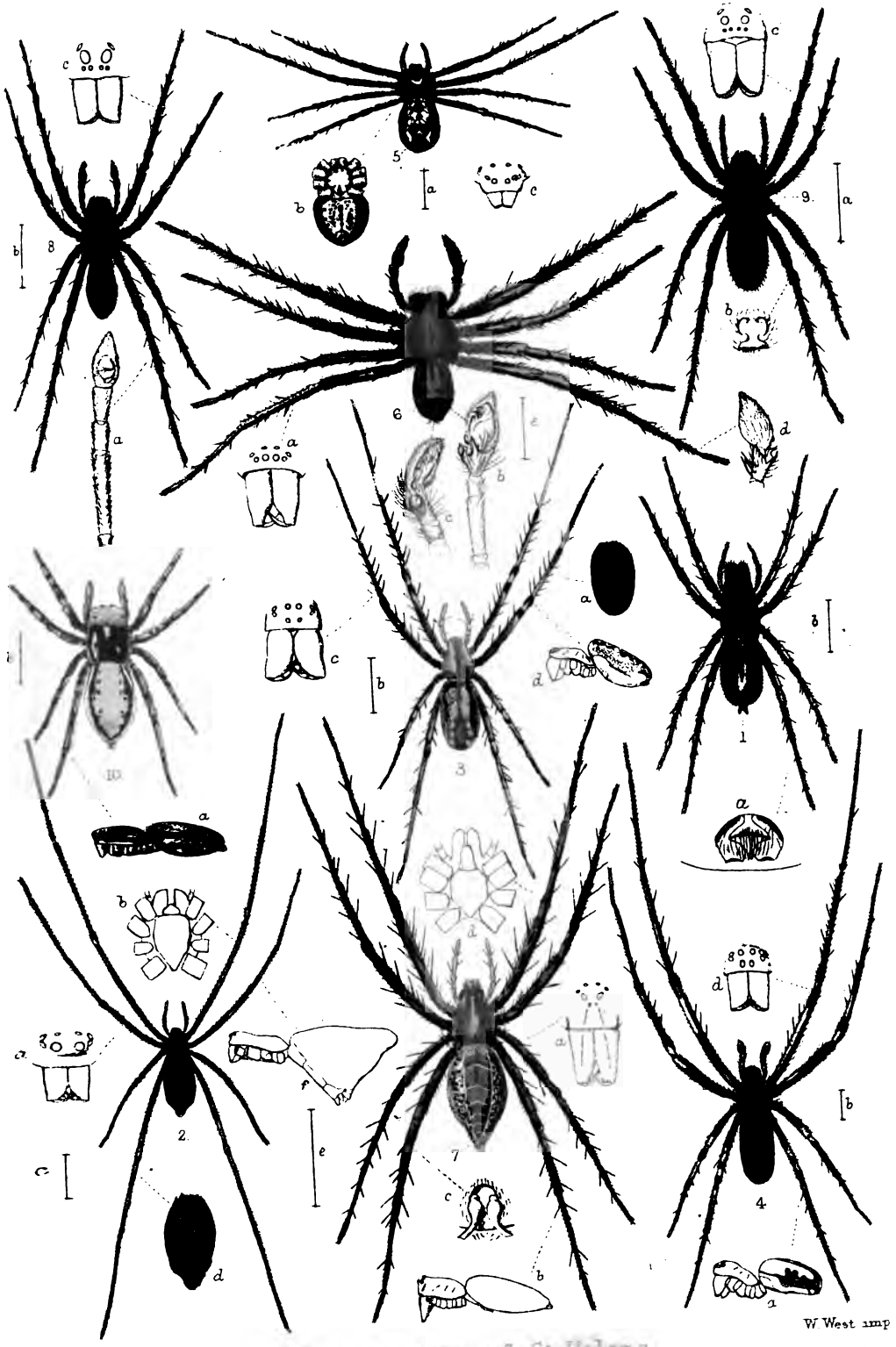
J. H. Ford

1. Dendrophis caudolineolata.
2. Dipsas barnesii.

J. Smit. lith

AILURUS FULGENS.

M & N Hanhart imp



A.T. Hollick lith

W. West imp

New Spiders of St Helena

J. Smit. lith.

M & N Hanhart imp.

HIRUNDO ANGOLENSIS

M&N Hanhart imp.

PELECANUS MOLINÆ

J Smit lith

M & N Hanhart imp

THRYOTHORUS NISORIUS

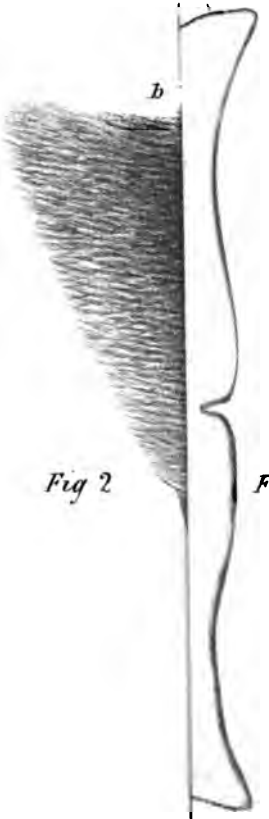


Fig 2

Fig 3.

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C B Sowerby del et lith

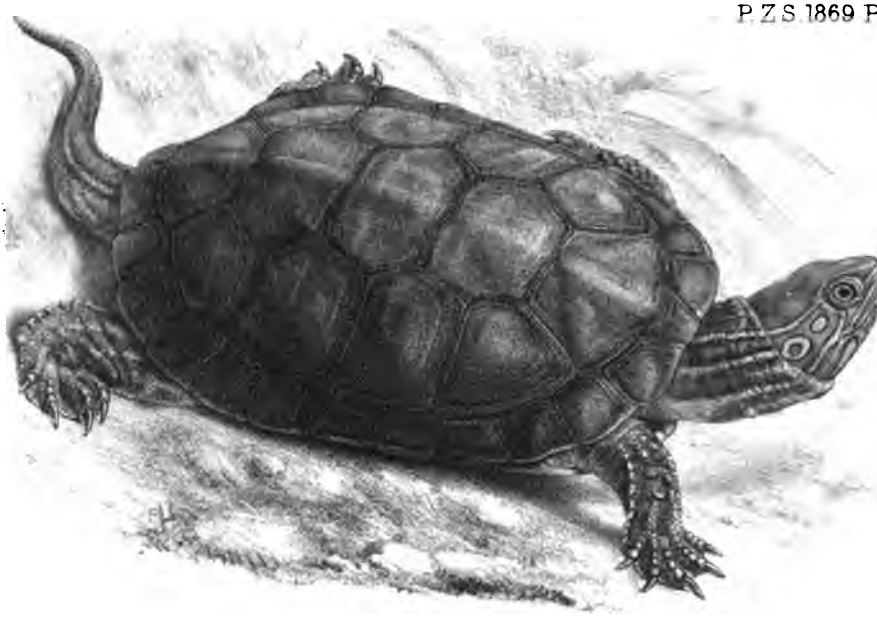
M & N Hanhart imp

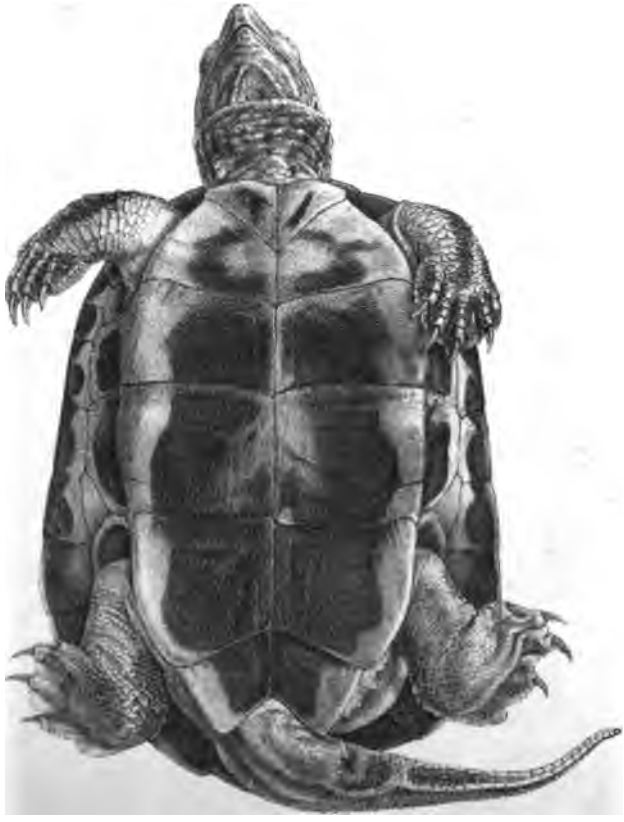
NEW HELICES FROM THE WESTERN PACIFIC ISLANDS

J Smit lith.

M & N Hanhart imp

1. SYNALLAXIS CURTATA 2. LEPTASTHENURA ANDICOLA.





G. H. Ford.

W. West.